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Comparison Tables: BBOB 2009 Function Testbed

Anne Auger — Steffen Finck — Nikolaus Hansen — Raymond Ros

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Domaine 1



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Comparison Tables: BBOB 2009 Function Testbed

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Abstract: This document presents the results in the form of tables from the Black-Box Optimization Benchmarking (BBOB) workshop of the Genetic and Evolutionary Computation Conference (GECCO), Montreal Canada, 2009. Each table presents the comparative performances of the algorithms submitted to BBOB 2009 on one problem from the function testbed.

Key-words: continuous optimization, benchmarking

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Tables de comparaison: suite de fonctions tests BBOB 2009

Résumé : Ce document présente les résultats sous forme de table du workshop Black-Box Optimization Benchmarking (BBOB) de la conférence Genetic and Evolutionary Computation Conference (GECCO), Montréal Canada, 2009. Chaque table présente les performances des algorithmes soumis à BBOB 2009 pour un problème de la suite de fonctions tests.

Mots-clés : optimisation continue, banc d'essai

This document provides tabular results of the workshop for Black-Box Optimization Benchmarking (BBOB) at GECCO 2009¹. More than 30 algorithms have been tested on 24 benchmark functions in dimensions between 2 and 40. A description of the used objective functions can be found in [14, 9]. The experimental set-up is described in [13].

The performance measure provided in the following tables is the expected number of objective function evaluations to reach a given target function value (ERT, expected running time), divided by the respective value for the best algorithm. Consequently, the best (smallest) value is 1 and the value 1 appears in each column at least once. See [13] for details on how ERT is obtained. All numbers are computed with no more than two digits of precision.

¹see <http://coco.gforge.inria.fr/doku.php?id=bbob-2009>

Table 1: 02-D, running time excess ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

1 Sphere											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	2.8	9.7	56	170	290	440	640	970	ALPS [17]
AMaLgAM IDEA	1	1.1	2.1	4.4	11	14	23	28	32	46	AMaLgAM IDEA [4]
avg NEWUOA	1	1	1.9	1.1	1.1	1	1	1	1	1	avg NEWUOA [31]
BayEDAcG	1	1	1.9	4.2	18	79	110	140	160	210	BayEDAcG [10]
BFGS	1	1	3.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	BFGS [30]
Cauchy EDA	1	1	19	15	27	39	50	63	75	100	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	3.3	3.8	8.5	13	19	24	29	39	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	3.3	3.6	7.6	11	14	18	22	29	(1+1)-CMA-ES [2]
DASA	1	1	39	23	44	52	62	76	95	120	DASA [19]
DEPSO	1	1	2.1	12	27	46	51	96	120	170	DEPSO [12]
DIRECT	1	1	1	1.4	2.5	9.4	15	20	32	56	DIRECT [25]
EDA-PSO	1	1	1.9	5	20	34	53	80	110	210	EDA-PSO [6]
full NEWUOA	1	1	2.7	1.2	1.2	1.2	1.2	1.2	1.2	1.2	full NEWUOA [31]
G3-PCX	1	1	1.9	6	17	19	24	29	34	46	G3-PCX [26]
simple GA	1	1	2.7	7.2	62	310	1100	1800	2600	4500	simple GA [22]
GLOBAL	1	1	1.9	5.7	39	50	54	55	56	58	GLOBAL [23]
iAMaLgAM IDEA	1	1	2.3	3.8	6.7	12	14	19	22	31	iAMaLgAM IDEA [4]
LSfminbnd	1	1	7.8	3.2	3.6	4.1	4.1	4.1	4.1	4.1	LSfminbnd [28]
LSstep	1	1	46	34	62	63	68	68	69	69	LSstep [28]
MA-LS-Chain	1	1	2.4	7.4	26	40	67	85	92	100	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1.5	2.2	2.6	2.6	2.6	2.6	2.6	MCS (Neum) [18]
NELDER (Han)	1	1	2.1	1.3	3	3.9	5.1	6.3	7.4	9.8	NELDER (Han) [16]
NELDER (Doe)	1	1	1	1.5	2.9	4.1	5.3	6.5	7.6	10	NELDER (Doe) [5]
NEWUOA	1	1	2.8	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	1	3.5	2.8	6.7	10	14	18	23	30	(1+1)-ES [1]
POEMS	1	1	170	80	110	400	680	1100	1300	2100	POEMS [20]
PSO	1	1	2.1	5.3	20	59	120	200	250	470	PSO [7]
PSO_Bounds	1	1.1	2.4	6	26	89	270	460	770	1200	PSO_Bounds [8]
Monte Carlo	1	1	1.5	9.7	49	540	5900	4.8e4	6.8e5	<i>11e-6/1e6</i>	Monte Carlo [3]
Rosenbrock	1	1	5.6	3.1	3.9	4.9	6.2	7.6	8.8	11	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	3.9	5.9	9.5	14	18	24	28	38	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.6	8.9	25	33	37	43	48	60	VNS (Garcia) [11]

Table 2: 02-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	11	24	58	120	130	160	200	230	260	330	ALPS [17]
AMaLgAM IDEA	4.9	4.8	6.2	7.6	7.5	9.1	10	11	13	16	AMaLgAM IDEA [4]
avg NEWUOA	1.2	1.1	1.9	5.6	8.5	10	14	17	20	27	avg NEWUOA [31]
BayEDAcG	37	62	80	78	82	87	110	110	140	140	BayEDAcG [10]
BFGS	1.7	1.6	2.5	4	3.7	3.9	4.1	4.1	4.1	4.4	BFGS [30]
Cauchy EDA	13	17	18	18	18	20	23	24	25	29	Cauchy EDA [24]
BIPOP-CMA-ES	4	5.4	13	19	18	18	20	20	20	22	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.1	5.1	10	13	13	13	14	14	15	16	(1+1)-CMA-ES [2]
DASA	21	19	19	22	21	21	23	25	26	31	DASA [19]
DEPSO	10	16	18	26	27	31	35	40	45	53	DEPSO [12]
DIRECT	5.9	5.1	7.5	8	7.1	8.5	9.4	12	13	46	DIRECT [25]
EDA-PSO	8.8	11	13	19	20	26	39	49	65	88	EDA-PSO [6]
full NEWUOA	1.2	1.2	2.4	5.8	8.3	10	13	15	18	23	full NEWUOA [31]
G3-PCX	8.6	8.4	14	64	69	76	83	82	82	82	G3-PCX [26]
simple GA	11	44	130	320	420	540	780	990	1300	1900	simple GA [22]
GLOBAL	11	19	19	17	13	13	13	13	13	13	GLOBAL [23]
iAMaLgAM IDEA	2.6	3.8	5.1	9.2	9.1	10	11	12	12	14	iAMaLgAM IDEA [4]
LSfminbnd	1.4	1.2	1	1	1	1	1	1	1	1	LSfminbnd [28]
LSstep	14	12	9.5	9.9	7.9	7.9	7.8	7.5	7.3	7.3	LSstep [28]
MA-LS-Chain	12	14	17	22	20	24	28	28	29	34	MA-LS-Chain [21]
MCS (Neum)	1.5	1.6	1.4	1.8	1.7	2.6	3.2	3.3	3.7	23	MCS (Neum) [18]
NELDER (Han)	1.9	1.8	1.7	1.8	1.8	2	2.2	2.4	2.6	3	NELDER (Han) [16]
NELDER (Doe)	1.6	1.7	1.6	1.9	1.7	1.9	2.2	2.3	2.5	3	NELDER (Doe) [5]
NEWUOA	1	1	2.2	8.8	12	15	19	23	26	35	NEWUOA [31]
(1+1)-ES	3.2	2400	8700	4.7e4	1.2e5	3.8e5	<i>74e-3/1e6</i>	.	.	.	(1+1)-ES [1]
POEMS	140	250	380	420	400	460	510	570	630	780	POEMS [20]
PSO	7.5	14	56	83	83	98	120	130	160	200	PSO [7]
PSO_Bounds	6.9	24	54	170	310	360	400	440	530	780	PSO_Bounds [8]
Monte Carlo	21	50	240	1200	5600	1e5	<i>94e-4/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	2.6	3.1	2.5	3.7	4.4	5.4	6.3	6.5	6.9	7.9	Rosenbrock [27]
IPOP-SEP-CMA-ES	4.5	5.4	14	19	16	17	18	18	18	20	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	8.4	15	22	27	24	25	26	26	26	29	VNS (Garcia) [11]

Table 3: 02-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

3 Rastrigin separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.1	1.6	9.2	6.7	6.4	11	12	15	19	23	ALPS [17]
AMaLgAM IDEA	1.1	1.1	3.7	4.6	12	12	12	12	13	13	AMaLgAM IDEA [4]
avg NEWUOA	1	2.7	5.1	1.6	3.2	3.2	3.2	3.2	3.2	3.1	avg NEWUOA [31]
BayEDAcG	1.1	1.2	4.4	4	9.7	18	41	65	65	64	BayEDAcG [10]
BFGS	1.2	18	14	3.1	10	10	10	10	10	10	BFGS [30]
Cauchy EDA	1.1	9.6	9.6	3.3	8.4	33	43	43	43	43	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.2	3.5	3.5	5.2	6.2	6.4	6.5	6.5	6.7	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.9	6.9	3.8	7.9	7.9	7.9	7.9	7.9	7.8	(1+1)-CMA-ES [2]
DASA	6.3	22	18	1.8	6.9	7	7.1	7.2	7.4	7.6	DASA [19]
DEPSO	1.8	2	5.7	2.3	2.7	4	4.5	5	5.4	6.4	DEPSO [12]
DIRECT	1	1.1	2.7	1	2.4	2.4	2.5	2.6	2.7	3	DIRECT [25]
EDA-PSO	1.2	1.4	4.8	6.4	14	19	20	20	21	22	EDA-PSO [6]
full NEWUOA	1	4	2.3	1.8	2.2	2.2	2.2	2.1	2.1	2.1	full NEWUOA [31]
G3-PCX	1.1	2	4.1	7.8	40	40	39	39	39	39	G3-PCX [26]
simple GA	1	2	8.3	13	19	27	40	55	70	110	simple GA [22]
GLOBAL	1.1	1.6	7	1.8	3.1	3.1	3.1	3.1	3.1	3.1	GLOBAL [23]
iAMaLgAM IDEA	1.1	1.4	1.8	6.3	17	17	17	17	17	17	iAMaLgAM IDEA [4]
LSfminbnd	2.1	4.7	17	32	43	64	63	63	63	61	LSfminbnd [28]
LSstep	28	120	24	1.5	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1	1.5	5.7	1.7	2.5	2.6	2.7	2.7	2.8	2.9	MA-LS-Chain [21]
MCS (Neum)	1	1.1	1.5	1.1	1.5	1.6	1.6	2.6	2.6	2.6	MCS (Neum) [18]
NELDER (Han)	1.2	1.8	1.4	4	13	13	13	13	12	12	NELDER (Han) [16]
NELDER (Doe)	1	1	1	1	1.7	1.8	1.8	1.8	1.8	1.8	NELDER (Doe) [5]
NEWUOA	1.5	2.4	4.8	1.5	4.2	4.2	4.2	4.1	4.1	4.1	NEWUOA [31]
(1+1)-ES	1.1	2.4	12	5	15	15	15	15	15	14	(1+1)-ES [1]
POEMS	31	200	42	11	14	20	24	29	32	41	POEMS [20]
PSO	1.1	1.6	5.1	3.3	3.4	4.7	6	7.2	8.8	11	PSO [7]
PSO_Bounds	1.1	1.8	4.8	5.3	8.3	14	18	22	26	34	PSO_Bounds [8]
Monte Carlo	1.1	1.5	14	67	460	3100	2.1e4	<i>39e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	1	16	45	15	26	26	26	26	26	25	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.5	2.3	3.4	7.6	8.4	9.2	9.4	9.6	9.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.9	8.8	2.9	4.1	4.2	4.2	4.5	4.7	7.7	VNS (Garcia) [11]

Table 4: 02-D, running time excess ERT/ERT_{best} on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

4 Skew Rastrigin-Bueche separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	2.5	9	7.1	8.3	9.7	12	15	17	20	ALPS [17]
AMaLGaM IDEA	1	2.2	2.6	5.6	5.1	48	48	46	47	45	AMaLGaM IDEA [4]
avg NEWUOA	1	4.5	6.2	4	14	13	12	12	12	11	avg NEWUOA [31]
BayEDAcG	1	2.3	4.5	13	62	120	110	<i>10e-1/2e3</i>	.	.	BayEDAcG [10]
BFGS	1	13	11	5.7	12	11	11	10	10	9.8	BFGS [30]
Cauchy EDA	1	19	6.8	13	75	410	470	450	450	430	Cauchy EDA [24]
BIPOP-CMA-ES	1	3.8	2.6	6.9	55	97	99	98	99	110	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	2.4	5.2	5.5	27	25	24	23	23	22	(1+1)-CMA-ES [2]
DASA	1	82	15	2	3.6	3.4	3.3	3.3	3.4	3.4	DASA [19]
DEPSO	1	2.4	7.2	4.2	6.5	11	17	17	17	35	DEPSO [12]
DIRECT	1	1	1.8	1.8	6.6	6.1	14	14	16	16	DIRECT [25]
EDA-PSO	1	2.6	4.2	9.9	18	19	19	19	19	20	EDA-PSO [6]
full NEWUOA	1	3.8	5.4	3.9	15	14	13	13	13	12	full NEWUOA [31]
G3-PCX	1	2.1	20	17	76	70	67	65	64	62	G3-PCX [26]
simple GA	1	2.6	10	16	22	28	37	49	60	100	simple GA [22]
GLOBAL	1	2.4	8.5	1.2	5.2	4.8	4.6	4.5	4.5	4.3	GLOBAL [23]
iAMaLGaM IDEA	1	3.8	2.5	9.5	61	57	56	55	55	54	iAMaLGaM IDEA [4]
LSfminbnd	1	4.6	1	45	120	230	<i>10e-1/4e3</i>	.	.	.	LSfminbnd [28]
LSstep	1	220	19	1.3	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1	2.3	5.6	1.8	4.4	4.2	4.1	4	4.1	4.1	MA-LS-Chain [21]
MCS (Neum)	1	1	2	1	2.9	2.7	2.7	2.7	2.7	2.6	MCS (Neum) [18]
NELDER (Han)	1	3.1	5	5.3	27	25	24	23	23	22	NELDER (Han) [16]
NELDER (Doe)	1	2.1	1.9	1.4	3.5	3.2	3.1	3	3	3	NELDER (Doe) [5]
NEWUOA	1	3	5	4.5	18	16	16	15	15	14	NEWUOA [31]
(1+1)-ES	1	3.1	4.5	5.5	23	21	20	20	20	19	(1+1)-ES [1]
POEMS	1	240	36	9.8	22	23	29	32	35	41	POEMS [20]
PSO	1.1	3.2	4	3.3	4.6	5.6	6.4	7.4	8.7	11	PSO [7]
PSO_Bounds	1	3.3	4.4	6.3	9.6	17	21	24	27	33	PSO_Bounds [8]
Monte Carlo	1	3.3	8.6	67	620	8200	2.8e4	5.5e4	<i>11e-3/1e6</i>	.	Monte Carlo [3]
Rosenbrock	1	71	27	15	52	48	46	44	44	42	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	3.5	3	8.7	75	180	270	260	260	250	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	2.6	5.1	4.1	8.8	8.2	7.9	8.3	8.8	17	VNS (Garcia) [11]

Table 5: 02-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

5 Linear slope											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.1	8.8	76	100	100	100	100	100	100	ALPS [17]
AMaLgAM IDEA	1	1.1	5.3	16	18	18	18	18	18	18	AMaLgAM IDEA [4]
avg NEWUOA	1	1.2	1.1	1.5	1.6	1.6	1.6	1.6	1.6	1.6	avg NEWUOA [31]
BayEDAcG	1	1	3.3	92	100	100	100	100	100	100	BayEDAcG [10]
BFGS	1	1	1.5	2.8	2.8	2.9	2.9	2.9	2.9	2.9	BFGS [30]
Cauchy EDA	1	1	16	17	17	17	17	17	17	17	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	3.4	5.3	5.7	5.8	5.8	5.8	5.8	5.8	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1.9	3.1	3.4	3.4	3.4	3.4	3.4	3.4	(1+1)-CMA-ES [2]
DASA	1	1.9	19	32	40	46	53	60	66	80	DASA [19]
DEPSO	1	1	6.1	34	35	36	36	36	36	36	DEPSO [12]
DIRECT	1	1	3.4	2.8	4.2	4.2	4.2	4.2	4.2	4.2	DIRECT [25]
EDA-PSO	1	1	5	15	16	17	17	17	17	17	EDA-PSO [6]
full NEWUOA	1	1.3	1	1.2	1.4	1.4	1.4	1.4	1.4	1.4	full NEWUOA [31]
G3-PCX	1	1.1	4.1	29	31	31	31	31	31	31	G3-PCX [26]
simple GA	1	1	4.2	310	2e3	4200	6300	9800	1.5e4	6.8e5	simple GA [22]
GLOBAL	1	1.1	4.4	69	70	70	70	70	70	70	GLOBAL [23]
iAMaLgAM IDEA	1	1	4.6	12	13	13	13	13	13	13	iAMaLgAM IDEA [4]
LSfminbnd	1	1	4.9	7.3	8.5	9.1	9.1	9.1	9.1	9.1	LSfminbnd [28]
LSstep	1	1.2	59	79	91	91	91	91	91	91	LSstep [28]
MA-LS-Chain	1	1.1	4.7	81	120	130	130	130	130	130	MA-LS-Chain [21]
MCS (Neum)	1	1	1.2	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1	1.8	2.1	2.2	2.2	2.2	2.2	2.2	2.2	NELDER (Han) [16]
NELDER (Doe)	1	1	1.3	1.9	1.9	1.9	1.9	1.9	1.9	1.9	NELDER (Doe) [5]
NEWUOA	1	1	1.1	1.5	1.5	1.5	1.5	1.5	1.5	1.5	NEWUOA [31]
(1+1)-ES	1	1	1.9	2.4	2.5	2.6	2.6	2.6	2.6	2.6	(1+1)-ES [1]
POEMS	1	1	140	150	170	180	190	190	190	190	POEMS [20]
PSO	1	1.1	4.2	18	20	21	21	21	21	21	PSO [7]
PSO_Bounds	1	1	6.1	13	16	16	16	16	16	16	PSO_Bounds [8]
Monte Carlo	1	1	4.4	530	4.9e4	<i>22e-3/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	3.5	3.4	3.5	3.5	3.5	3.5	3.5	3.5	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	4	6.6	7.1	7.1	7.1	7.1	7.1	7.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	6.3	27	27	27	27	27	27	27	VNS (Garcia) [11]

Table 6: 02-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

6 Attractive sector											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	3.2	3.2	2.2	12	31	50	62	73	80	83	ALPS [17]
AMaLGaM IDEA	1.1	1.4	2.1	4.5	4.9	5.5	6.2	6.5	6.7	7	AMaLGaM IDEA [4]
avg NEWUOA	1.4	2.1	3.1	4.7	3.9	4.4	4.4	4.5	4.7	4.6	avg NEWUOA [31]
BayEDAcG	2.8	1.9	1.5	160	640	<i>72e-2/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	4.3	4.4	4.2	3.4	2.7	2.4	2	1.9	1.7	1.6	BFGS [30]
Cauchy EDA	11	10	16	18	17	17	17	17	16	16	Cauchy EDA [24]
BIPOP-CMA-ES	3.9	3	2	2.8	3.6	3.9	4.2	4.2	4.1	4.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.2	3.3	2.1	3	2.3	2.2	2.2	2.3	2.2	2.1	(1+1)-CMA-ES [2]
DASA	30	29	23	22	18	19	19	18	18	18	DASA [19]
DEPSO	1.7	1.7	3.8	11	12	14	14	15	16	17	DEPSO [12]
DIRECT	1.4	1	1.4	7.6	5.8	120	800	1500	1200	970	DIRECT [25]
EDA-PSO	3.4	2.4	3.1	12	12	15	19	27	29	34	EDA-PSO [6]
full NEWUOA	1	2.2	3.4	3.7	3.2	3.5	3.7	3.7	4.1	4.5	full NEWUOA [31]
G3-PCX	2.3	1.5	2.3	4.5	3.7	3.9	3.9	3.8	3.8	4.1	G3-PCX [26]
simple GA	4.8	3.4	3.5	14	85	1e3	3100	4100	3600	4900	simple GA [22]
GLOBAL	3.7	2.9	2.3	8.8	7.4	6.2	5.2	4.5	3.9	3.2	GLOBAL [23]
iAMaLGaM IDEA	2.7	1.9	2.4	3.6	3.8	4	4.1	4.2	4.3	4.4	iAMaLGaM IDEA [4]
LSfminbnd	19	190	280	370	290	260	210	180	150	120	LSfminbnd [28]
LSstep	53	330	910	580	380	330	710	1200	<i>17e-4/1e4</i>	.	LSstep [28]
MA-LS-Chain	4.4	2.9	2.2	13	14	14	12	12	10	10	MA-LS-Chain [21]
MCS (Neum)	1.4	190	52	29	19	42	100	110	100	120	MCS (Neum) [18]
NELDER (Han)	2.1	1.5	1	1	1.1	1.1	1.1	1.1	1.1	1.1	NELDER (Han) [16]
NELDER (Doe)	1.6	2	1.3	1.3	1	1	1	1	1	1	NELDER (Doe) [5]
NEWUOA	1.2	2.4	4.4	4.7	3.9	4.4	4.7	4.8	5	4.9	NEWUOA [31]
(1+1)-ES	2.4	2.2	2.5	3.7	3.6	3.6	3.4	3.4	3.3	3.2	(1+1)-ES [1]
POEMS	200	160	99	130	120	140	130	140	180	180	POEMS [20]
PSO	1.5	1.1	2.1	4.6	7.9	18	23	29	32	36	PSO [7]
PSO_Bounds	2.2	1.5	2.6	7	37	77	130	140	140	170	PSO_Bounds [8]
Monte Carlo	3	2.3	2.7	16	53	780	1.3e4	8.1e4	1.5e5	<i>28e-5/1e6</i>	Monte Carlo [3]
Rosenbrock	4	3	2.2	2.1	1.8	1.8	1.8	1.8	1.7	1.5	Rosenbrock [27]
IPOP-SEP-CMA-ES	4.7	3.1	1.7	4.1	3.8	4.5	4.6	4.7	4.6	4.4	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	2.6	2.7	1.9	7.2	6.9	6.7	6.3	6.3	6.1	5.7	VNS (Garcia) [11]

Table 7: 02-D, running time excess ERT/ERT_{best} on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

7 Step-ellipsoid											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.1	1.4	4.1	4.7	12	9.5	11	11	11	13	ALPS [17]
AMaLGaM IDEA	1.1	1.5	3.4	20	8.1	2.7	2.5	2.5	2.5	2.4	AMaLGaM IDEA [4]
avg NEWUOA	1.7	2.7	4	3.7	6.8	5	10	10	10	9	avg NEWUOA [31]
BayEDAcG	1.5	1.7	4.2	3.1	79	85	76	76	76	110	BayEDAcG [10]
BFGS	1.6	3.7	10	19	34	<i>76e-2/200</i>	.	.	.	.	BFGS [30]
Cauchy EDA	5.5	8.4	19	7.6	5.3	2	1.9	1.9	1.9	2.1	Cauchy EDA [24]
BIPOP-CMA-ES	1.9	1.9	3.2	2.6	3.4	1.5	1.5	1.5	1.5	1.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.5	1.4	2.7	1.8	2.8	1	1	1	1	1	(1+1)-CMA-ES [2]
DASA	30	59	170	170	310	240	440	440	440	390	DASA [19]
DEPSO	1.7	1.7	6.5	4.8	4.9	2.6	3.1	3.1	3.1	3.6	DEPSO [12]
DIRECT	1.4	1	2.1	1.3	1	2.7	3	3	3	2.7	DIRECT [25]
EDA-PSO	1.5	1.8	3.7	3.1	6.2	6.2	9	9	9	14	EDA-PSO [6]
full NEWUOA	1.9	2.7	2	3.7	3.7	1.7	2.9	2.9	2.9	2.7	full NEWUOA [31]
G3-PCX	1.3	1.5	4.5	12	35	19	21	21	21	19	G3-PCX [26]
simple GA	1.6	1.6	5.2	3.9	22	24	47	47	47	67	simple GA [22]
GLOBAL	1.2	1.8	6.8	4.1	7.5	2.7	4.4	4.4	4.4	3.9	GLOBAL [23]
iAMaLGaM IDEA	1.8	1.8	3.9	12	4.7	2.8	2.5	2.5	2.5	2.4	iAMaLGaM IDEA [4]
LSfminbnd	1.3	1.1	6.3	11	66	55	500	500	500	960	LSfminbnd [28]
LSstep	28	28	260	250	460	1500	<i>29e-3/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1.7	2.3	5.8	3.4	4.7	3.6	4.6	4.6	4.6	4.7	MA-LS-Chain [21]
MCS (Neum)	1.4	1.4	1	4.1	4.5	2.2	6.5	6.5	6.5	6	MCS (Neum) [18]
NELDER (Han)	1.5	1.3	2.5	25	18	6.6	6.5	6.5	6.5	5.9	NELDER (Han) [16]
NELDER (Doe)	1.8	1.6	2.6	1	8.5	5.4	5.2	5.2	5.2	5.4	NELDER (Doe) [5]
NEWUOA	1.7	2	2.5	9.3	9.3	6	14	14	14	12	NEWUOA [31]
(1+1)-ES	2.3	3.3	5.6	4.1	4.3	1.8	3.3	3.3	3.3	3	(1+1)-ES [1]
POEMS	220	210	180	45	41	21	23	23	23	28	POEMS [20]
PSO	1.5	1.3	4.1	3.5	4.8	3.2	3.6	3.6	3.6	4.4	PSO [7]
PSO_Bounds	1.3	1.6	6.2	3.4	5.8	5	6.7	6.7	6.7	14	PSO_Bounds [8]
Monte Carlo	1.7	1.5	4.6	4.5	43	87	150	150	150	950	Monte Carlo [3]
Rosenbrock	16	42	150	120	170	78	190	190	190	170	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.1	5.5	2.7	2.8	1.2	1.3	1.3	1.3	1.5	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	2.4	3.9	3.8	5.1	2.1	2	2	2	2	VNS (Garcia) [11]

Table 8: 02-D, running time excess ERT/ERT_{best} on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	8 Rosenbrock original											
Δ_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ_{target} ERT_{best}/D	
ALPS	2.9	2.8	4.7	19	31	66	54	74	94	130	ALPS [17]	
AMaLGaM IDEA	2.4	4.1	6.2	10	6.8	7	4.4	4.7	5.1	5	AMaLGaM IDEA [4]	
avg NEWUOA	3.9	2.5	2.6	4.6	2.4	2.4	1.4	1.4	1.4	1.3	avg NEWUOA [31]	
BayEDAcG	2.3	2.9	5.6	11	48	350	<i>53e-3/2e3</i>	.	.	.	BayEDAcG [10]	
BFGS	7.5	4.9	4.1	5.1	2.4	2.2	1.3	1.3	1.3	1.1	BFGS [30]	
Cauchy EDA	15	11	10	24	19	21	12	13	14	13	Cauchy EDA [24]	
BIPOP-CMA-ES	3.1	3.3	3.5	7.1	9.2	11	6.4	6.5	6.7	6.2	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	6.4	4.3	3.8	11	6.9	7	4.2	4.1	4.3	4	(1+1)-CMA-ES [2]	
DASA	31	33	110	520	480	680	520	580	700	820	DASA [19]	
DEPSO	4	3.3	3.6	14	15	25	28	42	65	<i>76e-7/2e3</i>	DEPSO [12]	
DIRECT	1	1	1.4	5	4.4	8.7	10	16	17	21	DIRECT [25]	
EDA-PSO	1.9	3	5.4	11	50	98	97	140	180	220	EDA-PSO [6]	
full NEWUOA	6.6	3.9	7	7	3.2	2.8	1.6	1.5	1.5	1.3	full NEWUOA [31]	
G3-PCX	2.8	4	5	24	16	18	11	11	11	9.6	G3-PCX [26]	
simple GA	2	2.9	8.4	34	87	170	1300	8900	<i>61e-5/1e5</i>	.	simple GA [22]	
GLOBAL	4.4	4.5	14	19	8.2	7.2	4.1	3.9	3.9	3.4	GLOBAL [23]	
iAMaLGaM IDEA	2.3	2.8	4.4	12	8	8.4	5	5.2	5.5	5.2	iAMaLGaM IDEA [4]	
LSfminbnd	16	7	420	1500	2300	6300	<i>90e-2/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	67	51	37	1500	3600	6100	<i>32e-2/1e4</i>	.	.	.	LSstep [28]	
MA-LS-Chain	2.7	3.6	7.2	16	10	15	9	8.8	9	8.5	MA-LS-Chain [21]	
MCS (Neum)	1	1.2	1	1	1	1	1	1	1	1	MCS (Neum) [18]	
NELDER (Han)	1.9	1.4	2.1	3.7	2	2	1.1	1.2	1.2	1.2	NELDER (Han) [16]	
NELDER (Doe)	3	3.2	4.6	6.2	2.9	2.7	1.6	1.5	1.6	1.5	NELDER (Doe) [5]	
NEWUOA	3.8	2.8	4.3	7	3.5	3.2	1.9	1.8	1.8	1.6	NEWUOA [31]	
(1+1)-ES	2.3	2.2	47	59	23	34	35	51	70	95	(1+1)-ES [1]	
POEMS	230	110	120	110	76	110	74	91	120	130	POEMS [20]	
PSO	2.7	2.6	6.5	11	16	27	26	37	49	67	PSO [7]	
PSO_Bounds	3.7	4.3	6	19	24	61	69	120	150	200	PSO_Bounds [8]	
Monte Carlo	2.7	3.2	5.8	19	72	670	2200	3.9e4	3.1e5	<i>17e-5/1e6</i>	Monte Carlo [3]	
Rosenbrock	5.8	3.4	4.9	10	5.2	4.8	2.8	2.7	2.8	2.5	Rosenbrock [27]	
IPOP-SEP-CMA-ES	6.4	3.9	5.2	19	17	17	9.5	9.3	9.6	8.7	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	9.5	4.8	8.1	16	10	11	6.9	6.8	7.2	6.7	VNS (Garcia) [11]	

Table 9: 02-D, running time excess ERT/ERT_{best} on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	9 Rosenbrock rotated										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	3.3	7.2	33	19	41	62	64	81	100	140	ALPS [17]
AMaLGaM IDEA	4.2	13	22	6.3	9.5	9.5	7.5	7.4	7.7	7.6	AMaLGaM IDEA [4]
avg NEWUOA	7.7	10	22	4.7	4	3.2	2.3	2.1	2	1.9	avg NEWUOA [31]
BayEDAcG	3.8	11	29	10	99	600	<i>66e-3/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	4.2	9.2	16	2.4	2.3	1.9	1.4	1.3	1.2	1.1	BFGS [30]
Cauchy EDA	16	37	59	14	20	19	14	14	14	14	Cauchy EDA [24]
BIPOP-CMA-ES	2.6	10	19	4.6	7.1	7.5	5.8	5.6	5.8	5.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.5	9.9	26	8.8	8	7.3	5.4	5	5	4.9	(1+1)-CMA-ES [2]
DASA	65	110	320	250	290	330	320	380	550	740	DASA [19]
DEPSO	2.7	12	58	12	12	20	19	25	45	97	DEPSO [12]
DIRECT	1	1	1	2	5	5.8	8.3	14	18	25	DIRECT [25]
EDA-PSO	3.8	12	47	8.5	27	51	78	120	150	200	EDA-PSO [6]
full NEWUOA	7.1	12	24	2.7	2.2	1.8	1.3	1.2	1.1	1.1	full NEWUOA [31]
G3-PCX	4.1	10	28	15	20	18	14	13	13	11	G3-PCX [26]
simple GA	5	15	44	22	90	190	2200	2200	1e4	1.5e4	simple GA [22]
GLOBAL	3.5	11	30	9.1	11	7.9	5.2	4.7	4.5	4.2	GLOBAL [23]
iAMaLGaM IDEA	3.1	7.9	29	6	7.2	6.9	5.3	5.1	5.3	5.3	iAMaLGaM IDEA [4]
LSfminbnd	6.2	15	20	210	670	3100	4100	3600	3400	<i>76e-3/1e4</i>	LSfminbnd [28]
LSstep	270	610	750	230	670	1800	2100	3800	<i>76e-3/1e4</i>	.	LSstep [28]
MA-LS-Chain	5	9.5	35	8.6	13	13	11	10	10	11	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	2.7	3.6	10	1.6	2	1.8	1.3	1.2	1.2	1.2	NELDER (Han) [16]
NELDER (Doe)	4.1	6.9	11	2.3	2.6	2.1	1.5	1.4	1.4	1.4	NELDER (Doe) [5]
NEWUOA	5.2	8.3	24	3.6	3.3	2.7	1.9	1.8	1.8	1.7	NEWUOA [31]
(1+1)-ES	4.4	8.1	19	81	120	120	100	110	130	160	(1+1)-ES [1]
POEMS	360	450	560	65	78	110	98	110	130	160	POEMS [20]
PSO	4	15	37	8.7	12	24	28	38	49	67	PSO [7]
PSO_Bounds	3.9	9	48	11	27	96	120	160	200	240	PSO_Bounds [8]
Monte Carlo	3	10	47	17	110	900	3600	6.9e4	3.7e5	<i>16e-5/1e6</i>	Monte Carlo [3]
Rosenbrock	8.9	12	22	2.6	3.1	2.9	2.2	2.2	2.2	2.2	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.1	9.5	16	7.6	15	14	10	9.3	9.4	9	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	4.8	21	45	14	15	12	9.8	9.4	9.8	10	VNS (Garcia) [11]

Table 10: 02-D, running time excess ERT/ERT_{best} on f_{10} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	10 Ellipsoid											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	22	25	47	69	160	350	780	1600	2100	3200	ALPS [17]	
AMaLgAM IDEA	6.7	5.7	3	3	3.8	4	4.1	4.1	4.3	4.4	AMaLgAM IDEA [4]	
avg NEWUOA	2.6	3.6	3.8	4.8	6.9	7.6	8.8	9.5	9.9	11	avg NEWUOA [31]	
BayEDAcG	17	13	60	190	310	<i>33e-1/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	2.3	1.5	1	1.4	1.4	1.4	1.4	2.6	6.3	24	BFGS [30]	
Cauchy EDA	14	13	7.4	6.4	7	7	7.4	7.7	8	8.4	Cauchy EDA [24]	
BIPOP-CMA-ES	12	12	7.9	9	8.5	7.9	7.7	7.4	7.3	6.8	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	7.3	5.8	7.2	6.6	6.3	5.8	5.5	5.3	5.2	4.8	(1+1)-CMA-ES [2]	
DASA	22	15	8900	5.2e4	6.1e4	9.5e4	1.2e5	1.1e5	1e5	8.6e4	DASA [19]	
DEPSO	16	26	80	110	330	310	<i>51e-2/2e3</i>	.	.	.	DEPSO [12]	
DIRECT	3.9	4.3	3.9	9.5	20	68	120	190	220	460	DIRECT [25]	
EDA-PSO	17	26	43	140	330	640	1100	2100	3e3	8600	EDA-PSO [6]	
full NEWUOA	2	3	3.8	4.5	6	6.4	7.1	7.7	8.2	9	full NEWUOA [31]	
G3-PCX	11	9.5	26	39	39	37	34	31	29	25	G3-PCX [26]	
simple GA	27	51	77	700	2800	4300	4.2e4	3.8e4	<i>23e-3/1e5</i>	.	simple GA [22]	
GLOBAL	18	19	11	7.4	6.4	5.8	5.3	4.9	4.6	4	GLOBAL [23]	
iAMaLgAM IDEA	5.5	4	3.3	3.7	4.1	4.1	4	4.1	4.2	4.1	iAMaLgAM IDEA [4]	
LSfminbnd	1.8	1	770	6300	<i>15e+0/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	2.1	1.2	770	2800	<i>15e+0/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	16	20	13	18	19	20	19	18	18	17	MA-LS-Chain [21]	
MCS (Neum)	1	1.2	1.7	8.7	47	130	520	1100	1300	3700	MCS (Neum) [18]	
NELDER (Han)	3	2.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1	NELDER (Han) [16]	
NELDER (Doe)	3.2	2.2	1.2	1	1	1	1	1	1	1	NELDER (Doe) [5]	
NEWUOA	2.3	1.9	3.1	4.3	6.5	7.3	8.5	9.6	10	11	NEWUOA [31]	
(1+1)-ES	6.3	5.3	8700	2.4e4	7.7e4	1.5e5	4.3e5	<i>13e-2/1e6</i>	.	.	(1+1)-ES [1]	
POEMS	110	90	300	540	1400	2100	2400	3200	3700	6400	POEMS [20]	
PSO	23	26	180	280	480	650	850	990	1100	1900	PSO [7]	
PSO_Bounds	21	24	530	770	740	830	1500	1900	1900	2100	PSO_Bounds [8]	
Monte Carlo	23	55	110	690	3900	4.4e4	1.3e5	3.8e5	<i>61e-4/1e6</i>	.	Monte Carlo [3]	
Rosenbrock	4.8	2.8	3.1	3.4	3.2	3	2.9	2.8	3.2	3	Rosenbrock [27]	
IPOP-SEP-CMA-ES	8.3	12	16	14	16	15	13	12	12	11	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	22	25	17	12	12	11	10	9.4	9.1	8.3	VNS (Garcia) [11]	

Table 11: 02-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

11 Discus											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	17	40	35	80	200	410	880	1200	1700	3400	ALPS [17]
AMaLGaM IDEA	4.8	5.4	3	3.5	4.2	3.9	4.2	4.4	4.4	4.6	AMaLGaM IDEA [4]
avg NEWUOA	1.3	1.5	1.5	3.3	5.1	5.4	6.8	7.3	8	8.8	avg NEWUOA [31]
BayEDAcG	9.3	18	31	150	1100	<i>14e-1/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1.6	1.7	1.2	1.6	2	1.7	1.9	2.7	5.7	36	BFGS [30]
Cauchy EDA	13	15	6.7	7.4	8.1	8	8.3	8.1	8.9	9	Cauchy EDA [24]
BIPOP-CMA-ES	4.7	8.7	7.9	8.8	9.2	8.2	8	7.6	7.5	6.8	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.8	5.9	5.8	6.4	6.6	5.7	5.6	5.4	5.1	4.7	(1+1)-CMA-ES [2]
DASA	15	15	9e3	4e4	5.4e4	5.7e4	5.3e4	5e4	4.7e4	4.2e4	DASA [19]
DEPSO	24	34	34	110	<i>45e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	3.3	5.1	2.6	5.2	28	49	58	190	270	460	DIRECT [25]
EDA-PSO	8.6	27	96	260	460	990	1900	2900	6500	<i>36e-6/1e5</i>	EDA-PSO [6]
full NEWUOA	1.6	3.5	2.7	4.4	6.2	6.2	7	7.7	8	8.6	full NEWUOA [31]
G3-PCX	9.5	9.1	9.7	25	28	36	35	33	32	27	G3-PCX [26]
simple GA	20	57	53	220	5e3	4.6e4	<i>14e-2/1e5</i>	.	.	.	simple GA [22]
GLOBAL	17	23	9.2	7.5	6.9	5.8	5.4	4.9	4.6	4	GLOBAL [23]
iAMaLGaM IDEA	4.5	6	2.8	3.3	4	3.8	4	3.9	3.9	4	iAMaLGaM IDEA [4]
LSfminbnd	2.1	1.8	500	2900	5500	<i>96e-1/1e4</i>	.	.	.	.	LSfminbnd [28]
LSstep	1	1	380	1800	2600	<i>81e-1/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	12	15	11	18	23	21	20	20	20	17	MA-LS-Chain [21]
MCS (Neum)	1	1.1	87	120	170	300	920	1300	2e3	<i>91e-5/3e4</i>	MCS (Neum) [18]
NELDER (Han)	2	2.1	1	1.1	1.1	1	1.1	1.1	1.1	1	NELDER (Han) [16]
NELDER (Doe)	2.2	2.4	1	1	1	1	1	1	1	1	NELDER (Doe) [5]
NEWUOA	1.2	1.5	1.5	3.2	5.5	6.1	6.9	7.7	8.4	11	NEWUOA [31]
(1+1)-ES	4.2	850	7700	2.1e4	6e4	2.3e5	4.4e5	<i>63e-3/1e6</i>	.	.	(1+1)-ES [1]
POEMS	55	83	1e3	1400	2100	2800	4e3	6500	7900	7100	POEMS [20]
PSO	10	23	480	530	660	670	860	1e3	1300	1900	PSO [7]
PSO_Bounds	11	21	3200	5200	6300	5500	6700	6300	6100	5500	PSO_Bounds [8]
Monte Carlo	16	51	94	870	6300	4.3e4	2.1e5	<i>97e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	2.3	2.9	2.4	2.7	3	2.7	2.6	2.5	2.6	2.5	Rosenbrock [27]
IPOP-SEP-CMA-ES	5.4	6.9	13	17	17	14	13	13	12	11	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	8.4	14	12	12	12	11	10	9.7	9.4	8.6	VNS (Garcia) [11]

Table 12: 02-D, running time excess ERT/ERT_{best} on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

12 Bent cigar											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	19	37	40	51	76	94	130	210	230	370	ALPS [17]
AMaLGaM IDEA	5.4	4.1	5.8	13	17	17	17	18	16	15	AMaLGaM IDEA [4]
avg NEWUOA	1.7	1.1	1	1.6	1.5	1.5	1.5	1.5	1.4	1.4	avg NEWUOA [31]
BayEDAcG	40	26	69	87	<i>67e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1.8	1.1	1.2	3.2	3.1	2.9	2.8	2.6	2.4	4.2	BFGS [30]
Cauchy EDA	11	9.9	14	24	19	18	18	17	15	14	Cauchy EDA [24]
BIPOP-CMA-ES	6	6.1	7.9	12	9.9	9.1	9	11	9.6	8.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.9	7	9.4	13	10	8.9	8.7	7.6	6.5	5.6	(1+1)-CMA-ES [2]
DASA	16	64	2700	6800	6100	8800	1.4e4	1.2e4	9700	7900	DASA [19]
DEPSO	17	16	41	55	51	48	45	40	35	45	DEPSO [12]
DIRECT	3	3.3	6.2	35	80	70	160	270	250	290	DIRECT [25]
EDA-PSO	11	24	40	98	160	300	790	1e3	1e3	820	EDA-PSO [6]
full NEWUOA	1.4	1.9	4.6	5.2	3.8	3.4	3.3	3	2.7	2.4	full NEWUOA [31]
G3-PCX	9.1	6.1	12	29	34	34	32	31	29	28	G3-PCX [26]
simple GA	23	39	93	170	580	1e3	2400	2700	2200	1900	simple GA [22]
GLOBAL	11	11	8.1	8.3	7.2	6.3	6.4	5.9	5	4.4	GLOBAL [23]
iAMaLGaM IDEA	4.1	2.5	4.5	7	6.4	6.4	6.4	6	5.8	5.4	iAMaLGaM IDEA [4]
LSfminbnd	1.7	1	590	1200	770	630	570	490	410	330	LSfminbnd [28]
LSstep	500	280	300	230	230	350	720	600	820	640	LSstep [28]
MA-LS-Chain	13	13	12	15	13	12	13	13	12	10	MA-LS-Chain [21]
MCS (Neum)	1	1.1	62	49	32	26	24	28	39	30	MCS (Neum) [18]
NELDER (Han)	1.9	1.4	1	1	1	1	1	1	1	1	NELDER (Han) [16]
NELDER (Doe)	2	1.4	1.1	1.6	1.6	1.7	1.7	1.6	1.4	1.3	NELDER (Doe) [5]
NEWUOA	1.5	1.1	1.9	2.9	2.3	2.1	2	1.8	1.6	1.4	NEWUOA [31]
(1+1)-ES	3.8	1500	6800	1.7e4	2.3e4	5.5e4	1.3e5	2.3e5	1.9e5	<i>25e-3/1e6</i>	(1+1)-ES [1]
POEMS	64	79	83	650	1100	1200	1600	2100	2900	1.5e4	POEMS [20]
PSO	11	12	19	57	110	130	160	180	220	300	PSO [7]
PSO_Bounds	12	19	230	440	390	510	690	630	560	560	PSO_Bounds [8]
Monte Carlo	18	27	97	580	3200	1.6e4	1.4e5	<i>38e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	3.3	2.9	2.5	3.6	3	5.4	5.1	4.5	3.9	3.3	Rosenbrock [27]
IPOP-SEP-CMA-ES	7.4	9.2	7.6	9.5	9.6	8.8	8.5	8.1	7	6.3	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	17	17	15	13	8.8	7.5	7.1	6.4	5.6	4.9	VNS (Garcia) [11]

Table 13: 02-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	13 Sharp ridge										
$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$
ALPS	1.3	3.2	13	47	100	170	300	1300	3700	2.9e4	ALPS [17]
AMaLGaM IDEA	1.1	3.4	2.6	3.2	3.6	3.7	3.9	4	3.9	4.1	AMaLGaM IDEA [4]
avg NEWUOA	1.8	6.7	6.7	17	38	54	73	130	140	770	avg NEWUOA [31]
BayEDAcG	1.4	2.4	52	140	570	950	<i>11e-1/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	1.2	5	6.8	15	45	74	160	660	580	<i>67e-5/5e3</i>	BFGS [30]
Cauchy EDA	4.1	15	7.3	7.7	7.7	8.2	8.5	8.6	8.5	8.5	Cauchy EDA [24]
BIPOP-CMA-ES	1.3	4.3	3.2	5.4	5.7	5.9	6.4	6.1	6.6	7	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.1	4.4	5.2	7.3	7	7.3	8.1	7.6	7.9	7.6	(1+1)-CMA-ES [2]
DASA	13	90	540	850	2600	4900	1.6e4	4.7e4	1.4e5	<i>62e-5/1e6</i>	DASA [19]
DEPSO	1.1	6.1	8.4	25	63	120	<i>18e-3/2e3</i>	.	.	.	DEPSO [12]
DIRECT	1	1	2.5	4.2	5.1	8.7	24	49	74	120	DIRECT [25]
EDA-PSO	1.4	3.5	6.4	42	180	270	710	4e3	3.1e4	<i>27e-5/1e5</i>	EDA-PSO [6]
full NEWUOA	1.5	5.2	8.5	12	31	76	140	290	760	1800	full NEWUOA [31]
G3-PCX	1.2	3.9	13	30	36	47	50	55	70	61	G3-PCX [26]
simple GA	1.3	3.7	25	170	1100	2.2e4	<i>25e-3/1e5</i>	.	.	.	simple GA [22]
GLOBAL	1.3	2.8	9.2	9.3	7.3	6	13	<i>67e-5/400</i>	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.1	3.3	2.6	3.1	3.6	3.3	3.6	3.6	3.6	3.7	iAMaLGaM IDEA [4]
LSfminbnd	1	16	52	110	170	470	850	<i>13e-3/1e4</i>	.	.	LSfminbnd [28]
LSstep	28	420	280	570	1e3	1500	<i>35e-2/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1.1	3.3	8.7	17	18	21	23	21	19	22	MA-LS-Chain [21]
MCS (Neum)	1	4.7	23	20	170	960	2200	2500	<i>75e-4/3e4</i>	.	MCS (Neum) [18]
NELDER (Han)	1.7	1.6	1	1	1	1	1	1	1	1	NELDER (Han) [16]
NELDER (Doe)	1.3	2.2	1.1	1.1	1	1	1	1	1.1	1	NELDER (Doe) [5]
NEWUOA	1.6	2.8	6.3	10	22	25	72	62	91	150	NEWUOA [31]
(1+1)-ES	1.9	31	37	94	210	370	790	4200	8100	3.7e4	(1+1)-ES [1]
POEMS	170	110	48	93	140	330	1100	2300	6300	2.4e4	POEMS [20]
PSO	1.6	3.3	9	27	76	140	330	1100	2900	1.1e4	PSO [7]
PSO_Bounds	1.1	3.8	9.2	43	120	260	620	1200	3e3	<i>93e-7/1e5</i>	PSO_Bounds [8]
Monte Carlo	1.6	5.4	18	280	1.2e4	1.1e5	<i>32e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	3.2	4.8	5.6	7	7.5	18	28	43	70	170	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.1	3.7	13	20	18	15	14	14	13	11	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.4	3.9	8.8	9.7	9.6	8.8	9.2	9.1	8.6	8.4	VNS (Garcia) [11]

Table 14: 02-D, running time excess ERT/ERT_{best} on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{target} ERT_{best}/D	14 Sum of different powers											Δf_{target} ERT_{best}/D
	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07		
ALPS	1	1	1.6	2.4	14	60	75	83	130	530		ALPS [17]
AMaLgAM IDEA	1	1.2	1.6	3.3	3.9	4.7	4.2	3.9	3.8	4.2		AMaLgAM IDEA [4]
avg NEWUOA	1	1.4	3.4	2.2	1.4	1.3	1.6	1.8	2.2	6.8		avg NEWUOA [31]
BayEDAcG	1	1	1.9	1.8	10	25	67	98	180	<i>12e-5/2e3</i>		BayEDAcG [10]
BFGS	1	1.4	2.1	2.8	1.8	1.7	1.4	1.1	1	6		BFGS [30]
Cauchy EDA	1	4.6	13	13	12	11	10	8.6	8.9	8.5		Cauchy EDA [24]
BIPOP-CMA-ES	1	1.1	1.9	2.5	3	4.2	4.6	5.3	5.5	7.1		BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.4	1.7	3.1	3.4	3.6	4	3.9	4.4	4.7		(1+1)-CMA-ES [2]
DASA	1	18	22	22	16	18	33	590	9300	3.1e5		DASA [19]
DEPSO	1	1	1.4	5.2	10	16	17	18	55	<i>17e-7/2e3</i>		DEPSO [12]
DIRECT	1	1	1	1.3	2.1	2.8	6	8.6	12	32		DIRECT [25]
EDA-PSO	1	1.2	1.4	2.9	8.2	12	15	74	160	1100		EDA-PSO [6]
full NEWUOA	1	1.4	3.2	1.4	1	1	1	1.1	1.5	3.7		full NEWUOA [31]
G3-PCX	1	1.2	1.8	6.3	6.3	5.9	6.6	7.6	9.1	11		G3-PCX [26]
simple GA	1	1.1	1	4	41	200	280	630	3200	<i>58e-7/1e5</i>		simple GA [22]
GLOBAL	1	1.1	1.7	5.5	13	13	8.8	6.2	8.2	<i>34e-7/300</i>		GLOBAL [23]
iAMaLgAM IDEA	1	1.5	1.6	3.7	3.9	4	3.9	3.4	3.5	3.6		iAMaLgAM IDEA [4]
LSfminbnd	1	1.3	4.7	5.4	3	6.2	76	1500	<i>23e-5/1e4</i>	.		LSfminbnd [28]
LSstep	1	55	40	73	50	120	1600	5100	<i>23e-4/1e4</i>	.		LSstep [28]
MA-LS-Chain	1	1.3	1.7	3.1	9.6	15	13	12	12	17		MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1.4	1.7	2.8	3.1	23	8200		MCS (Neum) [18]
NELDER (Han)	1	1.5	2.1	1.4	1.4	1.4	1.2	1	1	1.1		NELDER (Han) [16]
NELDER (Doe)	1	1.1	1.3	1.4	1.3	1.3	1.1	1	1	1		NELDER (Doe) [5]
NEWUOA	1	1.1	3.7	2.4	1.6	1.5	1.6	1.8	2.1	5.4		NEWUOA [31]
(1+1)-ES	1	1.7	2.3	2.5	2.5	3.4	9.2	160	3400	<i>22e-7/1e6</i>		(1+1)-ES [1]
POEMS	1	140	190	86	73	160	180	180	330	3300		POEMS [20]
PSO	1	1.1	1.4	4.8	13	25	36	48	85	1700		PSO [7]
PSO_Bounds	1	1.1	1.5	2.7	14	45	72	110	180	1200		PSO_Bounds [8]
Monte Carlo	1	1	1.8	2.6	31	560	7200	1.1e5	4.2e5	<i>15e-5/1e6</i>		Monte Carlo [3]
Rosenbrock	1	2.2	4	1.9	1.6	1.6	1.9	1.8	2.4	3		Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.2	1.6	1.8	4.4	4.9	7.4	9.7	10	11		IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.1	6.2	10	9.4	9	8.1	8.6	9.3		VNS (Garcia) [11]

Table 15: 02-D, running time excess ERT/ERT_{best} on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

15 Rastrigin											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.1	1.6	2.7	6.8	3.4	4.8	5.7	7.1	7.9	9.1	ALPS [17]
AMaLGaM IDEA	1.1	2.8	1.1	4.3	2.7	2.8	2.8	2.7	2.6	2.3	AMaLGaM IDEA [4]
avg NEWUOA	1	2.6	2.5	2.5	3.3	3.2	3.1	2.9	2.8	2.4	avg NEWUOA [31]
BayEDAcG	1	2.2	2.1	8.2	7.6	26	<i>16e-2/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	1.2	17	4.2	4.6	7.9	7.7	7.3	7	6.6	5.8	BFGS [30]
Cauchy EDA	9.1	38	4.9	2.9	3.2	11	14	14	13	12	Cauchy EDA [24]
BIPOP-CMA-ES	1.2	2.9	1.1	1.8	2.1	2.2	2.2	2.1	2.1	1.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.2	2.8	22	7.7	7.6	7.4	7.1	6.8	6.5	5.7	(1+1)-CMA-ES [2]
DASA	4.6	22	64	84	64	62	60	57	54	48	DASA [19]
DEPSO	1.1	1.6	2.9	3.8	1.7	2.2	2.5	2.6	3	6.3	DEPSO [12]
DIRECT	1	1	1	1	1	1	1	1	1	1	DIRECT [25]
EDA-PSO	1	3.3	2	9.3	6.1	8.3	8.3	8.5	8.4	8.1	EDA-PSO [6]
full NEWUOA	1.2	3.1	1.5	1.4	3.5	3.4	3.3	3.1	3	2.6	full NEWUOA [31]
G3-PCX	1.1	2.3	7.8	13	22	21	20	19	18	16	G3-PCX [26]
simple GA	1.2	2.3	4.2	18	13	34	96	98	100	120	simple GA [22]
GLOBAL	1.1	2.6	3	1.6	2.6	2.5	2.4	2.3	2.2	2	GLOBAL [23]
iAMaLGaM IDEA	1.1	2.5	1	4.2	5.1	5.1	5	4.8	4.6	4.1	iAMaLGaM IDEA [4]
LSfminbnd	1.1	6.2	3.7	20	36	51	66	210	<i>71e-2/9e3</i>	.	LSfminbnd [28]
LSstep	1.1	47	170	200	80	79	77	74	71	63	LSstep [28]
MA-LS-Chain	1.1	2	1.7	1.9	1.6	1.5	1.5	1.5	1.4	1.3	MA-LS-Chain [21]
MCS (Neum)	1	1	2.1	3.5	1.4	1.4	1.3	1.3	1.2	1.1	MCS (Neum) [18]
NELDER (Han)	1	1.9	8.4	7.3	9.7	9.4	9	8.6	8.2	7.1	NELDER (Han) [16]
NELDER (Doe)	1	3.2	1.1	1.3	1.4	1.3	1.3	1.2	1.2	1	NELDER (Doe) [5]
NEWUOA	1.1	11	4.1	3.4	3.3	3.2	3	2.9	2.7	2.4	NEWUOA [31]
(1+1)-ES	1.4	3.7	1.1	5.3	8.4	8.2	7.9	7.5	7.1	6.3	(1+1)-ES [1]
POEMS	28	120	16	19	18	20	21	21	22	22	POEMS [20]
PSO	1.1	2.4	1.9	4.1	16	16	16	16	16	15	PSO [7]
PSO_Bounds	1.2	2.3	1.7	6.6	3.9	7.3	9.2	11	11	12	PSO_Bounds [8]
Monte Carlo	1.1	2.1	2.4	64	150	1500	5800	1.2e4	<i>50e-4/1e6</i>	.	Monte Carlo [3]
Rosenbrock	1.3	19	15	9.7	9.5	9.2	8.9	8.5	8	7	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	3.8	1.5	2.9	2.1	2.2	2.2	2.1	2.1	1.9	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	3.3	3.4	1.9	2.4	2.4	2.3	2.4	2.7	3.7	VNS (Garcia) [11]

Table 16: 02-D, running time excess ERT/ERT_{best} on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.3	2.7	5.6	9.1	14	19	25	34	37	ALPS [17]
AMaLGaM IDEA	1	1.2	3.2	3.4	5.1	4.6	4.5	4.2	4.1	3.3	AMaLGaM IDEA [4]
avg NEWUOA	1	12	15	9.1	5.5	6.8	13	21	37	73	avg NEWUOA [31]
BayEDAcG	1	1.4	1.5	9.8	24	39	76	71	68	110	BayEDAcG [10]
BFGS	1	11	40	150	170	270	<i>27e-2/6e3</i>	.	.	.	BFGS [30]
Cauchy EDA	1	4.2	4.5	4.4	6.1	15	29	31	35	27	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	3.1	3.5	3.5	2.5	2.4	2.3	2.3	1.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.2	6	2.3	2.3	5.2	8.8	12	11	12	(1+1)-CMA-ES [2]
DASA	1	9	29	150	180	130	210	250	340	530	DASA [19]
DEPSO	1	1.5	3.9	10	10	9.6	26	38	72	<i>16e-4/2e3</i>	DEPSO [12]
DIRECT	1	1.4	1.6	1	1	1	1	1.5	2	1.9	DIRECT [25]
EDA-PSO	1	1.8	2.6	4.8	15	200	290	370	410	320	EDA-PSO [6]
full NEWUOA	1	2.5	8.1	5.9	3.9	3.2	5.5	7.6	10	16	full NEWUOA [31]
G3-PCX	1	1.4	2.8	8.9	3.1	4.5	4.8	5	5.3	11	G3-PCX [26]
simple GA	1	1.2	2	4.1	16	42	180	450	690	690	simple GA [22]
GLOBAL	1	1.7	3.9	5.1	2.4	1.4	1.5	1.4	1.7	1.5	GLOBAL [23]
iAMaLGaM IDEA	1	1.1	1	6.9	7.4	9.1	9.2	8.6	8.3	7	iAMaLGaM IDEA [4]
LSfminbnd	1	3.6	5.6	5.7	5.4	8.3	14	33	38	110	LSfminbnd [28]
LSstep	1	1.5	1.6	11	23	63	70	150	200	150	LSstep [28]
MA-LS-Chain	1	1.2	1.3	3.6	4.2	6.4	10	11	10	8.3	MA-LS-Chain [21]
MCS (Neum)	1	1.1	5.1	6.7	2.7	4.3	6.8	10	29	120	MCS (Neum) [18]
NELDER (Han)	1	1.3	1.2	7.6	4.4	4.7	4.3	4	3.8	2.9	NELDER (Han) [16]
NELDER (Doe)	1	1.1	1.6	3.5	1.8	1.1	1.1	1	1	1	NELDER (Doe) [5]
NEWUOA	1	2.4	9	10	6.8	6.9	22	37	44	77	NEWUOA [31]
(1+1)-ES	1	1.7	35	38	35	33	56	73	84	120	(1+1)-ES [1]
POEMS	1	98	71	650	200	110	110	110	110	88	POEMS [20]
PSO	1	1.7	2.5	3.8	6.1	100	94	88	86	69	PSO [7]
PSO_Bounds	1	1.2	2.8	6.4	11	110	120	120	120	100	PSO_Bounds [8]
Monte Carlo	1	1.2	2.3	5	20	140	1200	2.4e4	7.2e4	<i>18e-5/1e6</i>	Monte Carlo [3]
Rosenbrock	1	10	33	36	33	27	79	290	<i>19e-4/8e3</i>	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.8	3.2	4.1	2.4	2.9	4	3.8	3.9	3.3	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.2	4.6	5	4.8	4.9	4.7	4.7	5.6	6.8	VNS (Garcia) [11]

Table 17: 02-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	17 Schaffer F7, condition 10										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.2	1.5	2.8	16	15	17	12	12	11	ALPS [17]
AMaLGaM IDEA	1	1.5	1.5	1.3	4.8	2.7	4.5	3.3	2.9	2.1	AMaLGaM IDEA [4]
avg NEWUOA	1.1	1.3	12	4.6	13	33	120	<i>75e-4/5e3</i>	.	.	avg NEWUOA [31]
BayEDAcG	1	1.1	1	2	8	7	8.7	8.8	27	<i>87e-6/2e3</i>	BayEDAcG [10]
BFGS	1	6.4	15	16	90	<i>24e-2/2e3</i>	.	.	.	.	BFGS [30]
Cauchy EDA	1	7.9	18	120	56	28	20	11	16	13	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.2	4.1	1.8	1.5	1	1	1	1.3	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	12	3.1	5.9	14	14	14	16	10	(1+1)-CMA-ES [2]
DASA	1	1	21	29	37	52	93	230	340	220	DASA [19]
DEPSO	1	1.3	2.7	1.1	4.3	3.7	3.7	2.8	2.4	2.8	DEPSO [12]
DIRECT	1	1	1.4	1	1	1	1.4	1.2	1	1	DIRECT [25]
EDA-PSO	1.1	1.1	2.6	2	3.9	7.4	9.9	8.2	8	7.1	EDA-PSO [6]
full NEWUOA	1	1.4	8.2	4.4	14	21	53	48	<i>30e-4/6e3</i>	.	full NEWUOA [31]
G3-PCX	1	1.1	2.5	4.5	6.2	3.9	3.2	2.6	4.4	3	G3-PCX [26]
simple GA	1	1.2	2.1	5.1	47	61	91	120	150	<i>69e-8/1e5</i>	simple GA [22]
GLOBAL	1	1.2	2.6	4	4.1	3.9	4.4	9.6	<i>75e-4/500</i>	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.2	1.3	8.8	6.2	4.2	5.1	4.2	4	2.8	iAMaLGaM IDEA [4]
LSfminbnd	1	1.2	5.4	1.2	7.3	55	<i>16e-3/5e3</i>	.	.	.	LSfminbnd [28]
LSstep	1.1	2	42	40	35	44	82	390	<i>10e-4/1e4</i>	.	LSstep [28]
MA-LS-Chain	1.1	1.3	1.3	2.2	5.3	4.3	4.8	2.8	3.1	2.9	MA-LS-Chain [21]
MCS (Neum)	1	1	1.3	4.3	4.8	5.4	9.2	44	140	130	MCS (Neum) [18]
NELDER (Han)	1	1.5	130	28	20	14	11	12	9.6	6.3	NELDER (Han) [16]
NELDER (Doe)	1	1.5	1.4	1.5	3.3	3	3.1	7	5.9	4	NELDER (Doe) [5]
NEWUOA	1	1.9	7.7	6.8	18	33	120	<i>75e-4/5e3</i>	.	.	NEWUOA [31]
(1+1)-ES	1	1.1	2.7	5.9	6.7	4.8	8.5	13	23	15	(1+1)-ES [1]
POEMS	4.5	110	110	18	35	31	32	23	24	21	POEMS [20]
PSO	1.1	1.2	1.9	1.6	5	6.2	8.1	6.2	5.5	5.5	PSO [7]
PSO_Bounds	1	1.3	1.9	1.3	13	15	22	15	21	30	PSO_Bounds [8]
Monte Carlo	1	1.1	1.7	5.2	220	4900	7.4e4	<i>73e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	1	20	45	83	140	500	350	<i>24e-2/5e3</i>	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.9	4	2.2	2.8	2.3	1.8	1.6	1.5	1.4	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.5	5.7	4.7	2.7	2.9	2.6	6.7	32	VNS (Garcia) [11]

Table 18: 02-D, running time excess ERT/ERT_{best} on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.1	1.3	1.6	6.6	5.5	5.4	6.7	8.1	9.6	13	ALPS [17]
AMaLGaM IDEA	1.1	1.3	1.3	4.1	1	1	1.1	1.2	1.1	1.1	AMaLGaM IDEA [4]
avg NEWUOA	1.7	7.9	5.4	9	6.1	62	<i>58e-3/6e3</i>	.	.	.	avg NEWUOA [31]
BayEDAcG	1.4	1.5	2.3	19	19	48	<i>53e-2/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	5.4	11	14	30	110	<i>74e-2/2e3</i>	.	.	.	.	BFGS [30]
Cauchy EDA	2.6	2200	380	55	11	6.4	5	7	7.4	6.7	Cauchy EDA [24]
BIPOP-CMA-ES	1.6	2.4	2.2	6.5	1.9	1.1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	22	6.6	13	17	38	83	140	<i>32e-3/1e4</i>	.	(1+1)-CMA-ES [2]
DASA	3.3	27	26	91	86	740	1800	4200	5900	5e3	DASA [19]
DEPSO	1.3	1	2.7	3.1	2.1	3.3	11	9.4	8.3	<i>75e-4/2e3</i>	DEPSO [12]
DIRECT	1.4	1.9	1	1	1.1	1.2	3.4	4.8	4.9	11	DIRECT [25]
EDA-PSO	1.3	1.3	2.4	5.4	7.1	9.1	11	12	13	15	EDA-PSO [6]
full NEWUOA	1.2	5	3	16	19	71	<i>58e-3/6e3</i>	.	.	.	full NEWUOA [31]
G3-PCX	1.9	1.1	2	10	21	41	48	72	99	85	G3-PCX [26]
simple GA	1.1	1.5	4.3	15	23	110	280	680	1200	<i>24e-4/1e5</i>	simple GA [22]
GLOBAL	1.3	1.2	2	3.1	2.2	4.8	7.6	<i>58e-3/1e3</i>	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.2	1.8	1.4	12	2.9	1.8	2.3	2	2	1.8	iAMaLGaM IDEA [4]
LSfminbnd	2.1	3.6	1.3	2.1	7	33	<i>58e-3/4e3</i>	.	.	.	LSfminbnd [28]
LSstep	28	18	12	79	60	110	<i>24e-2/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1.7	1.5	1.6	3.2	2.5	3.2	4	3.9	5.8	7	MA-LS-Chain [21]
MCS (Neum)	1.4	3	1.3	2.8	1.7	8.4	140	350	<i>30e-4/3e4</i>	.	MCS (Neum) [18]
NELDER (Han)	1.2	1.3	21	44	18	20	38	47	40	34	NELDER (Han) [16]
NELDER (Doe)	1.3	1.3	1.2	3.1	2.4	4.3	5.8	8.7	25	21	NELDER (Doe) [5]
NEWUOA	1.3	13	5.6	12	14	62	<i>98e-3/6e3</i>	.	.	.	NEWUOA [31]
(1+1)-ES	1.5	2.4	63	230	620	1500	4900	1.4e4	<i>75e-4/1e6</i>	.	(1+1)-ES [1]
POEMS	100	72	28	120	29	28	23	31	45	42	POEMS [20]
PSO	1.3	1.3	1.7	3.4	2.8	3.2	3.5	5.6	6.5	7.2	PSO [7]
PSO_Bounds	1.4	1.5	1.5	5.3	6.7	8.8	10	12	17	23	PSO_Bounds [8]
Monte Carlo	1.1	1.2	2.2	21	270	1.1e4	<i>24e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	26	54	61	56	200	<i>53e-2/5e3</i>	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.5	4.9	2.1	6.2	2.1	1.3	1.1	1	1.1	1.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.6	3.8	16	5.4	3.6	4.8	8.1	18	150	VNS (Garcia) [11]

Table 19: 02-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

19 Griewank-Rosenbrock F8F2											
Δ_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ_{target} ERT_{best}/D
ALPS	1	1.1	5.5	55	17	12	22	30	41	54	ALPS [17]
AMaLGaM IDEA	1	1.1	6.3	40	6.2	18	18	17	17	16	AMaLGaM IDEA [4]
avg NEWUOA	1	1.3	8	110	13	22	21	20	19	18	avg NEWUOA [31]
BayEDAcG	1	1.1	3.9	44	9.9	13	57	<i>35e-4/2e3</i>	.	.	BayEDAcG [10]
BFGS	1	11	37	310	61	30	29	27	26	24	BFGS [30]
Cauchy EDA	1	1.1	16	110	51	170	860	1300	2800	<i>18e-4/5e4</i>	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	6	31	10	12	12	15	14	14	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	5.6	87	33	32	31	29	28	26	(1+1)-CMA-ES [2]
DASA	1	7.5	42	760	97	250	250	250	260	270	DASA [19]
DEPSO	1	1	4.4	59	17	18	35	36	69	67	DEPSO [12]
DIRECT	1	1	1	1	4.6	10	9.6	9.1	8.9	59	DIRECT [25]
EDA-PSO	1	1.1	5.2	37	13	17	30	57	62	72	EDA-PSO [6]
full NEWUOA	1	1.3	6.7	88	17	17	17	16	15	14	full NEWUOA [31]
G3-PCX	1	1	5.3	52	37	49	47	45	43	40	G3-PCX [26]
simple GA	1	1.2	4.5	51	20	21	110	360	640	4900	simple GA [22]
GLOBAL	1	1.3	4.3	50	9.4	11	10	10	9.6	8.8	GLOBAL [23]
iAMaLGaM IDEA	1	1.1	5.5	25	63	50	48	48	46	42	iAMaLGaM IDEA [4]
LSfminbnd	1	1.1	9.4	49	10	29	70	120	310	<i>59e-5/5e3</i>	LSfminbnd [28]
LSstep	1	1.9	140	440	27	63	140	580	<i>11e-4/1e4</i>	.	LSstep [28]
MA-LS-Chain	1	1.1	6.7	60	7.2	15	15	14	14	13	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1	3.1	380	64	32	30	29	27	25	NELDER (Han) [16]
NELDER (Doe)	1	1.1	4.6	52	10	8.1	7.8	7.4	7.1	6.5	NELDER (Doe) [5]
NEWUOA	1	1.5	6.2	130	16	27	26	25	24	22	NEWUOA [31]
(1+1)-ES	1	1.6	6.2	100	22	23	25	27	30	38	(1+1)-ES [1]
POEMS	1	130	340	550	57	210	200	200	190	190	POEMS [20]
PSO	1	1.1	5.3	34	9.1	4.7	6	8.7	9.9	16	PSO [7]
PSO_Bounds	1	1.5	5.1	40	7.8	11	20	36	47	71	PSO_Bounds [8]
Monte Carlo	1	1.2	4.5	64	16	36	110	310	720	3.2e4	Monte Carlo [3]
Rosenbrock	1	6.9	42	160	34	30	29	28	26	24	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.5	4.3	29	6.8	19	20	19	19	18	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.2	2.2	43	12	19	19	20	20	21	VNS (Garcia) [11]

Table 20: 02-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

20 Schwefel $x*\sin(x)$											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	2.1	2.8	3.1	14	6.2	9.2	12	16	20	26	ALPS [17]
AMaLGaM IDEA	2.2	2.5	2.6	26	37	38	38	38	38	38	AMaLGaM IDEA [4]
avg NEWUOA	3	2.2	2.1	9.8	4	4	4	4	4	3.9	avg NEWUOA [31]
BayEDAcG	3.2	4	3.6	9.2	32	<i>25e-2/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	2.5	2.2	2.1	6	2.7	2.7	2.7	2.7	2.7	2.6	BFGS [30]
Cauchy EDA	26	20	18	9.9	31	150	1300	2e3	2e3	1900	Cauchy EDA [24]
BIPOP-CMA-ES	2.9	2.8	2.7	13	9.9	10	11	11	11	11	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.2	2	2.1	7.5	8.5	8.6	8.6	8.6	8.6	8.6	(1+1)-CMA-ES [2]
DASA	59	52	49	81	44	45	45	45	45	45	DASA [19]
DEPSO	1.4	1	1	9.9	4.9	5.6	6.4	6.8	8	9.2	DEPSO [12]
DIRECT	5.7	5.9	6.1	1	2.9	3	3.1	3.3	3.7	3.9	DIRECT [25]
EDA-PSO	1.7	3.3	3.2	9	13	21	25	25	26	27	EDA-PSO [6]
full NEWUOA	2.9	2.1	1.8	18	8.3	8.3	8.3	8.3	8.2	8.1	full NEWUOA [31]
G3-PCX	2.9	2.8	2.9	38	7.8	7.8	8	8.1	8.1	8.2	G3-PCX [26]
simple GA	2.7	2.4	2.8	14	15	27	45	65	85	130	simple GA [22]
GLOBAL	1.8	1.9	2.4	11	4.5	4.5	4.5	4.5	4.5	4.5	GLOBAL [23]
iAMaLGaM IDEA	2.1	2.4	2.2	51	26	26	27	27	27	27	iAMaLGaM IDEA [4]
LSfminbnd	6.5	6.7	6.6	150	<i>68e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	94	210	180	120	25	27	30	37	40	50	LSstep [28]
MA-LS-Chain	1.5	1.9	2.4	4.2	1.8	2	2.1	2.2	2.3	2.4	MA-LS-Chain [21]
MCS (Neum)	2.9	6.2	5.7	2.2	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1.5	1.3	1.3	36	28	28	28	28	28	27	NELDER (Han) [16]
NELDER (Doe)	1.6	1.7	1.5	3.9	2.8	2.8	2.9	2.9	2.9	2.9	NELDER (Doe) [5]
NEWUOA	3	2.2	2.1	7	5.9	5.9	5.9	5.9	5.8	5.8	NEWUOA [31]
(1+1)-ES	4.1	3.7	3.3	13	9	9.1	9.2	9.2	9.2	9.2	(1+1)-ES [1]
POEMS	190	140	130	25	30	35	42	46	52	61	POEMS [20]
PSO	2.5	2.2	2.5	8.3	5	6.3	8.7	10	12	15	PSO [7]
PSO_Bounds	2.5	2.9	3.7	11	6	13	20	25	30	36	PSO_Bounds [8]
Monte Carlo	2.2	2.8	3.6	21	67	680	5800	8.2e4	<i>80e-5/1e6</i>	.	Monte Carlo [3]
Rosenbrock	5	4	4	6.8	4.1	4.2	4.2	4.2	4.2	4.2	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.6	1.8	1.8	9.4	15	16	17	18	18	18	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	3.8	4.3	18	9.3	9.6	9.7	9.9	10	13	VNS (Garcia) [11]

Table 21: 02-D, running time excess ERT/ERT_{best} on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

21 Gallagher 101 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	1.2	2.2	1.8	2.6	4.9	6.4	7.8	12	ALPS [17]
AMaLGaM IDEA	1	1	1.3	28	17	11	11	10	10	10	AMaLGaM IDEA [4]
avg NEWUOA	1	1	6.1	6.5	4.6	2.9	2.8	2.7	2.6	2.7	avg NEWUOA [31]
BayEDAcG	1	1	1.7	1.6	9.3	14	39	57	86	85	BayEDAcG [10]
BFGS	1	1	2.6	4.8	3	2	1.9	1.8	1.7	1.8	BFGS [30]
Cauchy EDA	1	1	6	310	93	62	65	62	81	80	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1.4	11	10	8.2	9.7	9.3	8.9	8.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1.2	12	9.6	6.1	5.9	5.6	5.3	5.3	(1+1)-CMA-ES [2]
DASA	1	1	13	150	140	88	84	80	77	76	DASA [19]
DEPSO	1	1	2.1	2.5	1.5	1.8	2.4	2.6	2.9	5.6	DEPSO [12]
DIRECT	1	1	1.3	1	1	1	1	2	2	2.3	DIRECT [25]
EDA-PSO	1	1	1	1.8	83	54	53	52	51	52	EDA-PSO [6]
full NEWUOA	1	1	2.2	3.6	3	1.9	1.8	1.7	1.7	1.7	full NEWUOA [31]
G3-PCX	1	1	1.4	2.7	2.9	1.9	1.9	1.8	1.8	1.8	G3-PCX [26]
simple GA	1	1	1.4	1	1.7	4.1	7.7	18	120	270	simple GA [22]
GLOBAL	1	1	1.5	1.1	1.1	1	1	1	1	1	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.6	21	12	7.9	7.8	7.5	7.2	7.1	iAMaLGaM IDEA [4]
LSfminbnd	1	1	2.1	39	20	26	46	60	73	170	LSfminbnd [28]
LSstep	1	1	18	370	150	100	100	100	120	190	LSstep [28]
MA-LS-Chain	1	1	1.4	1.1	1.5	1.5	1.7	1.9	1.9	2	MA-LS-Chain [21]
MCS (Neum)	1	1	1.6	22	14	8.8	8.4	8	7.6	7.5	MCS (Neum) [18]
NELDER (Han)	1	1	1.8	19	20	13	12	12	11	11	NELDER (Han) [16]
NELDER (Doe)	1	1	1.4	2.6	2.6	1.7	1.6	1.5	1.5	1.5	NELDER (Doe) [5]
NEWUOA	1	1	3.5	3.9	4	2.5	2.4	2.3	2.2	2.3	NEWUOA [31]
(1+1)-ES	1	1	2.8	14	19	12	11	11	10	10	(1+1)-ES [1]
POEMS	1	1	130	93	890	560	540	520	490	490	POEMS [20]
PSO	1	1	1.2	1.4	83	53	51	48	46	47	PSO [7]
PSO_Bounds	1	1	1.5	33	300	190	180	170	170	170	PSO_Bounds [8]
Monte Carlo	1	1	2	1.8	1.2	3.5	8.8	28	42	640	Monte Carlo [3]
Rosenbrock	1	1	2.3	5.5	3.9	2.5	2.4	2.3	2.2	2.1	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1.3	9.6	6.4	6.3	8.5	8.7	8.6	9.2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1.1	6.1	14	9.1	8.8	8.5	8.4	8.4	VNS (Garcia) [11]

Table 22: 02-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

22 Gallagher 21 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	1.2	1.3	1	3	5.2	7.1	9.2	15	ALPS [17]
AMaLGaM IDEA	1	1	1.3	51	18	19	17	15	15	15	AMaLGaM IDEA [4]
avg NEWUOA	1	1	3	3.8	1.3	1.1	1.1	1.1	1.1	1.3	avg NEWUOA [31]
BayEDAcG	1	1	1.3	3.3	7.6	11	34	59	200	<i>37e-4/2e3</i>	BayEDAcG [10]
BFGS	1	1	5.4	5	1.5	1.2	1.1	1	1	1	BFGS [30]
Cauchy EDA	1	1	27	610	190	270	390	450	540	510	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1	7.3	11	8.7	10	9.2	9.1	8.7	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	14	26	7.2	5.7	5	4.5	4.4	4.3	(1+1)-CMA-ES [2]
DASA	1	1	11	80	22	21	22	28	40	63	DASA [19]
DEPSO	1	1	2.3	4.7	2.4	4	4.6	5	6.6	9.8	DEPSO [12]
DIRECT	1	1	1.5	2.1	1.3	1.3	1.4	2.2	4.8	5.1	DIRECT [25]
EDA-PSO	1	1	1.1	4	1.7	4.2	4.9	8.4	11	25	EDA-PSO [6]
full NEWUOA	1	1	6.5	6.8	1.5	1.2	1.1	1.1	1.1	1.2	full NEWUOA [31]
G3-PCX	1	1	2.1	2.2	1.1	1.1	1.1	1.3	1.4	1.6	G3-PCX [26]
simple GA	1	1	1.2	3	1.3	3.3	7.1	17	280	1900	simple GA [22]
GLOBAL	1	1	1.7	2.9	1.3	1.5	1.5	1.3	1.4	1.3	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.5	14	9.9	8.9	8	7.2	7.1	7.3	iAMaLGaM IDEA [4]
LSfminbnd	1	1	1.4	4.7	5.1	53	49	61	69	460	LSfminbnd [28]
LSstep	1	1	1	80	140	140	150	280	970	920	LSstep [28]
MA-LS-Chain	1	1	1	2.8	1.6	1.9	2.2	2.3	2.4	2.4	MA-LS-Chain [21]
MCS (Neum)	1	1	2.4	40	7.4	6	5.3	4.7	4.8	5.2	MCS (Neum) [18]
NELDER (Han)	1	1	7.7	39	9.8	7.6	6.6	5.9	5.8	5.5	NELDER (Han) [16]
NELDER (Doe)	1	1	1.3	8.1	1.8	1.4	1.2	1.1	1.1	1.1	NELDER (Doe) [5]
NEWUOA	1	1	1.9	6.3	1.2	1	1	1	1	1.1	NEWUOA [31]
(1+1)-ES	1	1	1.6	46	11	9.8	9.4	9.4	10	12	(1+1)-ES [1]
POEMS	1	1	64	940	230	190	160	150	150	150	POEMS [20]
PSO	1	1	1.5	2.7	1	1.8	1.9	2.3	3.8	6.5	PSO [7]
PSO_Bounds	1	1	1.2	540	87	67	60	56	58	64	PSO_Bounds [8]
Monte Carlo	1	1	1.3	2.8	1.5	3.1	7.2	24	93	760	Monte Carlo [3]
Rosenbrock	1	1	12	17	4.5	3.5	3.1	2.7	2.7	2.6	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1	7.7	4.4	4.1	3.9	3.6	3.8	3.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2	1	2.8	3.8	4.8	4.7	5	5.3	VNS (Garcia) [11]

Table 23: 02-D, running time excess ERT/ERT_{best} on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

23 Katsuuras											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	1.4	14	86	140	200	640	4100	2.8e4	ALPS [17]
AMaLGaM IDEA	1	1	1.3	7.5	10	9.8	9	8.9	8.4	8.1	AMaLGaM IDEA [4]
avg NEWUOA	1	1	4.2	6.7	25	100	260	<i>49e-3/6e3</i>	.	.	avg NEWUOA [31]
BayEDAcG	1	1	2	11	<i>56e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	4.8	4.9	28	120	480	460	410	<i>73e-3/5e3</i>	BFGS [30]
Cauchy EDA	1	1	1.8	16	860	<i>14e-2/5e4</i>	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1.8	8.3	15	14	13	13	12	12	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	2.1	5.1	8.4	8.6	7.7	7.6	6.9	6.6	(1+1)-CMA-ES [2]
DASA	1	1	5.7	17	170	1800	8600	9600	8700	7900	DASA [19]
DEPSO	1	1	2.2	24	<i>96e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1.5	4.2	290	270	240	230	210	200	DIRECT [25]
EDA-PSO	1	1	2.3	18	1400	<i>13e-2/1e5</i>	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	6	1.5	24	46	81	79	71	65	full NEWUOA [31]
G3-PCX	1	1	1.9	1.6	6.1	6	5.8	5.8	5.5	7.4	G3-PCX [26]
simple GA	1	1	1.4	6.6	330	840	3300	<i>41e-4/1e5</i>	.	.	simple GA [22]
GLOBAL	1	1	1	2.6	97	<i>21e-2/2e3</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.3	5.3	5.5	5.3	4.9	5	4.7	4.6	iAMaLGaM IDEA [4]
LSfminbnd	1	1	1.3	2.1	30	120	200	190	<i>25e-3/7e3</i>	.	LSfminbnd [28]
LSstep	1	1	2.6	18	1300	<i>24e-2/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	1.8	5.5	7.4	7.1	6.6	6.7	6.4	7	MA-LS-Chain [21]
MCS (Neum)	1	1	3.4	2.8	6.3	23	210	500	1e3	1900	MCS (Neum) [18]
NELDER (Han)	1	1	1.3	1.6	2.2	2.2	2	1.9	1.8	1.7	NELDER (Han) [16]
NELDER (Doe)	1	1	4.7	1	1	1	1	1	1	1	NELDER (Doe) [5]
NEWUOA	1	1	7.8	3.2	32	89	130	170	500	460	NEWUOA [31]
(1+1)-ES	1	1	2.6	3.7	19	55	240	1e3	2100	6700	(1+1)-ES [1]
POEMS	1	1	14	28	190	180	180	190	180	190	POEMS [20]
PSO	1	1	1.3	9	42	59	73	79	88	95	PSO [7]
PSO_Bounds	1	1	1.7	9.4	260	460	500	690	660	860	PSO_Bounds [8]
Monte Carlo	1	1	1.5	8	1900	<i>46e-3/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	1.9	2.2	9.9	15	17	23	29	<i>66e-7/5e3</i>	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	2.6	8.1	14	16	14	14	13	12	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1.8	8.3	38	67	65	62	56	52	VNS (Garcia) [11]

Table 24: 02-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

24 Lunacek bi-Rastrigin											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
	0.5	0.5	9.13	429	4260	11700	12100	12400	12400	12400	
ALPS	1	1	1	6.5	4	2.8	2.9	2.9	3	3.2	ALPS [17]
AMaLGaM IDEA	1	1	1.2	35	11	6.7	6.7	6.6	6.6	6.7	AMaLGaM IDEA [4]
avg NEWUOA	1	1	3.3	1.9	1.4	6.2	6	5.9	5.9	5.9	avg NEWUOA [31]
BayEDAcG	1	1	1.9	68	<i>22e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	3.4	5.1	2.9	<i>42e-2/3e3</i>	.	.	.	.	BFGS [30]
Cauchy EDA	1	1	3.9	33	170	<i>49e-2/5e4</i>	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	4.6	19	17	13	22	22	22	22	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	2.7	6.1	4.8	2.9	2.8	2.7	2.7	3.6	(1+1)-CMA-ES [2]
DASA	1	1	10	140	110	61	59	58	58	58	DASA [19]
DEPSO	1	1	3.3	67	<i>24e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1.9	79	8.7	5	4.9	4.7	4.7	4.8	DIRECT [25]
EDA-PSO	1	1	1.6	100	12	9	9	8.8	8.8	8.9	EDA-PSO [6]
full NEWUOA	1	1	2.8	1	1	1.1	1	1	1	1	full NEWUOA [31]
G3-PCX	1	1	1.2	37	20	<i>10e-2/5e4</i>	.	.	.	.	G3-PCX [26]
simple GA	1	1	1.6	67	<i>79e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	2.7	3.3	7	<i>51e-2/2e3</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.4	28	9.1	5.4	5.3	5.2	5.3	5.3	iAMaLGaM IDEA [4]
LSfminbnd	1	1	2.8	8.3	<i>37e-2/8e3</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	3	3	4.8	29	33	12	12	<i>11e-1/1e4</i>	.	.	LSstep [28]
MA-LS-Chain	1	1	2.5	31	34	<i>11e-1/1e4</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	2.5	5.7	1.6	2.7	2.7	2.6	2.6	2.6	MCS (Neum) [18]
NELDER (Han)	1	1	16	7.4	5	6.6	6.4	6.2	6.2	6.2	NELDER (Han) [16]
NELDER (Doe)	1	1	1.5	1.9	1.5	3.2	3.1	3	3	3	NELDER (Doe) [5]
NEWUOA	1	1	3.1	2.8	1.9	2	1.9	1.9	1.9	1.9	NEWUOA [31]
(1+1)-ES	1	1	8	12	11	21	20	19	19	19	(1+1)-ES [1]
POEMS	1	1	28	1500	170	<i>20e-1/1e5</i>	.	.	.	.	POEMS [20]
PSO	1	1	2.4	470	49	18	17	17	17	17	PSO [7]
PSO_Bounds	1	1	1.3	1500	150	57	55	54	54	54	PSO_Bounds [8]
Monte Carlo	1	1	2.5	14	150	570	<i>49e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	19	35	15	11	11	11	11	11	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1.7	7.2	3.9	3.7	3.7	3.6	3.6	3.6	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1.2	5.3	1.7	1	1	1.1	1.9	4.7	VNS (Garcia) [11]

Table 25: 03-D, running time excess ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

1 Sphere											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	2.6	31	160	280	450	660	860	1200	ALPS [17]
AMaLgAM IDEA	1	1.1	3.1	7.4	16	26	37	45	54	73	AMaLgAM IDEA [4]
avg NEWUOA	1	1.3	2.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	avg NEWUOA [31]
BayEDAcG	1	1	2.4	9.2	96	120	160	180	280	420	BayEDAcG [10]
BFGS	1	1	2.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	BFGS [30]
Cauchy EDA	1	1.1	40	36	58	91	110	140	160	210	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	2.8	5.1	11	18	23	29	34	47	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1.8	5.2	8.8	12	15	19	23	30	(1+1)-CMA-ES [2]
DASA	1	3.1	37	37	49	63	76	89	100	130	DASA [19]
DEPSO	1	1	2.9	15	36	65	96	120	150	200	DEPSO [12]
DIRECT	1	1	1.2	2	5.7	15	27	38	52	95	DIRECT [25]
EDA-PSO	1	1.1	2.8	10	28	56	120	280	390	690	EDA-PSO [6]
full NEWUOA	1	1.3	2.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	full NEWUOA [31]
G3-PCX	1	1.3	1.9	12	15	19	24	29	34	47	G3-PCX [26]
simple GA	1	1.1	3.1	26	440	1200	2100	3200	4200	6800	simple GA [22]
GLOBAL	1	1.1	3.1	22	38	41	42	44	45	48	GLOBAL [23]
iAMaLgAM IDEA	1	1.2	2.4	5.5	12	18	24	30	36	49	iAMaLgAM IDEA [4]
LSfminbnd	1	2.5	5.5	4.1	5.3	5.6	5.6	5.8	5.9	5.9	LSfminbnd [28]
LSstep	1	1.2	130	94	100	100	100	100	100	100	LSstep [28]
MA-LS-Chain	1	1.1	2.5	14	36	57	70	75	82	96	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1.6	2	2.4	2.4	2.4	2.4	2.4	MCS (Neum) [18]
NELDER (Han)	1	1.5	1.9	1.8	3.4	5.3	6.7	8.3	9.8	13	NELDER (Han) [16]
NELDER (Doe)	1	1	2	2.4	3.9	5.4	6.9	8.7	10	14	NELDER (Doe) [5]
NEWUOA	1	1	1.8	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	1.3	3.4	4.1	7	11	14	18	22	29	(1+1)-ES [1]
POEMS	1	23	170	110	180	390	1e3	1300	1700	2400	POEMS [20]
PSO	1	1.1	3.2	9.9	44	86	160	230	310	500	PSO [7]
PSO_Bounds	1	1	3.1	13	58	230	430	650	850	1500	PSO_Bounds [8]
Monte Carlo	1	1	3.8	35	1400	3.3e4	1.3e6	<i>15e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	1	1.7	4.5	3.3	4.8	5.9	7.5	8.5	10	13	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	3.5	5.3	10	14	20	26	31	41	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.6	13	24	31	37	46	50	62	VNS (Garcia) [11]

Table 26: 03-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	43	49	66	100	130	160	190	220	250	310	ALPS [17]
AMaLGaM IDEA	5.9	5.6	6	8.1	10	12	14	16	17	20	AMaLGaM IDEA [4]
avg NEWUOA	1	1	1.7	8.2	14	21	30	36	43	57	avg NEWUOA [31]
BayEDAcG	15	15	19	26	29	46	48	55	70	93	BayEDAcG [10]
BFGS	3.4	2.3	3.1	4	4.7	4.9	5	5	5.1	5.2	BFGS [30]
Cauchy EDA	15	17	18	21	25	29	34	36	40	48	Cauchy EDA [24]
BIPOP-CMA-ES	8.9	9.5	13	17	20	21	22	22	23	24	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	6	6.4	8.4	11	12	13	13	13	14	14	(1+1)-CMA-ES [2]
DASA	15	12	11	14	15	18	19	21	23	28	DASA [19]
DEPSO	18	14	15	18	24	29	33	36	40	47	DEPSO [12]
DIRECT	5	4.6	4.5	7.3	8.9	10	12	14	33	38	DIRECT [25]
EDA-PSO	7.8	9.9	13	31	58	84	110	130	150	200	EDA-PSO [6]
full NEWUOA	1	1.1	1.7	4.2	8.2	12	16	19	22	29	full NEWUOA [31]
G3-PCX	16	11	43	87	120	130	170	180	200	230	G3-PCX [26]
simple GA	70	160	280	410	570	780	950	1200	1400	1900	simple GA [22]
GLOBAL	16	11	9	8.9	9	9.3	9.4	9.4	9.5	9.7	GLOBAL [23]
iAMaLGaM IDEA	3.2	3.7	4.4	6.1	7.6	8.9	9.9	11	12	14	iAMaLGaM IDEA [4]
LSfminbnd	1.9	1.3	1	1	1	1	1	1	1	1	LSfminbnd [28]
LSstep	28	17	15	14	14	14	14	13	13	13	LSstep [28]
MA-LS-Chain	12	12	14	19	22	26	30	33	38	44	MA-LS-Chain [21]
MCS (Neum)	1.9	1.1	1.8	1.9	2.2	3.7	4.4	5	5.2	6.9	MCS (Neum) [18]
NELDER (Han)	2.4	2	2.2	3.3	4.3	4.6	4.8	4.9	5.1	5.4	NELDER (Han) [16]
NELDER (Doe)	1.9	1.8	2.3	2.8	3.2	3.6	3.8	3.9	4.2	4.6	NELDER (Doe) [5]
NEWUOA	1	1.3	3.4	14	25	33	42	49	56	72	NEWUOA [31]
(1+1)-ES	60	270	5800	2e4	4.1e4	6.6e4	3.2e5	4.8e5	<i>36e-4/1e6</i>	.	(1+1)-ES [1]
POEMS	270	250	280	320	360	450	500	510	620	720	POEMS [20]
PSO	20	25	46	56	65	83	95	100	120	140	PSO [7]
PSO_Bounds	16	47	150	300	340	510	560	580	640	920	PSO_Bounds [8]
Monte Carlo	66	420	6e3	1.8e5	<i>14e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.9	3.2	4.9	16	20	22	24	24	24	26	Rosenbrock [27]
IPOP-SEP-CMA-ES	9	8	9.5	12	13	14	15	15	16	17	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	17	17	21	26	26	27	28	29	29	30	VNS (Garcia) [11]

Table 27: 03-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

3 Rastrigin separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	25	6.2	8.9	11	13	15	17	21	ALPS [17]
AMaLGaM IDEA	1	2	3.6	4.2	14	15	15	15	15	15	AMaLGaM IDEA [4]
avg NEWUOA	1	4.4	9.4	5	33	33	33	33	33	32	avg NEWUOA [31]
BayEDAcG	1.1	1.5	32	9.7	<i>70e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1.3	29	42	25	160	150	150	150	150	150	BFGS [30]
Cauchy EDA	1.1	41	14	7.6	250	2600	<i>10e-2/5e4</i>	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	3.5	3.2	4.7	25	25	26	26	26	26	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.8	8.1	4	38	38	37	37	37	37	(1+1)-CMA-ES [2]
DASA	1.3	32	14	1.4	12	12	12	12	12	12	DASA [19]
DEPSO	1	2.4	11	2.7	4.1	4.8	5.6	5.9	7.3	8.6	DEPSO [12]
DIRECT	1	1	4.8	4.1	17	17	17	17	17	17	DIRECT [25]
EDA-PSO	1	1.6	5.6	13	42	44	44	45	46	49	EDA-PSO [6]
full NEWUOA	1	4.5	4.9	3.3	15	15	15	15	15	15	full NEWUOA [31]
G3-PCX	1.1	1.9	73	58	330	330	330	330	330	320	G3-PCX [26]
simple GA	1	2.2	52	15	23	31	41	56	69	100	simple GA [22]
GLOBAL	1.1	2.5	8.2	3.6	12	12	12	12	12	12	GLOBAL [23]
iAMaLGaM IDEA	1.1	1.9	12	12	39	39	39	39	39	39	iAMaLGaM IDEA [4]
LSfminbnd	1	6.9	1	38	54	54	53	53	53	52	LSfminbnd [28]
LSstep	28	150	21	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1	2.3	6.7	2.3	8.3	8.4	8.4	8.4	8.4	8.5	MA-LS-Chain [21]
MCS (Neum)	1	1	6.8	1.2	10	11	11	12	12	12	MCS (Neum) [18]
NELDER (Han)	1	1.8	25	17	100	100	100	100	100	100	NELDER (Han) [16]
NELDER (Doe)	1	1.7	3	1.5	8.4	8.4	8.3	8.3	8.3	8.3	NELDER (Doe) [5]
NEWUOA	1	2.9	5.7	5	55	54	54	54	53	53	NEWUOA [31]
(1+1)-ES	1	4.3	14	12	69	68	68	67	67	67	(1+1)-ES [1]
POEMS	16	210	26	8.2	23	27	31	35	37	45	POEMS [20]
PSO	1	1.5	7.3	3.5	6.1	7	7.9	8.5	9.6	11	PSO [7]
PSO_Bounds	1	2.2	15	8.6	18	22	25	27	29	41	PSO_Bounds [8]
Monte Carlo	1	1.3	110	5500	5.1e4	<i>10e-1/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	42	41	27	410	410	400	400	400	400	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.8	3.4	3.7	14	17	17	17	17	17	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.7	8.4	3.8	7.4	7.4	7.6	8.6	11	17	VNS (Garcia) [11]

Table 28: 03-D, running time excess ERT/ERT_{best} on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

4 Skew Rastrigin-Bueche separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.5	1.7	37	9.6	16	18	19	21	23	27	ALPS [17]
AMaLGaM IDEA	1.3	1.2	23	110	970	950	930	900	880	870	AMaLGaM IDEA [4]
avg NEWUOA	2.9	9.2	11	14	160	150	150	140	140	130	avg NEWUOA [31]
BayEDAcG	1.3	1.3	33	<i>47e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.8	20	48	54	<i>30e-1/3e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	5.9	20	23	1300	<i>13e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1.1	1.4	9.5	260	3300	4e3	3900	3800	3700	3600	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2	1.8	13	21	150	140	140	130	130	130	(1+1)-CMA-ES [2]
DASA	17	29	12	1.2	2	2	2	2.1	2.1	2.3	DASA [19]
DEPSO	2.5	1.5	13	6.8	18	47	46	45	44	43	DEPSO [12]
DIRECT	1	1	4.8	20	26	44	83	170	180	180	DIRECT [25]
EDA-PSO	1.5	1.2	16	24	110	110	100	100	100	100	EDA-PSO [6]
full NEWUOA	2.7	3.5	11	25	170	160	150	140	140	140	full NEWUOA [31]
G3-PCX	1.8	1.3	130	62	430	400	390	380	370	360	G3-PCX [26]
simple GA	1.3	1.4	90	19	24	34	42	54	63	110	simple GA [22]
GLOBAL	1.3	1.7	12	7.9	51	48	46	44	43	42	GLOBAL [23]
iAMaLGaM IDEA	1.3	1.6	12	130	860	820	800	770	760	740	iAMaLGaM IDEA [4]
LSfminbnd	2.1	3.4	1	<i>20e-1/4e3</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	54	70	17	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1.4	2.1	9.6	5.6	60	56	55	53	52	51	MA-LS-Chain [21]
MCS (Neum)	1	1.2	5.9	10	67	63	61	59	57	56	MCS (Neum) [18]
NELDER (Han)	2.3	1.4	33	72	320	300	290	280	270	270	NELDER (Han) [16]
NELDER (Doe)	1.8	1	4.5	7.8	43	40	39	37	37	36	NELDER (Doe) [5]
NEWUOA	2.3	2.2	24	21	300	280	280	260	260	250	NEWUOA [31]
(1+1)-ES	2.5	1.8	31	33	230	210	210	200	190	190	(1+1)-ES [1]
POEMS	89	100	48	13	46	47	48	51	53	57	POEMS [20]
PSO	1.3	1.3	15	6	98	93	91	89	87	87	PSO [7]
PSO_Bounds	1.5	1.1	28	21	28	36	36	38	39	51	PSO_Bounds [8]
Monte Carlo	1.3	1.7	220	1.6e4	<i>14e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.2	36	43	44	140	130	130	120	120	120	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.9	6.3	83	<i>14e-1/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	2.2	1.8	19	7.6	20	19	19	20	22	50	VNS (Garcia) [11]

Table 29: 03-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

5 Linear slope											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.3	27	90	98	100	110	110	110	110	ALPS [17]
AMaLgAM IDEA	1	1.1	11	20	21	21	21	21	21	21	AMaLgAM IDEA [4]
avg NEWUOA	1	1.5	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	avg NEWUOA [31]
BayEDAcG	1	1.3	22	360	370	370	370	370	370	370	BayEDAcG [10]
BFGS	1	2.6	1.6	2.4	2.5	2.6	2.6	2.6	2.6	2.6	BFGS [30]
Cauchy EDA	1	13	20	22	23	23	23	23	23	23	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.5	3.6	5.4	5.7	5.8	5.8	5.8	5.8	5.8	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	2.1	2.7	2.8	2.9	2.9	2.9	2.9	2.9	(1+1)-CMA-ES [2]
DASA	1	21	19	31	36	40	44	49	53	62	DASA [19]
DEPSO	1	1.4	15	35	39	39	39	39	39	39	DEPSO [12]
DIRECT	1	1	3.7	4.6	6.2	6.2	6.2	6.2	6.2	6.2	DIRECT [25]
EDA-PSO	1	1.3	8.5	16	17	17	17	17	17	17	EDA-PSO [6]
full NEWUOA	1	2	1.2	1.7	1.8	1.8	1.8	1.8	1.8	1.8	full NEWUOA [31]
G3-PCX	1	1.5	9.4	22	25	25	25	25	25	25	G3-PCX [26]
simple GA	1	1.2	14	1100	3e3	4800	7500	1.1e4	1.5e4	<i>22e-8/1e5</i>	simple GA [22]
GLOBAL	1	1.3	31	47	47	48	48	48	48	48	GLOBAL [23]
iAMaLgAM IDEA	1	1.2	3.5	8.3	8.8	8.8	8.8	8.8	8.8	8.8	iAMaLgAM IDEA [4]
LSfminbnd	1	1.1	7.5	11	11	11	11	11	11	11	LSfminbnd [28]
LSstep	1	28	93	120	120	120	120	120	120	120	LSstep [28]
MA-LS-Chain	1	1.3	25	88	92	92	93	93	93	93	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1.3	1.6	2.4	2.5	2.5	2.5	2.5	2.5	2.5	NELDER (Han) [16]
NELDER (Doe)	1	1.5	1.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	NELDER (Doe) [5]
NEWUOA	1	1.1	1.1	1.4	1.4	1.4	1.4	1.4	1.4	1.4	NEWUOA [31]
(1+1)-ES	1	1.6	2.3	3	3.1	3.1	3.1	3.1	3.1	3.1	(1+1)-ES [1]
POEMS	1	59	120	150	170	180	180	180	180	180	POEMS [20]
PSO	1	1.1	8.2	16	18	18	18	18	18	18	PSO [7]
PSO_Bounds	1	1.3	6.3	14	15	15	15	15	15	15	PSO_Bounds [8]
Monte Carlo	1	1.2	34	1.8e4	6.5e6	<i>32e-2/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	5	3.3	3.6	3.6	3.6	3.6	3.6	3.6	3.6	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.3	4.1	6.7	7	7.1	7.1	7.1	7.1	7.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	18	20	20	20	20	20	20	20	VNS (Garcia) [11]

Table 30: 03-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

6 Attractive sector											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	4.9	3.3	9.2	35	46	53	58	61	64	72	ALPS [17]
AMaLGaM IDEA	4.8	4.3	3.7	5.5	5.5	6.3	6.4	6.6	6.9	7.5	AMaLGaM IDEA [4]
avg NEWUOA	1.2	2.3	2.6	2.9	2.9	3.8	3.9	4.1	4.3	4.7	avg NEWUOA [31]
BayEDAcG	4.2	10	130	<i>66e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	3.3	2.2	3.5	3.4	2.9	2.4	2	1.8	1.9	3.1	BFGS [30]
Cauchy EDA	24	33	28	31	28	27	26	25	24	25	Cauchy EDA [24]
BIPOP-CMA-ES	1.6	1.6	2.4	3.2	3.1	3.2	3.2	3.1	3	3.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.4	1.6	1.3	1.6	1.8	1.7	1.6	1.6	1.6	1.6	(1+1)-CMA-ES [2]
DASA	33	58	30	32	30	36	55	56	54	66	DASA [19]
DEPSO	2.4	3.3	6	11	11	13	14	13	13	14	DEPSO [12]
DIRECT	1.4	1.1	3	33	440	1300	2700	<i>23e-3/3e4</i>	.	.	DIRECT [25]
EDA-PSO	3.9	3.4	2.7	13	28	42	59	62	66	76	EDA-PSO [6]
full NEWUOA	1.5	3.7	4	5.1	5.1	5.4	5.7	6	6.1	6.9	full NEWUOA [31]
G3-PCX	3	3.2	3.5	3.3	2.9	3.2	3.2	3.5	4.3	4.8	G3-PCX [26]
simple GA	2.4	2.7	9	100	270	4200	4400	3800	4400	1.6e4	simple GA [22]
GLOBAL	2.5	3.7	5.2	5.5	4	3.3	2.8	2.4	2.3	2.3	GLOBAL [23]
iAMaLGaM IDEA	2.4	2	2.1	2.9	3.1	3.7	4.1	4.2	4.3	4.8	iAMaLGaM IDEA [4]
LSfminbnd	14	220	490	810	510	400	310	260	220	190	LSfminbnd [28]
LSstep	240	690	1200	990	1e3	820	670	760	670	1700	LSstep [28]
MA-LS-Chain	3.8	4.6	4.3	10	10	9.6	9.1	8.9	8.3	8.1	MA-LS-Chain [21]
MCS (Neum)	2.1	1.5	3	160	120	140	140	130	150	210	MCS (Neum) [18]
NELDER (Han)	1.6	1.2	1.7	1.5	1.3	1.3	1.2	1.2	1.2	1.3	NELDER (Han) [16]
NELDER (Doe)	1	1	1	1	1	1	1	1	1	1	NELDER (Doe) [5]
NEWUOA	1.4	1.9	2.1	3.4	3.8	4	4.1	4	4.1	4.8	NEWUOA [31]
(1+1)-ES	2.1	3.2	1.7	2	1.8	1.8	2	2	2.1	3	(1+1)-ES [1]
POEMS	160	91	31	74	83	93	100	92	99	110	POEMS [20]
PSO	3.8	4	2.9	8	13	17	18	22	25	28	PSO [7]
PSO_Bounds	2.2	2.3	2.9	12	26	100	120	130	120	120	PSO_Bounds [8]
Monte Carlo	2.8	1.9	7.7	200	8700	1.1e5	<i>26e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	3.9	4	2.1	1.8	1.7	1.7	1.6	1.8	1.7	1.6	Rosenbrock [27]
IPOP-SEP-CMA-ES	4.5	3.6	2.8	3.7	3.3	3.5	3.6	3.6	3.6	3.6	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	2.2	2.3	5.6	5.9	4.8	4.6	4.3	4	3.9	3.8	VNS (Garcia) [11]

Table 31: 03-D, running time excess ERT/ERT_{best} on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

7 Step-ellipsoid												
Δ target	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ target	
ERT_{best}/D	0.333	0.867	3.8	21.6	114	155	161	161	161	178	ERT_{best}/D	
ALPS	1.1	2	6.2	10	7	8.7	9.3	9.3	9.3	11	ALPS [17]	
AMaLGaM IDEA	1.2	2.1	2.6	1.6	2.1	3.1	3	3	3	2.9	AMaLGaM IDEA [4]	
avg NEWUOA	1.3	3.5	1.2	6.8	4.8	19	41	41	41	37	avg NEWUOA [31]	
BayEDAcG	1.4	1	3.6	52	72	85	<i>56e-2/2e3</i>	.	.	.	BayEDAcG [10]	
BFGS	1.8	4.1	17	86	<i>37e-1/100</i>	.	.	.	.	.	BFGS [30]	
Cauchy EDA	7.1	16	14	6.1	1.9	1.8	1.9	1.9	1.9	2	Cauchy EDA [24]	
BIPOP-CMA-ES	1	2	3.3	2.8	1.1	1	1	1	1	1	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1.4	3.5	2.7	2.1	1	1.4	1.4	1.4	1.4	1.3	(1+1)-CMA-ES [2]	
DASA	24	57	85	260	120	1300	1600	1600	1600	1500	DASA [19]	
DEPSO	1.2	1.7	5.2	6.1	5.9	5.1	5.1	5.1	5.1	5.3	DEPSO [12]	
DIRECT	1	1.4	2.9	2.8	2.1	31	34	34	34	30	DIRECT [25]	
EDA-PSO	1.3	1.9	3.3	3.7	8.8	17	20	20	20	22	EDA-PSO [6]	
full NEWUOA	1.2	3.4	1	1	1.4	2.2	6.8	6.8	6.8	6.2	full NEWUOA [31]	
G3-PCX	1.1	1.5	6.2	8.3	12	16	54	54	54	48	G3-PCX [26]	
simple GA	1.3	2.2	3.3	24	27	130	200	200	200	250	simple GA [22]	
GLOBAL	1.3	2.2	6.2	5.4	4.6	8.8	51	51	51	46	GLOBAL [23]	
iAMaLGaM IDEA	1.2	3.3	2.6	15	8.1	6.1	6	6	6	5.4	iAMaLGaM IDEA [4]	
LSfminbnd	8.7	19	46	68	33	100	290	290	290	260	LSfminbnd [28]	
LSstep	1.6	210	300	320	390	930	<i>22e-2/1e4</i>	.	.	.	LSstep [28]	
MA-LS-Chain	1.3	2.1	6.1	4.3	2.2	3.1	3.9	3.9	3.9	3.9	MA-LS-Chain [21]	
MCS (Neum)	1	1.1	1	5.7	2.4	4.2	4.1	4.1	4.1	8.8	MCS (Neum) [18]	
NELDER (Han)	1.7	3	8	28	20	23	30	30	30	27	NELDER (Han) [16]	
NELDER (Doe)	1.1	1.9	7.5	4.2	4.3	4.2	8.8	8.8	8.8	8.8	NELDER (Doe) [5]	
NEWUOA	1.3	2.6	11	12	10	14	39	39	39	35	NEWUOA [31]	
(1+1)-ES	1.1	2.3	2	3.6	3.9	7.7	9.3	9.3	9.3	8.4	(1+1)-ES [1]	
POEMS	170	270	81	29	12	18	21	21	21	20	POEMS [20]	
PSO	1.1	2.2	3.5	5.3	3.1	4.4	5.1	5.1	5.1	5.1	PSO [7]	
PSO_Bounds	1.3	2	4.1	7.3	4.8	9.3	12	12	12	13	PSO_Bounds [8]	
Monte Carlo	1.3	2	5	30	130	3900	1.6e4	1.6e4	1.6e4	<i>55e-4/1e6</i>	Monte Carlo [3]	
Rosenbrock	41	140	97	150	370	<i>79e-2/3e3</i>	.	.	.	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	3.2	3.3	2.7	2.9	1.4	1.3	1.3	1.3	1.3	1.4	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	3.2	7.5	4.2	2.6	3	4.1	4.1	4.1	3.9	VNS (Garcia) [11]	

Table 32: 03-D, running time excess ERT/ERT_{best} on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	8 Rosenbrock original										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	2.8	8.5	23	46	33	65	93	120	150	210	ALPS [17]
AMaLGaM IDEA	5.1	2.9	3.8	9.9	5.8	6.3	7	7.5	7.8	8.3	AMaLGaM IDEA [4]
avg NEWUOA	3.1	1.9	1.9	2.6	1	1	1	1	1	1	avg NEWUOA [31]
BayEDAcG	3.7	4.7	11	110	560	<i>73e-2/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	3.3	2.1	1.4	2.7	1.1	1.1	1.1	1	1	1	BFGS [30]
Cauchy EDA	24	18	21	28	14	14	15	15	16	17	Cauchy EDA [24]
BIPOP-CMA-ES	4.8	3.8	3.5	8	4.5	4.9	5.2	5.2	5.4	5.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.7	1.6	1.9	6.3	2.8	2.8	3	3.1	3.2	3.4	(1+1)-CMA-ES [2]
DASA	38	22	15	470	470	750	1200	1500	2e3	2800	DASA [19]
DEPSO	6.7	8.1	7.7	14	11	24	64	<i>62e-4/2e3</i>	.	.	DEPSO [12]
DIRECT	1.5	1.4	2	5	3.5	9.2	15	22	29	42	DIRECT [25]
EDA-PSO	2.9	4	6.8	74	70	110	160	210	260	370	EDA-PSO [6]
full NEWUOA	3.7	1.9	1.4	2.8	1.1	1	1	1	1	1	full NEWUOA [31]
G3-PCX	2.5	4.3	4.2	16	9	9.3	9.3	9.1	9.1	9	G3-PCX [26]
simple GA	2.5	3.4	47	170	400	<i>49e-3/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	2.6	9.2	11	8.2	2.8	2.6	2.5	2.5	2.5	2.5	GLOBAL [23]
iAMaLGaM IDEA	2.6	2.4	2.2	8.1	4.5	5	5.1	5.3	5.6	5.9	iAMaLGaM IDEA [4]
LSfminbnd	10	4.4	24	810	2800	2400	2300	2200	<i>96e-2/1e4</i>	.	LSfminbnd [28]
LSstep	150	70	51	680	2800	2400	2300	2200	2100	<i>73e-2/1e4</i>	LSstep [28]
MA-LS-Chain	4.7	4.5	6.6	14	7.7	9.9	11	11	12	12	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	7.2	6.3	6.2	6	5.9	5.7	MCS (Neum) [18]
NELDER (Han)	1.6	1	1	2.1	1	1	1.1	1.1	1.1	1.2	NELDER (Han) [16]
NELDER (Doe)	2.1	2.1	1.6	4	1.5	1.4	1.4	1.4	1.5	1.5	NELDER (Doe) [5]
NEWUOA	3.1	1.5	1.4	2.8	1.2	1.2	1.2	1.2	1.2	1.2	NEWUOA [31]
(1+1)-ES	4.5	3.3	2.8	45	20	39	65	91	120	170	(1+1)-ES [1]
POEMS	140	50	37	94	48	69	170	290	330	410	POEMS [20]
PSO	2.9	4.4	9.8	46	52	93	150	210	260	380	PSO [7]
PSO_Bounds	2.5	4	17	60	160	590	740	840	920	1e3	PSO_Bounds [8]
Monte Carlo	2.7	6.9	43	1e3	1e4	1.2e5	<i>38e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	4.2	1.8	1.7	6.9	3	3.1	3.1	3	3.1	3	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.8	1.9	3	8.3	6.2	6.7	7	7	7.1	7.2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	2.5	9.9	7.7	9.4	5.1	5.4	5.7	5.7	5.9	6.1	VNS (Garcia) [11]

Table 33: 03-D, running time excess ERT/ERT_{best} on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

9 Rosenbrock rotated											
Δ target	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ target
ERT_{best}/D	0.333	0.333	6.93	21.8	42.4	49.7	53.2	54.9	56.3	59.4	ERT_{best}/D
ALPS	7.9	130	30	30	48	83	100	130	170	220	ALPS [17]
AMaLGaM IDEA	15	40	5.4	6.2	6	6.5	7.1	7.7	8.1	8.6	AMaLGaM IDEA [4]
avg NEWUOA	11	20	1.7	1.7	1.2	1.1	1.1	1.1	1.2	1.2	avg NEWUOA [31]
BayEDAcG	15	60	12	110	<i>12e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	9.3	20	1.5	1.5	1.1	1.1	1.1	1.1	1.1	1	BFGS [30]
Cauchy EDA	140	290	24	17	16	17	17	18	19	20	Cauchy EDA [24]
BIPOP-CMA-ES	9.9	30	3.9	4.6	4.4	4.7	4.9	5.1	5.3	5.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	8.2	36	2.7	4.5	3.6	3.6	3.7	3.8	3.9	4.1	(1+1)-CMA-ES [2]
DASA	200	390	24	790	720	980	1400	1900	2500	3600	DASA [19]
DEPSO	8	77	15	19	27	55	560	<i>46e-4/2e3</i>	.	.	DEPSO [12]
DIRECT	1	1	1.5	1.7	6.2	9.1	18	27	29	38	DIRECT [25]
EDA-PSO	7	42	7.5	49	69	120	190	260	350	490	EDA-PSO [6]
full NEWUOA	9.4	18	1.6	1.4	1	1	1	1	1	1	full NEWUOA [31]
G3-PCX	11	53	5.4	14	12	12	12	12	12	12	G3-PCX [26]
simple GA	8.4	130	49	100	3800	2.8e4	<i>11e-2/1e5</i>	.	.	.	simple GA [22]
GLOBAL	10	100	14	6.2	3.5	3.2	3.1	3.1	3.1	3.1	GLOBAL [23]
iAMaLGaM IDEA	12	28	3.3	5	4.9	5	5.4	5.8	6	6.4	iAMaLGaM IDEA [4]
LSfminbnd	25	61	4.7	180	310	870	1300	2600	2600	<i>71e-3/1e4</i>	LSfminbnd [28]
LSstep	390	3e3	180	400	3300	2800	<i>56e-2/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	12	73	11	9.9	8.7	9.9	11	11	12	13	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1.1	1.1	1.2	1.2	1.2	MCS (Neum) [18]
NELDER (Han)	5.2	12	1.2	1.2	1	1	1.1	1.1	1.2	1.3	NELDER (Han) [16]
NELDER (Doe)	6.9	18	1.5	1.4	1.1	1.1	1.1	1.1	1.2	1.3	NELDER (Doe) [5]
NEWUOA	7.7	22	1.7	1.7	1.2	1.2	1.2	1.2	1.3	1.3	NEWUOA [31]
(1+1)-ES	11	32	2.6	79	71	88	120	150	180	240	(1+1)-ES [1]
POEMS	650	780	66	69	68	150	250	380	500	910	POEMS [20]
PSO	9.3	75	11	17	34	66	130	200	270	440	PSO [7]
PSO_Bounds	11	59	13	77	370	530	670	780	880	1e3	PSO_Bounds [8]
Monte Carlo	12	71	43	670	1e4	2.9e5	<i>43e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	13	23	1.6	2.6	2.7	2.6	2.7	2.8	2.9	2.9	Rosenbrock [27]
IPOP-SEP-CMA-ES	10	28	3.7	5.6	7.4	8.2	8.1	8.2	8.3	8.4	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	20	140	11	6.8	6	6.2	6.3	6.5	6.7	7	VNS (Garcia) [11]

Table 34: 03-D, running time excess ERT/ERT_{best} on f_{10} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

10 Ellipsoid												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	23	38	50	120	360	700	1300	1900	2600	7100	ALPS [17]	
AMaLGaM IDEA	3.2	3	2	2.3	2.7	2.9	3.2	3.4	3.6	3.8	AMaLGaM IDEA [4]	
avg NEWUOA	1.1	1.3	1.9	3.4	5.8	6.9	7.9	8.8	9.5	11	avg NEWUOA [31]	
BayEDAcG	88	1600	<i>37e+1/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.4	1	1	1.2	1.2	1.2	1.4	1.5	5.9	76	BFGS [30]	
Cauchy EDA	13	9.4	6.3	6.2	6.7	7.3	7.8	8.3	8.7	9.5	Cauchy EDA [24]	
BIPOP-CMA-ES	8.1	5.6	4.1	4.1	4.6	4.9	4.9	4.9	4.9	4.8	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	4.5	3.1	2.7	2.7	2.7	3	3.1	3	3	3	(1+1)-CMA-ES [2]	
DASA	130	180	1.1e4	4.4e4	2.5e5	<i>24e-1/1e6</i>	.	.	.	.	DASA [19]
DEPSO	13	35	67	110	<i>55e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	4.1	8.4	7.6	49	120	160	490	480	1e3	2e3	DIRECT [25]	
EDA-PSO	20	66	210	2400	4200	7e3	1.1e4	<i>61e-2/1e5</i>	.	.	EDA-PSO [6]	
full NEWUOA	1	1.6	1.6	2.6	3.9	4.4	4.9	5.6	6	7.1	full NEWUOA [31]	
G3-PCX	8.8	7.2	14	21	28	30	36	39	41	42	G3-PCX [26]	
simple GA	30	90	200	2e3	1.2e4	<i>55e-2/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	9.9	6	3.3	2.8	2.7	2.6	2.5	2.4	2.3	2.2	GLOBAL [23]	
iAMaLGaM IDEA	3.3	2.5	1.8	2.1	2.6	2.9	3	3.1	3.2	3.3	iAMaLGaM IDEA [4]	
LSfminbnd	340	480	1700	2800	2500	<i>61e+0/1e4</i>	.	.	.	.	LSfminbnd [28]
LSstep	1100	2400	1700	<i>53e+1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	16	13	9.6	11	12	12	13	12	12	12	MA-LS-Chain [21]	
MCS (Neum)	23	14	67	170	820	4100	3800	<i>29e-2/2e4</i>	.	.	MCS (Neum) [18]	
NELDER (Han)	1.8	1.3	1	1	1	1	1	1	1	1	NELDER (Han) [16]	
NELDER (Doe)	2	1.3	1.2	1.1	1.1	1.1	1.1	1.1	1	1.1	NELDER (Doe) [5]	
NEWUOA	1.4	1.3	2.8	5.2	8.3	10	12	13	14	16	NEWUOA [31]	
(1+1)-ES	28	320	2100	6200	1.2e4	2.3e4	7.6e4	<i>36e-4/1e6</i>	.	.	(1+1)-ES [1]	
POEMS	49	72	410	1600	5300	1.2e4	<i>51e-2/1e5</i>	.	.	.	POEMS [20]	
PSO	9.2	12	59	1100	2400	3600	4800	6700	6500	1.8e4	PSO [7]	
PSO_Bounds	13	31	2100	8e3	1.2e4	1.1e4	2.2e4	2.1e4	2e4	1.8e4	PSO_Bounds [8]	
Monte Carlo	34	210	2100	6e4	2.5e5	<i>11e-1/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.6	3.9	8.5	7.8	7.2	6.8	6.5	6.4	6.9	6.5	Rosenbrock [27]	
IPOP-SEP-CMA-ES	22	17	11	9.8	9.6	9.2	8.8	8.5	8.2	7.8	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	9.3	7.1	5.9	6	5.9	5.8	5.7	5.6	5.5	5.3	VNS (Garcia) [11]	

Table 35: 03-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	
Δf_{target} ERT_{best}/D											Δf_{target} ERT_{best}/D
ALPS	19	48	31	120	250	520	1100	1800	2600	5e3	ALPS [17]
AMaLgAM IDEA	5.5	7	3.1	3	1.7	1.9	2.1	2.3	2.5	2.8	AMaLgAM IDEA [4]
avg NEWUOA	1.9	2.6	2	3.3	2.5	2.7	3.3	3.7	4.3	5	avg NEWUOA [31]
BayEDAcG	10	23	91	810	<i>85e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	2.1	1.9	1	1	1	1.4	3.7	11	41	<i>33e-7/7e3</i>	BFGS [30]
Cauchy EDA	19	24	7.8	6.5	4.1	4.3	5	5.2	5.6	6.4	Cauchy EDA [24]
BIPOP-CMA-ES	5.7	14	9.5	7.5	4	3.6	3.7	3.7	3.7	3.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.6	9.8	5.8	4.6	2.7	2.5	2.5	2.5	2.5	2.5	(1+1)-CMA-ES [2]
DASA	15	16	4600	9300	1.4e4	2.2e4	3.3e4	4.3e4	4.2e4	3.9e4	DASA [19]
DEPSO	9.8	62	130	270	<i>89e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	5.7	6.4	13	28	150	390	770	<i>24e-4/3e4</i>	.	.	DIRECT [25]
EDA-PSO	9.6	28	74	290	490	1100	5100	<i>41e-4/1e5</i>	.	.	EDA-PSO [6]
full NEWUOA	2.3	6.9	3.2	3.6	2.5	2.6	3.1	3.5	3.9	4.7	full NEWUOA [31]
G3-PCX	8.7	10	30	93	100	140	180	210	260	320	G3-PCX [26]
simple GA	17	66	74	2100	5600	<i>90e-2/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	14	23	5.4	3.9	2	1.8	1.8	1.8	1.7	1.7	GLOBAL [23]
iAMaLgAM IDEA	4.6	6.7	3.1	3.1	1.9	1.9	2	2.1	2.2	2.4	iAMaLgAM IDEA [4]
LSfminbnd	2.1	190	1800	<i>32e+0/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	2.1	400	2900	<i>36e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	13	24	21	22	11	10	10	10	9.9	9.7	MA-LS-Chain [21]
MCS (Neum)	1	1	49	82	100	510	<i>24e-3/2e4</i>	.	.	.	MCS (Neum) [18]
NELDER (Han)	3	3.4	2.2	2.2	1.3	1.2	1.2	1.2	1.2	1.1	NELDER (Han) [16]
NELDER (Doe)	3.2	3.7	2.3	2	1.1	1	1	1	1	1	NELDER (Doe) [5]
NEWUOA	1.7	8.8	3.1	3.4	2.5	2.6	3.2	3.7	4	5.1	NEWUOA [31]
(1+1)-ES	3.7	1300	8400	1.5e4	1.7e4	1.7e5	<i>37e-3/1e6</i>	.	.	.	(1+1)-ES [1]
POEMS	79	100	370	1e3	830	1500	1700	2100	2100	3200	POEMS [20]
PSO	12	30	60	150	160	270	360	450	530	990	PSO [7]
PSO_Bounds	9	25	240	740	610	1e3	1600	1600	1600	1700	PSO_Bounds [8]
Monte Carlo	22	52	130	2200	6.1e4	<i>13e-2/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.7	2.7	17	12	5.9	5.3	5.1	5	4.9	4.7	Rosenbrock [27]
IPOP-SEP-CMA-ES	5.2	20	17	15	7.4	6.6	6.6	6.5	6.4	6.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	12	30	14	9.6	4.8	4.5	4.4	4.4	4.4	4.3	VNS (Garcia) [11]

11 Discus

Table 36: 03-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

12 Bent cigar											
$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$
ALPS	73	85	94	100	170	460	1600	3400	1.4e4	9.3e4	ALPS [17]
AMaLgAM IDEA	5.9	6.4	4.7	4.2	4.8	5.2	5.6	4.9	4.9	5.2	AMaLgAM IDEA [4]
avg NEWUOA	1.1	1.9	4.5	3.2	2.2	2.2	2.2	1.8	1.8	1.9	avg NEWUOA [31]
BayEDAcG	27	26	67	82	120	220	<i>38e-1/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	1.9	1.5	1.7	1.4	1	1	1	2	2.3	43	BFGS [30]
Cauchy EDA	26	26	34	26	17	16	16	13	13	13	Cauchy EDA [24]
BIPOP-CMA-ES	5.2	4.8	7.9	5.7	4.5	4.7	4.8	3.9	4	4.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.8	4.3	8.5	6.1	4.3	4.2	4.2	3.3	3.6	3.5	(1+1)-CMA-ES [2]
DASA	17	17	3.1e4	3.6e4	3.6e4	<i>81e-1/1e6</i>	.	.	.	.	DASA [19]
DEPSO	24	25	80	160	260	<i>67e-1/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	4.6	4.6	7	6.5	5.7	10	58	53	49	240	DIRECT [25]
EDA-PSO	190	260	960	1700	5900	1.1e4	9500	6800	<i>91e-2/1e5</i>	.	EDA-PSO [6]
full NEWUOA	1	1.9	2.9	2.2	1.6	1.7	1.7	1.4	1.5	1.6	full NEWUOA [31]
G3-PCX	4.8	4.3	6	11	8.9	9.5	9.9	8	7.9	8.1	G3-PCX [26]
simple GA	200	380	430	2400	1.3e4	1.1e4	<i>11e-1/1e5</i>	.	.	.	simple GA [22]
GLOBAL	11	8.6	5.9	3.1	2	2.4	2.4	2.2	2.8	4	GLOBAL [23]
iAMaLgAM IDEA	4.1	4.4	9.6	8	6.1	6	5.9	4.7	4.7	4.6	iAMaLgAM IDEA [4]
LSfminbnd	6	6.2	700	1200	<i>14e+0/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	87	73	1400	790	400	<i>34e+0/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	16	14	25	15	10	11	11	8.8	9.1	8.9	MA-LS-Chain [21]
MCS (Neum)	1.3	1.1	1	1	1.2	1.2	2.7	2.5	4.5	18	MCS (Neum) [18]
NELDER (Han)	1.5	1.4	2	1.7	1.3	1.3	1.3	1	1	1.1	NELDER (Han) [16]
NELDER (Doe)	1.5	1.4	1.8	1.6	1.3	1.2	1.3	1	1	1	NELDER (Doe) [5]
NEWUOA	1.2	1	2	1.6	1.2	1.2	1.3	1	1.1	1.2	NEWUOA [31]
(1+1)-ES	2.7	7200	2.8e4	2.7e4	3.9e4	1.1e5	<i>12e-1/1e6</i>	.	.	.	(1+1)-ES [1]
POEMS	100	170	1800	1600	3800	5e3	<i>69e-2/1e5</i>	.	.	.	POEMS [20]
PSO	30	41	2400	2700	5800	1e4	<i>33e-1/1e5</i>	.	.	.	PSO [7]
PSO_Bounds	110	280	2e3	2200	2500	1.1e4	9500	<i>24e-1/1e5</i>	.	.	PSO_Bounds [8]
Monte Carlo	1700	1.1e4	1.6e5	<i>26e+0/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.6	1.5	38	19	10	9.4	8.9	6.9	7.4	11	Rosenbrock [27]
IPOP-SEP-CMA-ES	5.4	5.6	10	10	8.4	9.1	8.7	6.7	7	6.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	9.3	9.9	13	9.5	6	5.6	5.6	4.6	4.4	4.4	VNS (Garcia) [11]

Table 37: 03-D, running time excess ERT/ERT_{best} on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	13 Sharp ridge										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.5	12	48	66	100	200	410	1600	5400	2.2e4	ALPS [17]
AMaLGaM IDEA	1.4	4.3	3.7	3.9	4.2	4.3	3.4	3.4	3.5	3.4	AMaLGaM IDEA [4]
avg NEWUOA	2.5	1	5.6	14	42	110	160	280	260	<i>36e-4/8e3</i>	avg NEWUOA [31]
BayEDAcG	1.5	34	45	120	<i>24e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	3.5	1.5	1.1	1	1	1	2.1	31	410	<i>25e-6/9e3</i>	BFGS [30]
Cauchy EDA	39	22	14	12	12	12	9.4	9.2	9.6	9.3	Cauchy EDA [24]
BIPOP-CMA-ES	1.6	2.6	3.7	3.8	5	6.1	4.5	4.4	4.8	4.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.9	2.9	4.1	4.5	5.9	6.9	5.9	5.9	6.1	6	(1+1)-CMA-ES [2]
DASA	18	52	320	1100	1600	6100	2e4	4e4	1.5e5	<i>46e-5/1e6</i>	DASA [19]
DEPSO	1.9	9.5	14	60	100	210	<i>11e-2/2e3</i>	.	.	.	DEPSO [12]
DIRECT	1	1.9	2.9	6.8	6.8	16	29	31	61	160	DIRECT [25]
EDA-PSO	1.2	4.7	48	140	400	1400	5800	<i>73e-4/1e5</i>	.	.	EDA-PSO [6]
full NEWUOA	2.2	1	3	10	38	78	120	260	680	<i>51e-5/9e3</i>	full NEWUOA [31]
G3-PCX	1.5	4.8	20	73	97	110	160	220	230	210	G3-PCX [26]
simple GA	2.2	12	150	250	3600	1.5e4	2e4	<i>16e-2/1e5</i>	.	.	simple GA [22]
GLOBAL	1.3	9.4	6.6	4.5	6.3	8.4	88	<i>35e-4/400</i>	.	.	GLOBAL [23]
iAMaLGaM IDEA	2.2	3.2	2.9	2.7	3.1	3	2.4	2.5	2.6	2.5	iAMaLGaM IDEA [4]
LSfminbnd	5.9	14	120	220	620	1500	<i>39e-2/1e4</i>	.	.	.	LSfminbnd [28]
LSstep	120	150	510	1500	<i>65e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	2.2	7.9	9.7	13	17	17	13	12	12	12	MA-LS-Chain [21]
MCS (Neum)	1	1.7	14	130	370	370	710	830	<i>22e-4/2e4</i>	.	MCS (Neum) [18]
NELDER (Han)	1.9	1.2	1	1.1	1.2	1.3	1	1	1	1	NELDER (Han) [16]
NELDER (Doe)	1.5	1.3	1	1.1	1.2	1.3	1.2	1.2	1.2	1.1	NELDER (Doe) [5]
NEWUOA	2	1	4.5	9	42	62	200	1200	<i>12e-4/7e3</i>	.	NEWUOA [31]
(1+1)-ES	1.7	2.3	16	65	120	290	1e3	1600	3300	5.7e4	(1+1)-ES [1]
POEMS	280	52	73	670	1700	4900	<i>19e-3/1e5</i>	.	.	.	POEMS [20]
PSO	1.2	5.8	19	220	2200	5e3	2e4	1.7e4	1.5e4	<i>71e-3/1e5</i>	PSO [7]
PSO_Bounds	1.5	6.6	980	1400	1200	9e3	9200	<i>42e-3/1e5</i>	.	.	PSO_Bounds [8]
Monte Carlo	1.7	13	1300	1.6e5	<i>17e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	4.5	2.9	5	8.6	9.2	20	31	82	130	320	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.6	3	8.6	15	16	13	8.9	8.5	8.3	7.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	9.8	7.1	6	7.8	12	8.5	7.8	7.5	7.2	VNS (Garcia) [11]

Table 38: 03-D, running time excess ERT/ERT_{best} on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

14 Sum of different powers											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.2	2.3	10	55	71	69	81	200	2500	ALPS [17]
AMaLGaM IDEA	1	1.2	2.1	2.7	4.5	5	4.5	4.5	4.7	3.6	AMaLGaM IDEA [4]
avg NEWUOA	1	1.2	4.7	1.2	1.1	1.2	1.6	2.7		6.9	avg NEWUOA [31]
BayEDAcG	1	1.1	1.6	58	120	110	250	280	780	<i>28e-4/2e3</i>	BayEDAcG [10]
BFGS	1	2.1	3.7	1.5	1.5	1.3	1.1	1	1	29	BFGS [30]
Cauchy EDA	1	1	20	15	17	18	14	14	14	11	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.3	3.1	2.9	3.5	4.2	4.4	6.4	7.1	5.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	2.1	1.4	2.2	2.6	2.9	4	4.2	3.6	(1+1)-CMA-ES [2]
DASA	1	13	43	24	20	23	51	400	2900	4.8e4	DASA [19]
DEPSO	1	1	1.5	4.9	12	16	17	26	130	<i>11e-6/2e3</i>	DEPSO [12]
DIRECT	1	1	1.8	1.7	2.7	5.5	17	45	110	480	DIRECT [25]
EDA-PSO	1	1.1	1.8	4.2	11	21	76	130	190	6500	EDA-PSO [6]
full NEWUOA	1	1.3	6.2	1.4	1.2	1	1	1.5	2.3	4.4	full NEWUOA [31]
G3-PCX	1	1.1	2	4	4.6	4.2	4.9	11	45	280	G3-PCX [26]
simple GA	1	1	1.9	10	160	280	320	1600	6e3	<i>25e-6/1e5</i>	simple GA [22]
GLOBAL	1	1	2.5	8.4	11	7.4	5.1	4.8	12	<i>11e-6/300</i>	GLOBAL [23]
iAMaLGaM IDEA	1	1.4	2.7	2.4	3.2	3.7	3.1	3.2	3.6	3.2	iAMaLGaM IDEA [4]
LSfminbnd	1	1	7.2	4.4	3.5	6.1	67	600	<i>31e-5/1e4</i>	.	LSfminbnd [28]
LSstep	1	29	210	84	70	160	930	<i>22e-4/1e4</i>	.	.	LSstep [28]
MA-LS-Chain	1	1.1	1.8	6.7	11	12	9.8	11	15	13	MA-LS-Chain [21]
MCS (Neum)	1	1	2.5	12	11	7.9	5.7	6	50	<i>20e-7/2e4</i>	MCS (Neum) [18]
NELDER (Han)	1	1.3	1.9	1	1.2	1.3	1.2	1.3	1.3	1	NELDER (Han) [16]
NELDER (Doe)	1	1	2.7	1.1	1.4	1.8	1.5	1.5	1.6	1.2	NELDER (Doe) [5]
NEWUOA	1	1.1	4.1	1.1	1	1	1.2	2.1	3	17	NEWUOA [31]
(1+1)-ES	1	1.1	2.2	1.8	1.9	2.5	5.8	110	2400	<i>16e-7/1e6</i>	(1+1)-ES [1]
POEMS	1	140	250	55	91	110	150	160	220	1e4	POEMS [20]
PSO	1	1.1	1	3.1	14	24	30	45	76	2e3	PSO [7]
PSO_Bounds	1	1	2.7	4	33	62	86	140	280	1100	PSO_Bounds [8]
Monte Carlo	1	1.3	2.1	17	430	1.9e4	6e5	<i>43e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	1	2.5	5.5	1.4	1.3	1.5	2	2.4	3.1	14	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.1	2.8	2.6	3.6	4.2	4.8	9.9	11	8.3	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1	7.1	8.7	8.3	7.5	7.7	8.4	7.2	VNS (Garcia) [11]

Table 39: 03-D, running time excess ERT/ERT_{best} on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

15 Rastrigin											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.3	3.3	7.6	5.3	3.9	4.2	4.4	4.6	4.8	5.1	ALPS [17]
AMaLGaM IDEA	1.3	1.8	1.2	5	3.7	3.1	3	3	3	2.9	AMaLGaM IDEA [4]
avg NEWUOA	2	3.4	3.2	3.7	3.1	2.3	2.3	2.2	2.2	2.1	avg NEWUOA [31]
BayEDAcG	1.5	2.4	3.1	11	14	<i>11e-1/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	5.8	27	7.3	17	22	17	16	16	16	15	BFGS [30]
Cauchy EDA	9.2	46	3.9	5.4	27	<i>78e-3/5e4</i>	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1.9	4.4	1.9	1.3	1.7	1.3	1.3	1.3	1.3	1.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.5	3.9	1	5.8	9.5	7.2	7.1	6.9	6.8	6.6	(1+1)-CMA-ES [2]
DASA	9.8	36	56	200	200	150	150	140	140	140	DASA [19]
DEPSO	1.5	1	3.4	6.6	3.3	2.6	2.6	2.6	<i>10e-1/2e3</i>	.	DEPSO [12]
DIRECT	1	1.4	1	1.5	1	1.7	1.7	1.7	1.7	1.7	DIRECT [25]
EDA-PSO	1.2	1.6	3.8	7.4	9.5	7.4	7.3	7.4	7.4	7.5	EDA-PSO [6]
full NEWUOA	1.3	3.3	2.2	2.8	8.8	6.7	6.5	6.4	6.3	6.1	full NEWUOA [31]
G3-PCX	1.4	2.9	40	28	39	30	29	29	28	27	G3-PCX [26]
simple GA	1.4	3	14	20	62	62	62	64	83	150	simple GA [22]
GLOBAL	1.2	2.3	2.7	3.2	3.9	3	2.9	2.9	2.8	2.7	GLOBAL [23]
iAMaLGaM IDEA	1.4	3	6.2	5.6	4.6	3.6	3.6	3.5	3.5	3.4	iAMaLGaM IDEA [4]
LSfminbnd	1	5.5	4.8	21	20	15	15	15	15	14	LSfminbnd [28]
LSstep	1.2	170	380	140	67	51	50	50	49	48	LSstep [28]
MA-LS-Chain	1.5	3.1	2.6	1.6	3.3	2.5	2.5	2.5	2.4	2.4	MA-LS-Chain [21]
MCS (Neum)	1	1.4	1.8	1	1.8	1.4	1.3	1.3	1.6	1.5	MCS (Neum) [18]
NELDER (Han)	1.3	2.9	2.3	4.6	9.4	7.1	7	6.9	6.7	6.5	NELDER (Han) [16]
NELDER (Doe)	2.3	2.5	1.4	1	2.5	1.9	1.9	1.9	1.8	1.8	NELDER (Doe) [5]
NEWUOA	1.3	2.2	3.5	3.4	4.5	3.4	3.3	3.3	3.2	3.1	NEWUOA [31]
(1+1)-ES	2.2	4.5	3.4	6.2	13	10	10	9.8	9.6	9.3	(1+1)-ES [1]
POEMS	39	190	14	32	77	59	58	57	57	56	POEMS [20]
PSO	1.5	2.8	2.7	4	58	44	44	43	42	41	PSO [7]
PSO_Bounds	1.3	3.8	2.8	27	27	21	22	22	21	22	PSO_Bounds [8]
Monte Carlo	1.5	2.2	29	1500	<i>65e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	5.9	38	11	11	19	15	14	14	14	13	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.7	4.4	2.3	2.2	1.3	1	1	1	1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.4	2.6	3	3	3.7	2.8	2.8	2.9	2.9	4.5	VNS (Garcia) [11]

Table 40: 03-D, running time excess ERT/ERT_{best} on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.1	1.1	5.9	9.1	13	9	13	10	16	ALPS [17]
AMaLGaM IDEA	1	1.6	1.8	5.2	9.7	11	6	5.3	3.9	3.7	AMaLGaM IDEA [4]
avg NEWUOA	1	1.3	3.7	6.1	23	59	73	<i>19e-3/7e3</i>	.	.	avg NEWUOA [31]
BayEDAcG	1	1.4	1.7	25	<i>98e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	2.8	72	150	<i>14e-1/7e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	3	5.2	28	1100	<i>14e-2/5e4</i>	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.5	2.1	3.5	4.3	3.3	1.7	1.5	1.1	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.2	4.3	4.8	7.9	10	9.9	14	10	18	(1+1)-CMA-ES [2]
DASA	1	8.7	37	130	300	510	1e3	2200	2900	2900	DASA [19]
DEPSO	1	1.3	3.9	5.9	29	<i>15e-2/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	1	1.2	1.2	1	1	1	1	1	1.2	1.9	DIRECT [25]
EDA-PSO	1	1.3	1.5	19	110	160	97	93	73	72	EDA-PSO [6]
full NEWUOA	1	1.9	3.3	4.2	9	17	13	69	99	<i>26e-5/8e3</i>	full NEWUOA [31]
G3-PCX	1	1	1	3.2	11	18	13	27	58	100	G3-PCX [26]
simple GA	1	1.4	1	6	61	340	490	940	650	1300	simple GA [22]
GLOBAL	1	1.4	1.6	1.1	1.3	1.6	1.6	1.7	1.3	3.4	GLOBAL [23]
iAMaLGaM IDEA	1	1.1	1.9	1.9	10	9.2	6	5.2	3.5	3.6	iAMaLGaM IDEA [4]
LSfminbnd	1	1.2	1.6	3.5	19	50	100	<i>12e-3/9e3</i>	.	.	LSfminbnd [28]
LSstep	1	1.3	4	8.7	94	170	240	210	140	130	LSstep [28]
MA-LS-Chain	1	1.2	1.6	1.6	4.8	5.6	5.7	6.4	6	6.2	MA-LS-Chain [21]
MCS (Neum)	1	1.3	4.1	2.1	11	33	130	<i>18e-4/2e4</i>	.	.	MCS (Neum) [18]
NELDER (Han)	1	1.3	3.7	7	21	29	13	17	14	14	NELDER (Han) [16]
NELDER (Doe)	1	1.1	1.2	2.8	3.4	3.9	3.2	3.5	2.6	6.3	NELDER (Doe) [5]
NEWUOA	1	2.9	4.5	6.7	12	58	150	130	<i>13e-3/6e3</i>	.	NEWUOA [31]
(1+1)-ES	1	1.8	8.6	18	40	57	120	200	230	4e3	(1+1)-ES [1]
POEMS	1	120	16	24	71	210	96	84	57	57	POEMS [20]
PSO	1	1.6	1.5	3	41	77	73	66	45	59	PSO [7]
PSO_Bounds	1	1.4	1.8	6.4	58	170	120	120	95	93	PSO_Bounds [8]
Monte Carlo	1	1.3	1.8	7.9	180	4400	2.3e4	<i>80e-4/1e6</i>	.	.	Monte Carlo [3]
Rosenbrock	1	3	22	31	93	270	230	<i>23e-2/1e4</i>	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.4	2.1	3.5	4	3.5	1.6	1.4	1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.8	2.3	6.7	5.9	9.5	4.4	4	3	8.4	VNS (Garcia) [11]

Table 41: 03-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

17 Schaffer F7, condition 10											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.2	2.4	11	13	15	9.2	8.3	8.5	8.8	ALPS [17]
AMaLgAM IDEA	1	1.3	3.3	1.5	1	1	2.6	3.1	3.9	3	AMaLgAM IDEA [4]
avg NEWUOA	1	1.9	3.3	8	13	150	<i>32e-3/5e3</i>	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.7	2.3	6.7	7.6	17	9.7	16	<i>32e-4/2e3</i>	.	BayEDAcG [10]
BFGS	1	2.1	48	44	<i>44e-2/2e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	4.9	24	7.3	4.1	3.6	2.2	1.8	1.8	1.6	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.2	5.3	4	2.4	2.3	1.5	1.2	1.4	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	32	7.6	7.9	32	37	75	58	<i>76e-5/1e4</i>	(1+1)-CMA-ES [2]
DASA	1	15	65	49	110	480	900	990	3900	1.2e4	DASA [19]
DEPSO	1	1.3	5.1	4	3.5	3.5	2.3	2.2	2.3	5	DEPSO [12]
DIRECT	1	1	1.2	1	1.2	1.5	1	1	1	1.2	DIRECT [25]
EDA-PSO	1.1	1.3	2.3	4	17	29	20	17	17	16	EDA-PSO [6]
full NEWUOA	1	1.7	3.9	5.5	7.3	31	53	<i>35e-4/6e3</i>	.	.	full NEWUOA [31]
G3-PCX	1	1.3	2.6	33	39	48	47	110	290	640	G3-PCX [26]
simple GA	1	1.1	1.4	30	57	72	72	65	120	<i>58e-8/1e5</i>	simple GA [22]
GLOBAL	1	1.5	3	4.2	7.3	21	<i>98e-3/400</i>	.	.	.	GLOBAL [23]
iAMaLgAM IDEA	1	1.4	2.4	1	3.1	2.7	3.1	4.4	3.6	3	iAMaLgAM IDEA [4]
LSfminbnd	1	1.2	14	8.2	30	140	<i>21e-3/1e4</i>	.	.	.	LSfminbnd [28]
LSstep	1	1.5	71	200	100	880	<i>69e-3/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1	1.4	2.1	3.4	4	4.9	3.1	2.6	2.3	2	MA-LS-Chain [21]
MCS (Neum)	1	1	1	2.5	5.6	16	180	<i>35e-4/2e4</i>	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	62	22	44	95	95	110	250	400	NELDER (Han) [16]
NELDER (Doe)	1	1.2	1.9	3.7	8.5	36	69	<i>12e-4/2e4</i>	.	.	NELDER (Doe) [5]
NEWUOA	1	1.6	2.7	9	19	140	<i>32e-3/5e3</i>	.	.	.	NEWUOA [31]
(1+1)-ES	1	2.5	24	33	870	2300	4100	<i>12e-4/1e6</i>	.	.	(1+1)-ES [1]
POEMS	1	93	140	20	23	28	17	18	16	15	POEMS [20]
PSO	1	1.1	2.8	4.4	80	55	26	18	15	14	PSO [7]
PSO_Bounds	1	1.3	2.5	4.7	14	21	14	13	25	28	PSO_Bounds [8]
Monte Carlo	1	1.1	2.4	30	7200	<i>92e-3/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1.3	81	2200	<i>20e-1/8e3</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.2	2.8	1.8	2.1	1.8	1.4	1	1.1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.9	2.9	1.2	1.7	1.3	2	4.8	18	VNS (Garcia) [11]

Table 42: 03-D, running time excess ERT/ERT_{best} on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1.3	2.6	5	17	5.5	5.2	7.2	13	18	140	ALPS [17]	
AMaLGaM IDEA	1.2	3.4	1.6	6.1	3.5	3.2	3.1	2.9	2.5	2.5	AMaLGaM IDEA [4]	
avg NEWUOA	1.3	4.8	11	30	15	89	<i>76e-3/6e3</i>	.	.	.	avg NEWUOA [31]	
BayEDAcG	1.1	3	4.5	9.7	67	<i>20e-2/2e3</i>	.	.	.	.	BayEDAcG [10]	
BFGS	1	16	33	<i>29e-1/3e3</i>	.	.	.	.	.	.	BFGS [30]	
Cauchy EDA	1.3	31	280	80	9.4	4.3	4	8.5	7.3	6.6	Cauchy EDA [24]	
BIPOP-CMA-ES	1.1	3.4	1.4	3.4	1.8	1.1	1	1	1.1	1.3	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1.2	3.8	2.7	5	8.3	22	40	<i>16e-3/1e4</i>	.	.	(1+1)-CMA-ES [2]	
DASA	5.6	93	91	980	460	1600	<i>10e-3/1e6</i>	.	.	.	DASA [19]	
DEPSO	1.3	2.4	3.8	12	3.4	5.1	12	<i>18e-3/2e3</i>	.	.	DEPSO [12]	
DIRECT	1	1.5	1.1	2.7	1	1	2	2.9	5	8.3	DIRECT [25]	
EDA-PSO	1	4.5	2.4	28	13	9.3	12	13	14	16	EDA-PSO [6]	
full NEWUOA	1.1	4.6	4.2	16	13	<i>48e-3/7e3</i>	.	.	.	.	full NEWUOA [31]	
G3-PCX	1.1	3.3	2.4	11	18	63	<i>91e-4/5e4</i>	.	.	.	G3-PCX [26]	
simple GA	1	3.2	6.3	63	42	420	1200	<i>17e-3/1e5</i>	.	.	simple GA [22]	
GLOBAL	1.2	2.7	3.9	5.7	4.6	<i>21e-2/500</i>	.	.	.	.	GLOBAL [23]	
iAMaLGaM IDEA	1.1	1.9	1	1	1.6	3.3	3.7	3.9	3.4	3.8	iAMaLGaM IDEA [4]	
LSfminbnd	1	4.4	8.7	35	33	<i>10e-2/1e4</i>	.	.	.	.	LSfminbnd [28]	
LSstep	1	25	42	360	330	<i>12e-1/1e4</i>	.	.	.	.	LSstep [28]	
MA-LS-Chain	1.1	2.3	3	4.8	5.3	12	11	13	12	11	MA-LS-Chain [21]	
MCS (Neum)	1	1	4	2.9	20	<i>40e-3/2e4</i>	.	.	.	.	MCS (Neum) [18]	
NELDER (Han)	1.1	4.2	25	27	30	45	120	550	<i>98e-5/1e5</i>	.	NELDER (Han) [16]	
NELDER (Doe)	1.1	3.5	1.9	5.4	7	16	72	200	170	<i>63e-4/2e4</i>	NELDER (Doe) [5]	
NEWUOA	1	5.1	7.2	17	34	<i>12e-2/6e3</i>	.	.	.	.	NEWUOA [31]	
(1+1)-ES	1.8	9	340	300	2800	1.4e4	1.2e4	<i>83e-3/1e6</i>	.	.	(1+1)-ES [1]	
POEMS	42	250	25	180	25	24	50	95	100	170	POEMS [20]	
PSO	1	2.7	2	16	57	77	99	92	110	180	PSO [7]	
PSO_Bounds	1	2.7	2	170	65	57	67	68	69	780	PSO_Bounds [8]	
Monte Carlo	1.1	2.2	4.7	450	<i>26e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	1.1	160	220	2300	<i>50e-1/8e3</i>	.	.	.	.	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	1.2	4.7	1.2	1.8	2.1	1	1.1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1.2	3.5	3.2	2.3	4.3	5.3	6.6	13	45	130	VNS (Garcia) [11]	

Table 43: 03-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

19 Griewank-Rosenbrock F8F2											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	11	470	46	3	4.6	5.2	5.5	7.1	ALPS [17]
AMaLGaM IDEA	1	1.2	13	120	36	3.8	5.9	6	6	6	AMaLGaM IDEA [4]
avg NEWUOA	1	1.5	13	320	120	39	76	76	76	76	avg NEWUOA [31]
BayEDAcG	1	1.1	9.9	130	43	<i>64e-3/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1	37	110	870	160	33	<i>86e-3/5e3</i>	.	.	.	BFGS [30]
Cauchy EDA	1	2.3	57	540	310	<i>53e-3/5e4</i>	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.5	13	100	49	2.9	3.2	3.2	3.2	3.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	6.1	970	160	8.8	17	17	17	17	(1+1)-CMA-ES [2]
DASA	1	3.3	60	5100	520	230	460	460	460	480	DASA [19]
DEPSO	1	1	5.4	240	41	<i>43e-3/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	1	1	1	1	1	29	60	60	<i>10e-3/3e4</i>	.	DIRECT [25]
EDA-PSO	1	1.4	9.1	370	82	5.8	11	12	13	16	EDA-PSO [6]
full NEWUOA	1	1.7	25	370	56	11	17	17	17	17	full NEWUOA [31]
G3-PCX	1	1.1	7.6	920	640	100	95	95	95	94	G3-PCX [26]
simple GA	1	1.2	7.1	930	100	19	39	50	81	<i>68e-6/1e5</i>	simple GA [22]
GLOBAL	1	1.1	14	290	46	3.9	<i>94e-3/1e3</i>	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.2	10	160	73	7.6	7.7	7.7	7.7	7.7	iAMaLGaM IDEA [4]
LSfminbnd	1	3	26	270	54	46	<i>38e-3/7e3</i>	.	.	.	LSfminbnd [28]
LSstep	1	2	8.9	650	26	63	<i>28e-3/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1	1.1	7.6	190	20	1.6	2.2	2.2	2.2	2.3	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	11	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1	4.1	1500	120	17	40	40	40	40	NELDER (Han) [16]
NELDER (Doe)	1	1.1	7.6	150	20	5.4	11	11	11	11	NELDER (Doe) [5]
NEWUOA	1	1.5	20	1300	280	25	54	54	54	53	NEWUOA [31]
(1+1)-ES	1	2.3	10	2.1e5	3.1e4	1800	2600	2600	2600	2600	(1+1)-ES [1]
POEMS	1	130	630	1400	170	40	57	58	58	59	POEMS [20]
PSO	1	1.1	10	240	24	14	24	25	25	28	PSO [7]
PSO_Bounds	1	1.1	6.7	250	91	13	26	27	30	35	PSO_Bounds [8]
Monte Carlo	1	1.1	11	1e3	810	490	2900	6100	6100	<i>79e-4/1e6</i>	Monte Carlo [3]
Rosenbrock	1	15	250	3100	850	32	<i>27e-2/1e4</i>	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.1	9.1	190	54	2.6	2.4	2.4	2.5	2.5	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.4	23	220	36	4.8	6	6.1	6.3	10	VNS (Garcia) [11]

Table 44: 03-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

20 Schwefel $x*\sin(x)$											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	2.8	4.1	5.1	5	3.9	4.6	5.3	6.2	7.2	8.2	ALPS [17]
AMaLGaM IDEA	2.2	2.2	2.7	20	26	25	25	24	23		AMaLGaM IDEA [4]
avg NEWUOA	1.5	1.3	1.3	2.3	9.9	9.5	9.2	9	8.9	8.2	avg NEWUOA [31]
BayEDAcG	3.1	3	3.2	71	<i>13e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1.8	1.7	1.9	1.7	5.5	5.3	5.1	5	4.9	4.6	BFGS [30]
Cauchy EDA	17	18	20	10	460	930	<i>31e-2/5e4</i>	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	2.2	2.1	2.3	8.2	10	10	10	10	10	9.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.1	2.6	2.7	5.6	9.5	9.1	8.8	8.7	8.5	7.9	(1+1)-CMA-ES [2]
DASA	31	37	37	21	43	41	40	39	38	36	DASA [19]
DEPSO	1.1	4.1	5.9	2.4	4.9	4.8	4.8	4.9	4.8	4.7	DEPSO [12]
DIRECT	3.7	5.2	5.9	1	9	8.7	8.6	8.5	8.5	8.1	DIRECT [25]
EDA-PSO	2.3	3.4	3.6	6.7	4.5	4.9	5.1	5.3	5.6	6.1	EDA-PSO [6]
full NEWUOA	1.9	1.3	1.2	5.2	9.1	8.7	8.4	8.3	8.1	7.5	full NEWUOA [31]
G3-PCX	1.5	2.8	3.5	17	22	21	21	20	20	19	G3-PCX [26]
simple GA	3.2	4.3	5.1	14	7.1	10	14	17	21	29	simple GA [22]
GLOBAL	1.3	2.7	3.4	6	18	17	17	16	16	15	GLOBAL [23]
iAMaLGaM IDEA	2.3	2.9	3.7	16	19	18	18	18	17	16	iAMaLGaM IDEA [4]
LSfminbnd	6.4	6.1	6.8	9.9	<i>42e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	150	180	220	28	180	180	170	170	170	160	LSstep [28]
MA-LS-Chain	2.5	2.3	2.8	2.5	1	1	1	1	1	1	MA-LS-Chain [21]
MCS (Neum)	2.9	2.2	2.3	3.2	3.5	3.4	3.3	3.2	3.1	2.9	MCS (Neum) [18]
NELDER (Han)	1	1	1	19	25	24	23	23	23	21	NELDER (Han) [16]
NELDER (Doe)	1.5	1.5	1.7	3.6	10	10	9.7	9.5	9.4	8.7	NELDER (Doe) [5]
NEWUOA	1.6	1.4	1.3	1.1	3.9	3.7	3.6	3.5	3.4	3.2	NEWUOA [31]
(1+1)-ES	2.2	3.1	3.1	4.7	9.5	9.1	8.8	8.7	8.5	7.9	(1+1)-ES [1]
POEMS	110	87	84	7.4	65	63	63	69	69	66	POEMS [20]
PSO	1.4	3.2	3.7	2.6	22	22	21	21	21	20	PSO [7]
PSO_Bounds	2.1	2.7	3.2	5.2	52	78	76	85	84	80	PSO_Bounds [8]
Monte Carlo	1.3	2.6	3.1	56	1600	<i>94e-3/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	3	2.6	2.5	1.5	10	9.5	9.2	9.1	8.9	8.3	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.7	2.1	2.8	7.9	5.5	5.5	5.4	5.5	5.4	5.2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	3.7	2.8	2.9	4.4	5.5	5.3	5.1	5.1	5.2	5.8	VNS (Garcia) [11]

Table 45: 03-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

21 Gallagher 101 peaks											
Δf_{target} $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} $\text{ERT}_{\text{best}}/D$
ALPS	1	1	1.3	2.3	3.7	5.8	7.4	8.8	11	15	ALPS [17]
AMaLGaM IDEA	1	1	2.2	17	41	41	40	40	40	39	AMaLGaM IDEA [4]
avg NEWUOA	1	1	4	2.5	2.1	2	2	2	2	2	avg NEWUOA [31]
BayEDAcG	1	1	2.1	7.5	94	<i>63e-2/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1	1	2.1	3.3	3.5	3.4	3.3	3.3	3.2	3.2	BFGS [30]
Cauchy EDA	1	1	16	11	240	240	500	650	890	860	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1.7	6.8	6	6.1	6	6	6.1	6.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1.9	4.5	8.1	8	7.7	7.6	7.5	7.4	(1+1)-CMA-ES [2]
DASA	1	1	12	93	66	65	62	62	62	61	DASA [19]
DEPSO	1	1	1.2	4.1	3.5	4.6	5.3	6.6	7.1	7.5	DEPSO [12]
DIRECT	1	1	1.9	1	1.4	1.4	1.4	3.8	4.2	5.8	DIRECT [25]
EDA-PSO	1	1	1.4	3.2	54	55	58	59	62	65	EDA-PSO [6]
full NEWUOA	1	1	2.4	3.3	2.8	2.7	2.6	2.6	2.6	2.6	full NEWUOA [31]
G3-PCX	1	1	1.6	8.6	5.7	5.6	5.4	5.4	5.4	5.4	G3-PCX [26]
simple GA	1	1	1.5	2.5	5.3	18	29	43	99	230	simple GA [22]
GLOBAL	1	1	1.8	1.4	1	1	1	1	1	1	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.6	28	20	19	19	18	18	18	iAMaLGaM IDEA [4]
LSfminbnd	1	1	6.1	21	27	26	31	38	39	46	LSfminbnd [28]
LSstep	1	1	15	210	200	190	190	200	200	220	LSstep [28]
MA-LS-Chain	1	1	1.7	1.7	9.7	9.8	9.6	9.7	9.7	9.7	MA-LS-Chain [21]
MCS (Neum)	1	1	6.2	2.1	4.4	4.3	4.1	4.1	4.1	4.2	MCS (Neum) [18]
NELDER (Han)	1	1	1.6	16	26	25	24	23	23	23	NELDER (Han) [16]
NELDER (Doe)	1	1	2	2.8	2.9	2.8	2.7	2.7	2.7	2.6	NELDER (Doe) [5]
NEWUOA	1	1	1.6	2.7	3.5	3.5	3.4	3.4	3.4	3.4	NEWUOA [31]
(1+1)-ES	1	1	2	15	17	17	16	16	16	16	(1+1)-ES [1]
POEMS	1	1	95	680	550	540	510	510	510	500	POEMS [20]
PSO	1	1	1.2	120	110	110	100	100	100	100	PSO [7]
PSO_Bounds	1	1	1	120	180	170	170	170	170	170	PSO_Bounds [8]
Monte Carlo	1	1	1.5	2.9	8.3	34	120	980	4500	<i>62e-7/1e6</i>	Monte Carlo [3]
Rosenbrock	1	1	17	8.1	12	11	11	11	11	11	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1	4.6	15	17	17	17	17	17	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.1	9.2	11	11	11	11	11	11	VNS (Garcia) [11]

Table 46: 03-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

22 Gallagher 21 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	1.8	2.1	4	8.5	12	17	21	28	ALPS [17]
AMaLgAM IDEA	1	1	1.1	21	56	61	59	58	57	57	AMaLgAM IDEA [4]
avg NEWUOA	1	1	2.8	2	2.9	2.9	2.8	2.9	2.9	3.1	avg NEWUOA [31]
BayEDAcG	1	1	2	11	48	<i>36e-2/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1	1	3.3	2.6	2.1	2.1	2	2	2	2	BFGS [30]
Cauchy EDA	1	1	12	230	640	1100	2500	2500	2400	2400	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1.1	6.4	13	14	13	13	13	13	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	3.5	6.8	11	10	9.8	9.7	9.6	9.4	(1+1)-CMA-ES [2]
DASA	1	1	20	100	69	75	79	88	98	120	DASA [19]
DEPSO	1	1	4.8	4.7	13	14	14	18	26	34	DEPSO [12]
DIRECT	1	1	1.5	1	6.3	6.2	7.4	9.8	15	18	DIRECT [25]
EDA-PSO	1	1	1.2	3.9	5.4	11	16	22	29	42	EDA-PSO [6]
full NEWUOA	1	1	2.3	2	1.8	1.9	1.9	1.9	1.9	2.1	full NEWUOA [31]
G3-PCX	1	1	1.4	4.1	10	10	9.8	9.7	9.7	9.6	G3-PCX [26]
simple GA	1	1	1	3.5	6.5	27	270	950	1600	3100	simple GA [22]
GLOBAL	1	1	1.6	1.6	1	1	1	1	1	1	GLOBAL [23]
iAMaLgAM IDEA	1	1	1.6	21	43	44	43	42	43	42	iAMaLgAM IDEA [4]
LSfminbnd	1	1	14	13	19	66	62	70	77	150	LSfminbnd [28]
LSstep	1	1	64	48	160	240	320	<i>16e-2/1e4</i>	.	.	LSstep [28]
MA-LS-Chain	1	1	1.4	3.7	2.7	3.3	3.4	3.5	3.8	4.3	MA-LS-Chain [21]
MCS (Neum)	1	1	3.3	1.6	1.2	1.2	4.6	4.6	4.5	4.6	MCS (Neum) [18]
NELDER (Han)	1	1	5.5	10	13	13	12	12	12	12	NELDER (Han) [16]
NELDER (Doe)	1	1	4.1	2	2.2	2.2	2.1	2	2	2	NELDER (Doe) [5]
NEWUOA	1	1	2.8	2.5	5.8	5.8	5.6	5.5	5.5	5.7	NEWUOA [31]
(1+1)-ES	1	1	23	17	17	17	17	18	19	20	(1+1)-ES [1]
POEMS	1	1	42	170	450	450	420	420	410	410	POEMS [20]
PSO	1	1	1.1	130	130	130	120	120	120	120	PSO [7]
PSO_Bounds	1	1	1.5	2.2	64	65	67	69	76	88	PSO_Bounds [8]
Monte Carlo	1	1	1.7	3	4.8	40	200	1500	7100	<i>30e-7/1e6</i>	Monte Carlo [3]
Rosenbrock	1	1	1.7	5.6	5.2	5.3	5.1	5.1	5.1	5	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1.7	3.9	13	31	30	30	29	29	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1.4	10	12	13	13	14	14	15	VNS (Garcia) [11]

Table 47: 03-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

23 Katsuuras											
$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$
ALPS	1	1	3.7	12	54	200	370	890	6300	3e4	ALPS [17]
AMaLGaM IDEA	1	1	3.9	6.3	10	8.9	5.1	5.1	5.1	5.1	AMaLGaM IDEA [4]
avg NEWUOA	1	1	11	2.5	22	85	150	<i>46e-3/7e3</i>	.	.	avg NEWUOA [31]
BayEDAcG	1	1	3.2	34	<i>11e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	17	8.7	110	<i>23e-2/5e3</i>	.	.	.	.	BFGS [30]
Cauchy EDA	1	1	4.1	52	<i>51e-2/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	4.9	6.4	9.3	7.1	4.2	4.2	4.2	4.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	3.7	2	11	17	12	12	12	12	(1+1)-CMA-ES [2]
DASA	1	1	15	71	880	1700	1900	5400	5300	5100	DASA [19]
DEPSO	1	1	1.9	40	<i>12e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	4.7	1.5	31	25	15	16	18	22	DIRECT [25]
EDA-PSO	1	1	2.9	23	4900	3700	2e3	<i>31e-2/1e5</i>	.	.	EDA-PSO [6]
full NEWUOA	1	1	6.7	2.4	15	40	37	170	170	160	full NEWUOA [31]
G3-PCX	1	1	4.9	2.1	14	29	17	30	43	42	G3-PCX [26]
simple GA	1	1	4.3	16	520	3700	<i>88e-3/1e5</i>	.	.	.	simple GA [22]
GLOBAL	1	1	3.1	1.6	3.1	<i>81e-3/1e3</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	4.4	8.4	9.7	7.5	4.3	4.3	4.3	4.3	iAMaLGaM IDEA [4]
LSfminbnd	1	1	3.2	7.1	420	<i>31e-2/9e3</i>	.	.	.	.	LSfminbnd [28]
LSstep	1	1	5.6	4.9	490	<i>25e-2/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	4.1	2.1	6.7	5.2	2.9	3.1	3.1	3.1	MA-LS-Chain [21]
MCS (Neum)	1	1	1	2.7	12	39	330	<i>77e-4/2e4</i>	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	3.1	1.4	2.3	1.8	1	1	1	1	NELDER (Han) [16]
NELDER (Doe)	1	1	6.7	1	1	1	1.1	1.4	1.4	1.4	NELDER (Doe) [5]
NEWUOA	1	1	11	2.7	24	110	<i>68e-3/6e3</i>	.	.	.	NEWUOA [31]
(1+1)-ES	1	1	21	2.9	13	240	510	1500	1800	3500	(1+1)-ES [1]
POEMS	1	1	18	22	130	130	73	75	76	79	POEMS [20]
PSO	1	1	3.2	11	170	360	200	200	200	190	PSO [7]
PSO_Bounds	1	1	1.9	15	460	570	440	450	930	890	PSO_Bounds [8]
Monte Carlo	1	1	2.6	13	2.3e4	<i>13e-2/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	2.4	1.9	10	88	48	<i>31e-3/5e3</i>	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	4.6	7.1	13	11	5.9	5.9	5.9	5.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	4.6	6.7	27	41	23	23	24	23	VNS (Garcia) [11]

Table 48: 03-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

24 Lunacek bi-Rastrigin											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.1	7.9	3.5	6.2	2.9	2.9	3	3	3.1	ALPS [17]
AMaLGaM IDEA	1	1.2	1.5	9.7	10	4.5	4.6	4.7	4.7	5.1	AMaLGaM IDEA [4]
avg NEWUOA	1	2.6	3.7	1.2	2.4	<i>64e-2/6e3</i>	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.3	4.3	<i>40e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1.8	9.3	<i>41e-1/3e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1.1	1.7	4.2	100	<i>31e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1.3	7.6	7.9	3	4.1	4.9	4.9	4.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	9.2	3.3	<i>91e-2/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	69	85	420	<i>37e-2/1e6</i>	.	.	.	.	DASA [19]
DEPSO	1	1	5.8	<i>48e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	2.5	39	<i>30e-1/3e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1.2	6.4	<i>30e-1/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1.7	2.8	1.2	<i>76e-2/6e3</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.1	19	22	10	<i>10e-1/5e4</i>	.	.	.	.	G3-PCX [26]
simple GA	1	1.1	18	<i>32e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	3.4	1.1	<i>27e-1/2e3</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.5	5.3	5.8	9.9	8.7	8.7	8.7	8.7	8.8	iAMaLGaM IDEA [4]
LSfminbnd	1	1.1	1.9	6.4	<i>12e-1/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	3	3.1	6.5	41	<i>35e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.1	3.7	<i>30e-1/2e4</i>	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	17	2	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1	20	5.2	10	6.3	6.3	6.3	6.3	6.3	NELDER (Han) [16]
NELDER (Doe)	1	1	2.3	1.5	3.9	2.4	2.4	2.4	2.4	2.4	NELDER (Doe) [5]
NEWUOA	1	1.5	2.5	1	<i>45e-2/6e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	2.5	23	13	40	120	120	120	120	120	(1+1)-ES [1]
POEMS	1	58	16	86	42	12	12	12	12	12	POEMS [20]
PSO	1	1	4.7	400	<i>31e-1/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1.1	9.1	410	42	12	12	12	12	12	PSO_Bounds [8]
Monte Carlo	1	1.3	10	450	<i>10e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1.1	54	<i>36e-1/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1	5	<i>13e-1/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.6	2.9	1.6	110	64	64	64	65	110	VNS (Garcia) [11]

Table 49: 05-D, running time excess ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

1 Sphere											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.6	9.2	140	300	490	680	850	1e3	1400	ALPS [17]
AMaLgAM IDEA	1	1.5	5.5	16	29	44	58	72	87	120	AMaLgAM IDEA [4]
avg NEWUOA	1	3.3	1.5	1.3	1.3	1.3	1.3	1.3	1.3	1.3	avg NEWUOA [31]
BayEDAcG	1	1.2	5.2	46	92	130	170	280	390	560	BayEDAcG [10]
BFGS	1	3.4	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	BFGS [30]
Cauchy EDA	1	24	41	90	170	240	310	400	460	600	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.1	3.2	9	15	21	27	33	40	53	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.3	2.3	5.9	9.7	14	17	21	25	32	(1+1)-CMA-ES [2]
DASA	1	5.2	23	44	59	71	88	110	120	150	DASA [19]
DEPSO	1	1.3	8.1	26	48	77	110	130	170	220	DEPSO [12]
DIRECT	1	1	2	7	19	31	44	62	84	150	DIRECT [25]
EDA-PSO	1	1.1	3.2	20	320	890	1500	2100	2700	3800	EDA-PSO [6]
full NEWUOA	1	2.9	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	full NEWUOA [31]
G3-PCX	1	1.5	5.2	12	15	19	25	31	35	45	G3-PCX [26]
simple GA	1	1.5	8.7	360	1200	2100	2900	4100	5400	8300	simple GA [22]
GLOBAL	1	1.3	6.8	26	28	30	32	33	35	39	GLOBAL [23]
iAMaLgAM IDEA	1	1.4	2.5	9.8	19	28	36	47	56	73	iAMaLgAM IDEA [4]
LSfminbnd	1	2.8	6	6.3	6.7	6.7	6.8	6.8	6.8	6.8	LSfminbnd [28]
LSstep	1	140	92	120	130	130	130	130	130	130	LSstep [28]
MA-LS-Chain	1	1.3	7.8	25	47	60	74	90	120	140	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1.8	2.5	2.6	2.6	2.6	2.6	2.6	MCS (Neum) [18]
NELDER (Han)	1	1.7	1.5	3.3	5.4	7.2	9.2	11	13	17	NELDER (Han) [16]
NELDER (Doe)	1	2.3	1.5	3.4	5.6	7.4	9.5	11	13	17	NELDER (Doe) [5]
NEWUOA	1	2.4	1.1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	1.2	2.3	5	8.4	11	15	18	22	28	(1+1)-ES [1]
POEMS	1	240	110	130	380	760	1200	1600	2100	2900	POEMS [20]
PSO	1	1.3	3.7	22	55	110	180	240	320	450	PSO [7]
PSO_Bounds	1	1.2	3.8	41	210	430	730	980	1300	1900	PSO_Bounds [8]
Monte Carlo	1	1.4	7.5	1700	6.8e5	<i>10e-2/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	2.9	2.9	4.2	5.5	6.8	8.7	10	12	15	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.5	2.8	7	14	18	23	29	34	44	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.6	7.4	18	25	31	38	45	50	64	VNS (Garcia) [11]

Table 50: 05-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	45	55	73	95	120	150	170	190	210	260	ALPS [17]
AMaLGaM IDEA	5.2	5.3	7.1	10	13	15	17	19	21	24	AMaLGaM IDEA [4]
avg NEWUOA	1.2	2	6.4	21	41	56	75	92	110	150	avg NEWUOA [31]
BayEDAcG	32	38	41	46	52	58	64	79	84	95	BayEDAcG [10]
BFGS	3.3	3.4	3.8	5.6	6.2	6.5	6.6	6.8	6.9	7.1	BFGS [30]
Cauchy EDA	35	35	42	49	58	71	80	91	100	120	Cauchy EDA [24]
BIPOP-CMA-ES	11	11	13	16	18	19	20	20	21	22	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	5.6	6.6	9.4	11	12	13	14	14	14	15	(1+1)-CMA-ES [2]
DASA	10	8.6	9.7	12	13	15	17	19	21	26	DASA [19]
DEPSO	11	11	13	16	21	24	28	32	37	44	DEPSO [12]
DIRECT	4.2	4.3	5.7	7.2	8.4	10	14	16	22	380	DIRECT [25]
EDA-PSO	8.6	58	140	210	290	360	420	490	550	690	EDA-PSO [6]
full NEWUOA	1.5	2.7	6.9	19	36	50	69	87	100	130	full NEWUOA [31]
G3-PCX	15	30	69	150	220	280	340	410	470	620	G3-PCX [26]
simple GA	180	230	330	460	610	770	1300	1500	2200	2500	simple GA [22]
GLOBAL	7.1	5.4	6.3	6.9	7.3	7.5	7.8	8	8.2	8.5	GLOBAL [23]
iAMaLGaM IDEA	4.4	4.7	6.2	8.1	10	12	13	14	15	17	iAMaLGaM IDEA [4]
LSfminbnd	1.5	1.1	1	1	1	1	1	1	1	1	LSfminbnd [28]
LSstep	25	17	16	16	16	15	15	15	15	15	LSstep [28]
MA-LS-Chain	7.9	10	13	16	22	27	32	36	41	49	MA-LS-Chain [21]
MCS (Neum)	1.3	1	1.1	1.5	2.2	3.2	4.7	5.7	6.5	29	MCS (Neum) [18]
NELDER (Han)	2.4	2.7	5	6.8	7.4	7.7	7.9	8.1	8.3	8.6	NELDER (Han) [16]
NELDER (Doe)	2	2.5	4.9	8.1	8.9	9.3	9.6	9.8	10	10	NELDER (Doe) [5]
NEWUOA	1	1.8	5.7	22	45	60	85	100	130	170	NEWUOA [31]
(1+1)-ES	110	1600	5600	1.6e4	3e4	4.6e4	1.9e5	2.6e5	8e5	<i>19e-4/1e6</i>	(1+1)-ES [1]
POEMS	150	160	210	270	330	380	440	470	520	630	POEMS [20]
PSO	19	25	32	41	49	59	68	78	89	110	PSO [7]
PSO_Bounds	47	83	150	190	260	300	400	590	860	1200	PSO_Bounds [8]
Monte Carlo	1800	1.2e5	<i>11e+1/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.2	8.6	13	100	140	140	150	190	190	240	Rosenbrock [27]
IPOP-SEP-CMA-ES	5.4	5.7	7.2	8.5	9.4	10	11	11	12	13	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	15	14	18	20	24	24	25	26	26	27	VNS (Garcia) [11]

Table 51: 05-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

3 Rastrigin separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.5	2	5.7	12	22	24	26	28	29	33	ALPS [17]
AMaLGaM IDEA	1.5	2.1	4.5	65	480	500	510	520	520	520	AMaLGaM IDEA [4]
avg NEWUOA	3.3	4.8	3	130	<i>40e-1/6e3</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1.2	1.7	2.7	<i>29e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	7.4	56	110	<i>21e+0/4e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	35	25	6.7	2200	<i>26e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	3.5	1.5	1.4	16	140	140	140	140	140	140	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.2	1.3	9.1	440	<i>30e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	8.7	18	1.2	1.6	10	10	10	10	10	11	DASA [19]
DEPSO	1.4	2.9	3.7	29	30	30	30	<i>23e-1/2e3</i>	.	.	DEPSO [12]
DIRECT	1	2.6	45	300	<i>30e-1/2e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1.4	2.2	12	170	860	860	860	860	870	870	EDA-PSO [6]
full NEWUOA	4.3	3.7	4.2	160	<i>20e-1/7e3</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	2	3	84	2100	<i>30e-1/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1.1	1.6	19	18	25	34	43	53	110	200	simple GA [22]
GLOBAL	1.2	2.4	3.3	<i>50e-1/500</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.2	1.4	1.4	33	180	180	180	190	190	190	iAMaLGaM IDEA [4]
LSfminbnd	11	2.7	1	52	<i>21e-1/4e3</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	81	62	2.2	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1	1.3	1	6.4	32	32	32	32	32	32	MA-LS-Chain [21]
MCS (Neum)	1	1	1.2	24	220	210	210	210	210	210	MCS (Neum) [18]
NELDER (Han)	1	1.3	5.4	280	1500	1500	1500	1500	1500	1400	NELDER (Han) [16]
NELDER (Doe)	2.1	1	1.5	33	270	270	270	270	270	270	NELDER (Doe) [5]
NEWUOA	3	1.5	6.1	230	<i>40e-1/5e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1.8	2.3	16	310	3900	3800	3800	3800	3800	3800	(1+1)-ES [1]
POEMS	170	70	3.8	9.7	35	39	42	45	47	54	POEMS [20]
PSO	1.4	1.7	52	55	280	270	280	280	280	280	PSO [7]
PSO_Bounds	1.5	1.6	7.6	26	38	63	64	65	70	95	PSO_Bounds [8]
Monte Carlo	1	2.1	6800	<i>83e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	5.7	39	24	390	<i>70e-1/9e3</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.2	2.3	1.2	12	96	96	96	97	97	97	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.6	2.5	2.5	5.2	11	11	12	16	22	40	VNS (Garcia) [11]

Table 52: 05-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	4 Skew Rastrigin-Bueche separable										
Δf_{target} $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} $\text{ERT}_{\text{best}}/D$
ALPS	1.1	4.4	7.1	28	59	58	58	58	59	63	ALPS [17]
AMaLGaM IDEA	1.8	3.4	5.8	2e4	<i>20e-1/1e6</i>	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	5.4	10	14	<i>50e-1/8e3</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1.7	6.3	5.8	<i>69e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	3	67	170	<i>24e+0/4e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	7.6	39	85	<i>78e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1.1	2.9	2.7	<i>20e-1/4e5</i>	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.6	15	460	<i>30e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	15	13	1	1.8	5.9	5.7	5.6	5.6	5.7	5.9	DASA [19]
DEPSO	1.8	5.2	3.3	<i>30e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	2.5	190	110	250	<i>11e+0/2e4</i>	.	.	.	.	DIRECT [25]
EDA-PSO	1.1	3.5	14	2e3	<i>20e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	3.9	2.8	12	<i>30e-1/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.5	4.6	76	2200	<i>50e-1/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1.9	5	18	20	26	33	41	49	58	190	simple GA [22]
GLOBAL	1.3	4.9	8.3	<i>11e+0/600</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.7	2.3	3.9	2.1e4	<i>20e-1/1e6</i>	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	21	3	7.8	<i>42e-1/5e3</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	320	58	2	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1.5	3.8	1.7	35	180	170	160	160	160	160	MA-LS-Chain [21]
MCS (Neum)	1	2.3	4.1	<i>20e-1/1e4</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3.1	1.4	26	<i>30e-1/1e5</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1.9	1	7.1	900	870	840	810	790	780	770	NELDER (Doe) [5]
NEWUOA	4.1	27	27	300	<i>60e-1/7e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	3.3	2	25	3700	2e4	1.9e4	1.9e4	1.8e4	1.8e4	1.8e4	(1+1)-ES [1]
POEMS	210	67	4.5	17	45	47	47	49	52	57	POEMS [20]
PSO	1.7	2.7	3	140	4200	4e3	3900	3800	3700	3700	PSO [7]
PSO_Bounds	1.6	3.2	8	30	64	110	110	110	110	140	PSO_Bounds [8]
Monte Carlo	1.3	3.4	1.6e4	<i>12e+0/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	5.1	33	57	<i>99e-1/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.5	2.1	1	<i>37e-1/1e4</i>	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	2	5.6	2.5	16	39	38	39	50	54	130	VNS (Garcia) [11]

Table 53: 05-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	5 Linear slope										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.5	64	130	160	160	160	160	160	160	ALPS [17]
AMaLgAM IDEA	1	2	19	28	29	29	29	29	29	29	AMaLgAM IDEA [4]
avg NEWUOA	1	4.1	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	avg NEWUOA [31]
BayEDAcG	1	1.7	38	76	320	320	320	320	320	320	BayEDAcG [10]
BFGS	1	5.9	1.9	3	3.1	3.1	3.1	3.1	3.1	3.1	BFGS [30]
Cauchy EDA	1	29	39	41	41	41	41	41	41	41	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.5	4.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	2	2.3	3.1	3.2	3.2	3.2	3.2	3.2	3.2	(1+1)-CMA-ES [2]
DASA	1	45	28	36	40	43	49	52	55	63	DASA [19]
DEPSO	1	2	22	37	41	41	41	41	41	41	DEPSO [12]
DIRECT	1	4.5	9.2	12	13	13	13	13	13	13	DIRECT [25]
EDA-PSO	1	1	10	16	16	16	16	17	17	17	EDA-PSO [6]
full NEWUOA	1	1.5	2.2	2.4	2.4	2.4	2.4	2.4	2.4	2.4	full NEWUOA [31]
G3-PCX	1	1.8	14	25	27	28	28	28	28	28	G3-PCX [26]
simple GA	1	1.9	480	2100	4e3	6300	9200	1.2e4	1.7e4	3.4e4	simple GA [22]
GLOBAL	1	2.3	32	33	34	34	34	34	34	34	GLOBAL [23]
iAMaLgAM IDEA	1	1.4	7.1	11	12	12	12	12	12	12	iAMaLgAM IDEA [4]
LSfminbnd	1	18	13	14	14	14	14	14	14	14	LSfminbnd [28]
LSstep	1	180	140	160	160	160	160	160	160	160	LSstep [28]
MA-LS-Chain	1	1.5	53	69	70	71	71	71	71	71	MA-LS-Chain [21]
MCS (Neum)	1	3	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	3.9	2.5	4.1	4.2	4.2	4.2	4.2	4.2	4.2	NELDER (Han) [16]
NELDER (Doe)	1	3.1	1.9	2.4	2.5	2.5	2.5	2.5	2.5	2.5	NELDER (Doe) [5]
NEWUOA	1	2.9	1.3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	NEWUOA [31]
(1+1)-ES	1	3	2	2.4	2.5	2.6	2.6	2.6	2.6	2.6	(1+1)-ES [1]
POEMS	1	350	150	200	210	220	220	220	220	220	POEMS [20]
PSO	1	1.7	10	14	16	16	16	16	16	16	PSO [7]
PSO_Bounds	1	1.6	9.2	15	16	16	16	16	16	16	PSO_Bounds [8]
Monte Carlo	1	1.6	4300	<i>37e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	11	4	4.2	4.2	4.2	4.2	4.2	4.2	4.2	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	5.7	4.8	6.6	6.8	6.9	6.9	6.9	6.9	6.9	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	2.2	13	15	15	15	15	15	15	15	VNS (Garcia) [11]

Table 54: 05-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

6 Attractive sector												
Δ target	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ target	
ERT_{best}/D	2.28	3.2	22.8	42.7	56.2	80.7	116	149	208	266	ERT_{best}/D	
ALPS	31	32	20	28	40	41	39	39	34	37	ALPS [17]	
AMaLGaM IDEA	6.6	5.7	3.2	4.3	5.7	5.7	5.2	5	4.3	4.5	AMaLGaM IDEA [4]	
avg NEWUOA	1.2	2.6	1.3	1.6	2.6	2.6	2.6	2.6	2.4	2.5	avg NEWUOA [31]	
BayEDAcG	8.8	10	250	<i>13e+0/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]	
BFGS	2.9	4.9	3	3.3	3.4	3	2.5	2.3	2	7.8	BFGS [30]	
Cauchy EDA	49	230	92	69	68	58	47	43	35	34	Cauchy EDA [24]	
BIPOP-CMA-ES	2.5	5.2	2.3	2.1	2.2	1.9	1.7	1.6	1.3	1.3	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1.6	3.3	1.4	1.4	1.6	1.7	1.6	1.5	1.6	1.8	(1+1)-CMA-ES [2]	
DASA	21	21	7.8	9	50	99	110	100	81	150	DASA [19]	
DEPSO	6.3	8.3	5.5	6.4	8	8	7.1	7	6.3	9.7	DEPSO [12]	
DIRECT	2.5	2.2	2.3	28	790	1200	<i>22e-2/2e4</i>	.	.	.	DIRECT [25]	
EDA-PSO	5	4.9	11	51	81	85	79	75	65	68	EDA-PSO [6]	
full NEWUOA	1.5	3.6	1.2	1	1	1	1	1	1	1.4	full NEWUOA [31]	
G3-PCX	7.2	7.1	2.4	3	4.8	5.1	4.7	5.6	5.1	5.5	G3-PCX [26]	
simple GA	60	81	66	150	380	3700	1.2e4	9700	<i>24e-3/1e5</i>	.	simple GA [22]	
GLOBAL	12	10	2.9	2.1	2	2.9	2.2	2.7	3.6	35	GLOBAL [23]	
iAMaLGaM IDEA	3	3.6	2.1	2.3	3.1	3.1	2.7	2.6	2.2	2.3	iAMaLGaM IDEA [4]	
LSfminbnd	9.1	14	96	110	130	150	110	110	82	65	LSfminbnd [28]	
LSstep	160	200	410	290	300	420	600	490	<i>21e-2/1e4</i>	.	LSstep [28]	
MA-LS-Chain	12	11	4.8	6.8	7.9	7.4	5.8	5.1	4.1	3.7	MA-LS-Chain [21]	
MCS (Neum)	1	1	2.7	47	41	61	71	63	46	54	MCS (Neum) [18]	
NELDER (Han)	1.7	2.4	1	1.9	2.8	2.6	2.3	2.3	2	2.6	NELDER (Han) [16]	
NELDER (Doe)	2.3	11	5.1	5.6	5.6	4.9	5.3	6.6	5.6	8.5	NELDER (Doe) [5]	
NEWUOA	1.4	2.8	1.7	2.4	3.6	3.6	3.3	3.2	2.7	2.9	NEWUOA [31]	
(1+1)-ES	1.7	3.4	1.6	1.5	1.7	1.5	1.3	1.2	1	1	(1+1)-ES [1]	
POEMS	95	80	27	46	52	50	46	42	37	37	POEMS [20]	
PSO	5.2	5.3	4.7	9	11	12	11	12	10	11	PSO [7]	
PSO_Bounds	4.4	4.4	14	49	85	100	98	92	78	92	PSO_Bounds [8]	
Monte Carlo	290	480	300	5.7e4	<i>14e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	3	2.6	2.2	2.8	2.4	2.2	4.3	3.8	2.8	2.4	Rosenbrock [27]	
IPOP-SEP-CMA-ES	2.4	7	2.8	2.5	2.7	2.4	2.2	2	1.6	1.5	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	7.7	12	3.7	2.7	2.9	2.5	2	1.8	1.5	1.4	VNS (Garcia) [11]	

Table 55: 05-D, running time excess ERT/ERT_{best} on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	7 Step-ellipsoid											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1.1	2.3	33	10	5.7	7.7	9	9	9	9.7	ALPS [17]	
AMaLGaM IDEA	1.3	2.8	5.6	1	1.2	1.8	2.3	2.3	2.3	2.4	AMaLGaM IDEA [4]	
avg NEWUOA	1.1	2.5	4.4	5.9	13	130	<i>17e-3/8e3</i>	.	.	.	avg NEWUOA [31]	
BayEDAcG	1.5	2.4	20	31	120	99	<i>73e-2/2e3</i>	.	.	.	BayEDAcG [10]	
BFGS	3	14	<i>32e+0/100</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	10	31	33	4.9	2.4	2.9	2.9	2.9	2.9	3.4	Cauchy EDA [24]	
BIPOP-CMA-ES	1.7	2.2	5	1.5	1	1	1	1	1	1	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	1.6	3.5	5.3	2	2.1	3.1	3.1	3.1	3.1	(1+1)-CMA-ES [2]	
DASA	24	43	230	280	1100	2e4	<i>16e-3/8e5</i>	.	.	.	DASA [19]	
DEPSO	1.2	6.5	14	3	5	7.2	8.3	8.3	8.3	8.5	DEPSO [12]	
DIRECT	1	1	2.8	1.7	120	<i>41e-3/2e4</i>	.	.	.	.	DIRECT [25]
EDA-PSO	1.3	1.7	22	24	13	17	18	18	18	19	EDA-PSO [6]	
full NEWUOA	1.7	3.3	1	1.2	4	14	24	24	24	23	full NEWUOA [31]	
G3-PCX	1.3	2.5	19	18	45	150	410	410	410	410	G3-PCX [26]	
simple GA	1.4	3.5	50	35	57	240	520	520	520	520	simple GA [22]	
GLOBAL	1.6	2.9	12	5.7	10	<i>82e-2/400</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.2	2.3	3.8	1.9	3	2.9	3.7	3.7	3.7	3.7	iAMaLGaM IDEA [4]	
LSfminbnd	3.8	17	49	64	100	510	<i>40e-2/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	28	190	370	700	640	<i>19e-1/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1.1	3.5	8.4	3.2	13	13	24	24	24	24	MA-LS-Chain [21]	
MCS (Neum)	1	1.3	2.8	5.9	13	140	<i>25e-3/1e4</i>	.	.	.	MCS (Neum) [18]	
NELDER (Han)	1.1	1.6	27	33	56	120	310	310	310	300	NELDER (Han) [16]	
NELDER (Doe)	1.4	1.3	1.4	7.5	15	39	71	71	71	71	NELDER (Doe) [5]	
NEWUOA	1.5	2.2	9.9	13	60	<i>32e-2/6e3</i>	.	.	.	.	NEWUOA [31]
(1+1)-ES	1.9	2.6	5.6	6.8	100	370	810	810	810	790	(1+1)-ES [1]	
POEMS	400	180	74	15	9.2	11	21	21	21	22	POEMS [20]	
PSO	1.1	4	11	9.5	590	480	540	540	540	530	PSO [7]	
PSO_Bounds	1.3	2.3	9.4	13	170	140	130	130	130	130	PSO_Bounds [8]	
Monte Carlo	1.3	2.9	39	1200	<i>38e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	11	220	1200	670	<i>13e+0/3e3</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1.1	2.5	6	1.8	1.2	1.2	1.2	1.2	1.2	1.2	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	3.5	11	1.6	6.8	6.6	7.8	7.8	7.8	7.8	VNS (Garcia) [11]	

Table 56: 05-D, running time excess ERT/ERT_{best} on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	8 Rosenbrock original											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	11	32	51	49	100	150	180	210	250	340	ALPS [17]	
AMaLGaM IDEA	3.1	4.3	5.2	6.1	7.7	8.1	8.5	8.9	9.1	9.7	AMaLGaM IDEA [4]	
avg NEWUOA	1.3	1.6	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	avg NEWUOA [31]	
BayEDAcG	5.5	11	140	<i>45e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.1	2.4	2.1	1.8	1.6	1.5	1.5	1.5	1.5	1.5	BFGS [30]	
Cauchy EDA	24	32	49	31	33	33	34	36	37	40	Cauchy EDA [24]	
BIPOP-CMA-ES	2.7	3.6	3.2	3.7	4.5	4.7	4.8	5	5.1	5.4	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	2.1	2.1	2.1	5.1	5	4.9	4.9	4.9	4.9	5	(1+1)-CMA-ES [2]	
DASA	16	21	19	160	390	700	1e3	1500	2e3	3300	DASA [19]	
DEPSO	4.7	7.2	12	18	<i>23e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	2.5	2.8	4.1	5.7	22	56	100	150	190	290	DIRECT [25]	
EDA-PSO	3.7	10	72	100	200	300	400	520	620	840	EDA-PSO [6]	
full NEWUOA	2.3	2.2	1.6	1	1	1	1	1	1	1	full NEWUOA [31]	
G3-PCX	5.5	5.3	4.6	20	18	17	17	16	16	16	G3-PCX [26]	
simple GA	8.4	110	190	840	<i>78e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	11	7.4	5	2.1	2.1	2.1	2.1	2.1	2.1	2.2	GLOBAL [23]	
iAMaLGaM IDEA	2.3	2.8	3.4	7.5	7.6	7.7	7.7	8	8.1	8.4	iAMaLGaM IDEA [4]	
LSfminbnd	5.5	9.1	10	290	450	1900	<i>34e-1/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	78	64	64	95	330	910	1800	1800	<i>53e-2/1e4</i>	.	LSstep [28]	
MA-LS-Chain	5.8	7.3	8.7	7.2	9.6	10	11	11	11	12	MA-LS-Chain [21]	
MCS (Neum)	1	1.4	1.5	1	1	1	1.1	1.1	1.1	1.1	MCS (Neum) [18]	
NELDER (Han)	1.3	1.6	1.6	3.7	3.3	3.2	3.1	3.1	3.1	3.2	NELDER (Han) [16]	
NELDER (Doe)	1.1	2.3	2.1	2.4	2.4	2.3	2.3	2.3	2.4	2.4	NELDER (Doe) [5]	
NEWUOA	1	1	1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	NEWUOA [31]	
(1+1)-ES	2.7	22	15	240	230	240	260	290	320	380	(1+1)-ES [1]	
POEMS	67	40	69	180	200	390	750	2100	5500	1.8e4	POEMS [20]	
PSO	3.8	7.1	13	150	200	310	470	620	780	1100	PSO [7]	
PSO_Bounds	5.1	12	30	470	920	1200	1400	3e3	<i>12e-5/1e5</i>	.	PSO_Bounds [8]	
Monte Carlo	10	220	2e4	<i>64e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.3	53	32	23	22	23	25	27	30	36	Rosenbrock [27]	
IPOP-SEP-CMA-ES	1.7	2.8	3.5	5.8	6.8	6.7	6.8	6.8	6.9	7.1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	8.9	5.9	5.1	6.6	7.7	21	46	48	47	46	VNS (Garcia) [11]	

Table 57: 05-D, running time excess ERT/ERT_{best} on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

9 Rosenbrock rotated											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	140	1100	91	92	130	200	260	310	370	560	ALPS [17]
AMaLGaM IDEA	53	140	9.1	23	18	17	16	16	16	15	AMaLGaM IDEA [4]
avg NEWUOA	20	56	2.4	3.1	2.1	1.8	1.7	1.6	1.6	1.5	avg NEWUOA [31]
BayEDAcG	81	350	38	<i>39e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	31	84	3.6	3	2	1.8	1.6	1.5	1.5	1.4	BFGS [30]
Cauchy EDA	400	910	71	54	45	42	41	41	42	43	Cauchy EDA [24]
BIPOP-CMA-ES	28	98	5.8	8.7	7.2	6.7	6.4	6.2	6.3	6.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	30	86	4.2	7.7	5.9	5.3	5	4.9	4.9	4.7	(1+1)-CMA-ES [2]
DASA	330	7500	230	6700	4800	4600	4800	5300	6600	8900	DASA [19]
DEPSO	100	370	22	150	<i>10e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	3.2	4.2	48	56	130	140	150	310	DIRECT [25]
EDA-PSO	70	410	250	210	270	470	700	1100	1300	2800	EDA-PSO [6]
full NEWUOA	33	72	2.6	2.7	1.9	1.7	1.5	1.5	1.4	1.3	full NEWUOA [31]
G3-PCX	94	380	14	18	14	12	11	11	10	9.8	G3-PCX [26]
simple GA	100	3800	420	5.6e4	<i>17e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	210	340	11	4.6	3.2	3	2.8	2.7	2.7	2.7	GLOBAL [23]
iAMaLGaM IDEA	42	120	7	22	15	14	13	12	12	12	iAMaLGaM IDEA [4]
LSfminbnd	60	330	13	130	180	440	<i>25e-3/1e4</i>	.	.	.	LSfminbnd [28]
LSstep	2e3	1.3e4	520	5600	<i>19e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	84	260	18	20	17	17	17	16	16	16	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	13	62	3.1	13	8.2	6.9	6.2	5.9	5.8	5.4	NELDER (Han) [16]
NELDER (Doe)	21	56	2.4	3.1	2.5	2.3	2.1	2.1	2.1	2	NELDER (Doe) [5]
NEWUOA	16	28	1.8	3.6	2.5	2.1	1.9	1.9	1.9	1.7	NEWUOA [31]
(1+1)-ES	29	64	2.9	100	80	99	130	160	200	270	(1+1)-ES [1]
POEMS	1200	1700	140	130	290	590	1100	1900	1.1e4	<i>39e-6/1e5</i>	POEMS [20]
PSO	66	290	25	940	680	790	1100	1400	2400	2800	PSO [7]
PSO_Bounds	69	360	220	1500	1600	1800	4e3	1.1e4	2.2e4	2e4	PSO_Bounds [8]
Monte Carlo	180	1.3e4	4.1e4	<i>58e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	32	150	5.3	9.8	10	14	14	14	14	14	Rosenbrock [27]
IPOP-SEP-CMA-ES	43	230	9.8	11	9.9	8.8	8.3	8	8	7.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	60	250	11	18	14	12	11	11	11	10	VNS (Garcia) [11]

Table 58: 05-D, running time excess ERT/ERT_{best} on f_{10} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

10 Ellipsoid												Comparison
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	29	54	88	320	890	2e3	5300	2e4	<i>21e-5/1e6</i>	.	ALPS [17]	
AMaLgAM IDEA	2.7	2.6	1.9	1.9	2	2.3	2.5	2.7	2.3	2.6	AMaLgAM IDEA [4]	
avg NEWUOA	1.2	2.2	3.1	4.6	6.6	8.1	10	12	11	14	avg NEWUOA [31]	
BayEDAcG	400	840	<i>28e+2/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.7	1.5	1	1	1	1	1	1	1.1	23	BFGS [30]	
Cauchy EDA	16	16	11	9	9.4	11	12	13	11	13	Cauchy EDA [24]	
BIPOP-CMA-ES	5.1	5.1	3.5	2.9	2.7	2.7	2.8	2.8	2.3	2.4	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	3.2	3.8	2.5	2.2	2	2.1	2.1	2.1	1.7	1.7	(1+1)-CMA-ES [2]	
DASA	99	1100	6900	1.8e4	3.9e4	5.9e4	1.2e5	1.1e5	9e4	<i>47e-1/1e6</i>	DASA [19]	
DEPSO	18	78	210	<i>88e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	8.8	57	110	140	280	<i>15e-2/2e4</i>	.	.	.	.	DIRECT [25]
EDA-PSO	71	130	890	1400	3900	1.2e4	<i>21e-1/1e5</i>	.	.	.	EDA-PSO [6]	
full NEWUOA	1	2	3.6	6.2	8.7	10	13	15	13	17	full NEWUOA [31]	
G3-PCX	3.3	7.2	22	27	36	41	49	57	51	64	G3-PCX [26]	
simple GA	130	500	2400	<i>15e+0/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	3.8	3	1.9	1.6	1.8	1.9	2	2.2	1.7	1.7	GLOBAL [23]	
iAMaLgAM IDEA	2.2	2.2	1.8	1.6	1.7	1.9	2	2.2	1.8	2	iAMaLgAM IDEA [4]	
LSfminbnd	160	780	<i>25e+1/1e4</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1200	<i>25e+2/1e4</i>	.	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	7.1	9.9	9	9.3	8.6	8.6	8.8	8.7	6.9	6.9	MA-LS-Chain [21]	
MCS (Neum)	53	110	280	<i>17e+0/1e4</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1.1	1.2	1.4	1.3	1.4	1.4	1.5	1.5	1.2	1.2	NELDER (Han) [16]	
NELDER (Doe)	1	1	1.2	1.3	1.2	1.2	1.2	1.2	1	1	NELDER (Doe) [5]	
NEWUOA	1.5	2.6	3.1	5.5	8.1	11	14	17	16	21	NEWUOA [31]	
(1+1)-ES	34	130	700	2500	4500	5900	1.4e4	5.8e4	<i>67e-5/1e6</i>	.	(1+1)-ES [1]	
POEMS	41	170	790	2500	<i>45e-1/1e5</i>	.	.	.	.	.	POEMS [20]
PSO	15	120	1700	3300	<i>10e+0/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	290	1200	3800	1.5e4	<i>20e+0/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	990	4.7e4	<i>10e+1/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	11	25	24	44	40	38	37	36	29	37	Rosenbrock [27]	
IPOP-SEP-CMA-ES	10	12	7.4	5.6	5.1	5	5	5	4	3.9	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	6.6	6.2	4.5	3.5	3.4	3.4	3.5	3.5	2.8	2.8	VNS (Garcia) [11]	

Table 59: 05-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	11 Discus											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	15	23	54	340	300	540	810	1100	1800	2.2e4	ALPS [17]	
AMaLGaM IDEA	4.5	5.4	2.1	2.7	1	1	1	1	1	1.1	AMaLGaM IDEA [4]	
avg NEWUOA	2.6	11	5.4	7.2	2.7	2.6	2.8	2.9	3.1	3.4	avg NEWUOA [31]	
BayEDAcG	9.1	15	160	<i>15e+0/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.1	1.8	1	1	1.1	1.9	8.2	21	200	<i>32e-6/8e3</i>	BFGS [30]	
Cauchy EDA	25	51	18	17	6	5.5	5.3	5.4	5.6	5.9	Cauchy EDA [24]	
BIPOP-CMA-ES	6.4	15	8.4	7.2	2.2	1.8	1.6	1.5	1.4	1.3	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	4	7	6.5	6.6	2.1	1.8	1.5	1.4	1.3	1.2	(1+1)-CMA-ES [2]	
DASA	11	12	1900	5200	2300	2800	3200	4200	9700	4.5e4	DASA [19]	
DEPSO	11	22	140	<i>10e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	5.8	15	87	2200	<i>19e-1/2e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	8.9	30	110	650	970	2400	6200	5500	<i>70e-3/1e5</i>	.	EDA-PSO [6]	
full NEWUOA	2.7	20	11	14	5.4	4.9	5.3	5.5	5.9	6.5	full NEWUOA [31]	
G3-PCX	7.6	7.9	55	110	45	44	49	52	56	61	G3-PCX [26]	
simple GA	15	34	340	7100	9400	<i>21e-1/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	13	10	4	5.5	3.5	5.1	5	4.8	5	8.5	GLOBAL [23]	
iAMaLGaM IDEA	6.1	6.6	3.4	3.8	1.2	1.1	1	1	1	1	iAMaLGaM IDEA [4]	
LSfminbnd	2.7	320	<i>61e+0/1e4</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	3.6	750	4900	<i>73e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	7.9	8.7	15	19	6.7	5.6	4.9	4.4	4.2	3.8	MA-LS-Chain [21]	
MCS (Neum)	1	1	82	460	<i>13e-1/1e4</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	2.9	2.7	3.2	5	1.7	1.6	1.5	1.5	1.5	1.6	NELDER (Han) [16]	
NELDER (Doe)	4.4	3.4	4.5	4.7	1.5	1.4	1.2	1.2	1.1	1.2	NELDER (Doe) [5]	
NEWUOA	1.7	5.9	3.5	4.7	1.8	1.7	1.8	1.8	2	2.2	NEWUOA [31]	
(1+1)-ES	2.8	6700	6400	9300	3700	3800	6700	2.8e4	<i>90e-5/1e6</i>	.	(1+1)-ES [1]	
POEMS	88	61	230	510	270	350	630	800	940	2200	POEMS [20]	
PSO	8.2	13	91	240	120	140	160	190	240	390	PSO [7]	
PSO_Bounds	7.2	21	430	1400	1e3	1e3	1100	1600	1500	1400	PSO_Bounds [8]	
Monte Carlo	7.4	30	730	1.1e5	<i>11e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.2	12	120	88	26	21	18	16	14	13	Rosenbrock [27]	
IPOP-SEP-CMA-ES	18	33	16	14	4.2	3.4	2.9	2.6	2.5	2.2	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	11	34	11	8.7	2.5	2.1	1.8	1.6	1.6	1.5	VNS (Garcia) [11]	

Table 60: 05-D, running time excess ERT/ERT_{best} on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	12 Bent cigar											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	100	120	130	170	540	1400	4200	1.4e4	2.7e4	<i>24e-5/1e6</i>	ALPS [17]	
AMaLgAM IDEA	8.8	9.2	10	6.7	8.6	9.8	11	4.9	5.1	5.2	AMaLgAM IDEA [4]	
avg NEWUOA	1.1	1.8	3.5	2.8	2.8	2.9	3	1.3	1.3	1.4	avg NEWUOA [31]	
BayEDAcG	46	46	96	260	390	<i>71e-1/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1.1	1	1.1	1	1	1	1	1.3	2	49	BFGS [30]	
Cauchy EDA	66	75	79	41	35	37	38	17	17	17	Cauchy EDA [24]	
BIPOP-CMA-ES	5.1	6.3	11	7.4	7.4	7.5	7.7	3.4	3.3	3.3	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	2.8	3.4	4	2.9	3.5	3.9	4.1	1.9	1.9	1.9	(1+1)-CMA-ES [2]	
DASA	17	17	1.2e4	5.4e4	5.9e4	1.8e5	<i>32e-1/1e6</i>	.	.	.	DASA [19]	
DEPSO	23	33	55	47	120	<i>95e-2/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	6.6	8	8.5	8.7	19	39	110	96	380	<i>21e-6/2e4</i>	DIRECT [25]	
EDA-PSO	310	390	1100	3e3	8900	<i>21e-1/1e5</i>	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1.5	3.7	2.6	2.7	3	3.3	1.6	1.6	1.7	full NEWUOA [31]	
G3-PCX	4	4.2	14	11	13	13	12	5.3	5.2	5.1	G3-PCX [26]	
simple GA	520	620	930	2400	1.9e4	<i>11e-1/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	5.6	5	4.6	2.7	2.4	3	5	3	3.1	3.4	GLOBAL [23]	
iAMaLgAM IDEA	5.5	6.1	6.9	4.3	4	4.3	4.7	2.1	2.1	2.3	iAMaLgAM IDEA [4]	
LSfminbnd	3.4	3.6	310	1200	1900	<i>68e-1/1e4</i>	.	.	.	.	LSfminbnd [28]
LSstep	23	26	460	1200	<i>57e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	11	11	11	13	16	15	16	6.9	6.7	6.5	MA-LS-Chain [21]	
MCS (Neum)	1.2	1.1	1	18	17	15	22	22	26	56	MCS (Neum) [18]	
NELDER (Han)	1.4	1.7	2.3	2.2	2.2	2.2	2.3	1	1	1	NELDER (Han) [16]	
NELDER (Doe)	1.6	2.4	4.4	2.9	2.7	2.7	2.7	1.2	1.1	1.2	NELDER (Doe) [5]	
NEWUOA	1.1	1.5	3.5	2.6	2.5	2.5	2.6	1.1	1.1	1.1	NEWUOA [31]	
(1+1)-ES	2.6	1200	2.1e4	6.1e4	1.9e5	<i>23e-1/1e6</i>	.	.	.	.	(1+1)-ES [1]
POEMS	180	210	1900	2900	8900	<i>17e-1/1e5</i>	.	.	.	.	POEMS [20]
PSO	28	35	750	3800	5400	7900	1.5e4	<i>41e-1/1e5</i>	.	.	PSO [7]	
PSO_Bounds	120	180	1900	2500	5500	1.7e4	<i>46e-1/1e5</i>	.	.	.	PSO_Bounds [8]	
Monte Carlo	<i>19e+3/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.4	1.4	98	63	91	100	95	46	42	48	Rosenbrock [27]	
IPOP-SEP-CMA-ES	4.6	6.2	12	11	9.1	8.7	8.6	3.7	3.5	3.3	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	6.9	9	19	12	10	9.7	9.4	4	3.8	3.6	VNS (Garcia) [11]	

Table 61: 05-D, running time excess ERT/ERT_{best} on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	13 Sharp ridge											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	2.7	43	50	83	280	440	570	2300	3900	<i>76e-7/1e6</i>	ALPS [17]	
AMaLGaM IDEA	3.3	5.8	4.2	4.6	4.9	4.9	1.5	1.5	1.4	1.4	AMaLGaM IDEA [4]	
avg NEWUOA	4	1	4.5	8.1	42	67	68	450	390	<i>15e-4/9e3</i>	avg NEWUOA [31]	
BayEDAcG	1.9	38	170	350	<i>19e+0/2e3</i>	.	.	.	.	.	BayEDAcG [10]	
BFGS	4.6	1.2	1	1	1	1	4.8	24	140	<i>37e-6/1e4</i>	BFGS [30]	
Cauchy EDA	54	31	21	24	25	25	7.4	7.5	7.3	7.3	Cauchy EDA [24]	
BIPOP-CMA-ES	3.4	3.8	3.9	5.4	5.9	5.4	1.6	1.6	1.5	1.7	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	2.6	2.1	4.4	6.3	6.1	6.3	1.9	2.9	3.2	3.1	(1+1)-CMA-ES [2]	
DASA	54	51	200	640	2500	7800	5e3	1.4e4	<i>23e-4/1e6</i>	.	DASA [19]	
DEPSO	2.1	8.7	11	350	280	240	<i>21e-1/2e3</i>	.	.	.	DEPSO [12]	
DIRECT	1.6	4.7	7	21	34	140	42	57	120	<i>12e-6/2e4</i>	DIRECT [25]	
EDA-PSO	3.4	47	150	390	2e3	1e4	<i>64e-3/1e5</i>	.	.	.	EDA-PSO [6]	
full NEWUOA	5.5	1	1.8	6.7	23	85	97	<i>19e-4/1e4</i>	.	.	full NEWUOA [31]	
G3-PCX	3.3	3.9	14	60	150	340	120	260	590	<i>15e-5/5e4</i>	G3-PCX [26]	
simple GA	2.6	120	240	730	4400	2.2e4	<i>20e-2/1e5</i>	.	.	.	simple GA [22]	
GLOBAL	3.4	7.4	4.2	6.1	11	<i>19e-2/300</i>	.	.	.	.	GLOBAL [23]	
iAMaLGaM IDEA	1.9	3.1	2.6	3	3.2	3.3	1	1	1	1	iAMaLGaM IDEA [4]	
LSfminbnd	14	15	33	150	540	1100	<i>19e-2/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	250	140	550	1100	2900	<i>22e+0/1e4</i>	.	.	.	.	LSstep [28]	
MA-LS-Chain	1.8	9.9	8.3	21	24	19	5.1	4.8	5.3	4.9	MA-LS-Chain [21]	
MCS (Neum)	1	1.6	41	210	460	2300	550	<i>21e-2/1e4</i>	.	.	MCS (Neum) [18]	
NELDER (Han)	2.2	1.2	2	3.8	5.3	4.9	1.3	1.3	1.2	1.3	NELDER (Han) [16]	
NELDER (Doe)	2.9	1.7	2.4	2.4	5.3	6.1	1.9	2.5	3.9	5	NELDER (Doe) [5]	
NEWUOA	2.6	1.8	3.1	9.3	35	55	54	120	330	<i>17e-4/8e3</i>	NEWUOA [31]	
(1+1)-ES	4.3	11	20	30	110	250	160	350	1500	7200	(1+1)-ES [1]	
POEMS	310	57	87	660	5600	1e4	<i>22e-2/1e5</i>	.	.	.	POEMS [20]	
PSO	3	8.7	1600	1e4	2.8e4	<i>57e-1/1e5</i>	.	.	.	.	PSO [7]	
PSO_Bounds	1.3	20	350	2400	5700	1e4	5400	<i>81e-2/1e5</i>	.	.	PSO_Bounds [8]	
Monte Carlo	1.9	960	<i>30e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	8.6	3.1	7.6	13	26	49	39	56	63	290	Rosenbrock [27]	
IPOP-SEP-CMA-ES	3.1	2.9	9	11	12	11	2.8	2.7	2.5	2.3	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1.9	6.2	4.8	5.6	6.6	6.2	1.9	1.9	1.9	2.1	VNS (Garcia) [11]	

Table 62: 05-D, running time excess ERT/ERT_{best} on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

14 Sum of different powers											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.3	2.5	32	66	72	75	130	390	1e4	ALPS [17]
AMaLGaM IDEA	1	1.5	2.1	4.5	6.1	6.6	5.8	5	5.2	3.8	AMaLGaM IDEA [4]
avg NEWUOA	1	1.7	2.1	1	1	1	1.2	1.8	5	1e3	avg NEWUOA [31]
BayEDAcG	1	1.4	3	100	220	250	1e3	<i>12e-2/2e3</i>	.	.	BayEDAcG [10]
BFGS	1	3.4	2.2	1.7	1.8	1.5	1.3	1	1	350	BFGS [30]
Cauchy EDA	1	18	23	29	40	40	33	28	28	19	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.3	1.1	2.8	3.7	4	4.6	4.3	5.4	4.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	2.2	1.8	1.9	2.3	2.3	2.6	3.3	4	3.2	(1+1)-CMA-ES [2]
DASA	1	18	19	18	20	21	49	460	3500	<i>12e-7/1e6</i>	DASA [19]
DEPSO	1	1.5	2.6	6.9	8.9	11	17	45	<i>47e-6/2e3</i>	.	DEPSO [12]
DIRECT	1	1	1	3.7	4.8	7.4	23	370	1900	<i>62e-6/2e4</i>	DIRECT [25]
EDA-PSO	1	1.5	1.4	7.1	96	190	210	190	300	<i>22e-7/1e5</i>	EDA-PSO [6]
full NEWUOA	1	2.8	2.7	1.1	1.1	1	1	1.4	3.2	26	full NEWUOA [31]
G3-PCX	1	1.1	1.7	3.5	3.5	3.6	5	9.7	26	390	G3-PCX [26]
simple GA	1	1.8	2.1	91	270	310	350	3300	<i>13e-5/1e5</i>	.	simple GA [22]
GLOBAL	1.1	1.7	2.2	7.7	5.9	4.4	3.3	2.6	3.6	<i>59e-7/300</i>	GLOBAL [23]
iAMaLGaM IDEA	1	1.3	1.4	2.7	4.3	4.5	4.1	3.5	3.6	2.7	iAMaLGaM IDEA [4]
LSfminbnd	1	3.7	5.9	4.5	4.3	7.4	70	1700	<i>35e-5/1e4</i>	.	LSfminbnd [28]
LSstep	1	28	120	96	97	180	<i>35e-4/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1	1.3	2	7.2	11	11	11	13	16	12	MA-LS-Chain [21]
MCS (Neum)	1	1	1.4	2.8	2.7	2.5	2.8	3.4	230	<i>10e-6/1e4</i>	MCS (Neum) [18]
NELDER (Han)	1	1.3	1.1	1.2	1.5	1.5	1.4	1.2	1.3	1	NELDER (Han) [16]
NELDER (Doe)	1	2.3	1.1	1.1	1.4	1.6	1.7	1.6	1.6	1.3	NELDER (Doe) [5]
NEWUOA	1	1.8	1.7	1	1	1	1.2	1.9	5.5	2500	NEWUOA [31]
(1+1)-ES	1	3	2.1	1.8	2.1	2.2	5.6	66	1100	<i>12e-7/1e6</i>	(1+1)-ES [1]
POEMS	1	180	110	42	81	130	140	130	630	<i>31e-7/1e5</i>	POEMS [20]
PSO	1	1.4	1.9	5.6	15	21	30	50	220	<i>90e-8/1e5</i>	PSO [7]
PSO_Bounds	1	1.7	1.9	12	45	74	140	200	410	<i>14e-7/1e5</i>	PSO_Bounds [8]
Monte Carlo	1	1.1	1.2	100	7.6e4	<i>93e-3/1e6</i>	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	7.9	2.4	1.2	1.3	1.5	4.6	23	26	43	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.5	1.6	3	3.6	3.6	5.3	9	9.5	6.4	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.2	3.3	5.5	5.4	5.3	5.3	5.4	7	5.5	VNS (Garcia) [11]

Table 63: 05-D, running time excess ERT/ERT_{best} on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

15 Rastrigin												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1.1	1.9	9.2	9	26	26	26	25	25	25	ALPS [17]	
AMaLGaM IDEA	1.3	2.7	1.7	2.6	5.3	5.2	5.2	5.1	5.1	5	AMaLGaM IDEA [4]	
avg NEWUOA	1.3	2	5.8	46	<i>30e-1/6e3</i>	.	.	.	.	.	avg NEWUOA [31]	
BayEDAcG	1.2	2.7	4.8	<i>61e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]	
BFGS	2.2	46	87	<i>13e+0/3e3</i>	.	.	.	.	.	.	BFGS [30]	
Cauchy EDA	8.7	36	12	190	<i>24e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]	
BIPOP-CMA-ES	1	2.3	1.6	1.5	1.2	1.2	1.2	1.2	1.2	1.2	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1.4	2	10	80	<i>30e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]	
DASA	15	26	230	1700	<i>20e-1/1e6</i>	.	.	.	.	.	DASA [19]	
DEPSO	1	5.7	7.9	<i>41e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]	
DIRECT	1	1.2	5.4	9.4	<i>99e-2/2e4</i>	.	.	.	.	.	DIRECT [25]	
EDA-PSO	1.1	2	20	7.5	24	23	23	24	24	24	EDA-PSO [6]	
full NEWUOA	1.9	2.9	6.3	55	<i>50e-1/7e3</i>	.	.	.	.	.	full NEWUOA [31]	
G3-PCX	1.3	2.2	130	370	<i>50e-1/5e4</i>	.	.	.	.	.	G3-PCX [26]	
simple GA	1.1	1.9	35	91	370	360	360	350	350	<i>15e-1/1e5</i>	simple GA [22]	
GLOBAL	1	2	6	<i>90e-1/500</i>	.	.	.	.	.	.	GLOBAL [23]	
iAMaLGaM IDEA	1.1	1.8	1	7	9.2	9.1	9	8.9	8.8	8.6	iAMaLGaM IDEA [4]	
LSfminbnd	1	4	35	<i>60e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]	
LSstep	1.1	80	1400	80	<i>24e+0/1e4</i>	.	.	.	.	.	LSstep [28]	
MA-LS-Chain	1.1	2.3	2.6	5.3	6	5.9	5.8	5.7	5.6	5.5	MA-LS-Chain [21]	
MCS (Neum)	1	1	4	25	38	38	37	36	36	<i>20e-1/1e4</i>	MCS (Neum) [18]	
NELDER (Han)	1.7	2.5	20	43	83	81	80	79	77	75	NELDER (Han) [16]	
NELDER (Doe)	1.3	5	4.5	20	73	72	71	70	69	67	NELDER (Doe) [5]	
NEWUOA	1.9	7.8	5.8	41	<i>30e-1/5e3</i>	.	.	.	.	.	NEWUOA [31]	
(1+1)-ES	1.3	1.7	28	100	250	240	240	230	230	220	(1+1)-ES [1]	
POEMS	1	80	15	130	370	370	360	360	350	340	POEMS [20]	
PSO	1.1	1.5	16	220	370	360	350	350	340	330	PSO [7]	
PSO_Bounds	1.3	2.3	170	120	<i>20e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]	
Monte Carlo	1.2	1.7	6900	<i>83e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	4.4	190	310	<i>16e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	1.5	1.7	1.6	1	1	1	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	3.1	2.4	5.9	680	690	680	690	680	670	VNS (Garcia) [11]	

Table 64: 05-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass												
Δf_{target} $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} $\text{ERT}_{\text{best}}/D$	
ALPS	1	1.7	2.5	8.6	6.3	6.7	13	60	160	830	ALPS [17]	
AMaLGaM IDEA	1	1.4	3	15	12	5	4.9	5.6	5.5	5.4	AMaLGaM IDEA [4]	
avg NEWUOA	1	1.2	2.6	12	47	<i>35e-2/8e3</i>	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.2	5.7	<i>35e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	4.2	150	960	<i>49e-1/8e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	3.4	5.6	1200	<i>15e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.1	3	3.6	2.6	1.1	1.3	1.3	1.4	1.4	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	1	2.5	10	17	21	31	62	60	<i>70e-3/1e4</i>	(1+1)-CMA-ES [2]	
DASA	1	6.6	4.8	310	980	1200	<i>24e-3/1e6</i>	.	.	.	DASA [19]	
DEPSO	1	1.2	11	<i>42e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	2	1.2	1.6	3.4	2.1	5.9	10	19	40	DIRECT [25]	
EDA-PSO	1	1.4	4.6	210	82	38	53	49	61	61	EDA-PSO [6]	
full NEWUOA	1	2.3	2.7	12	29	32	<i>12e-2/1e4</i>	.	.	.	full NEWUOA [31]	
G3-PCX	1	1.2	1	22	44	32	350	320	<i>60e-4/5e4</i>	.	G3-PCX [26]	
simple GA	1	1.3	2.1	84	93	71	150	630	620	600	simple GA [22]	
GLOBAL	1	1.3	1.4	1	1	1.3	3.5	7	6.8	6.6	GLOBAL [23]	
iAMaLGaM IDEA	1	1.4	1.9	8.6	5.5	4.4	5.9	6.5	6.4	6.8	iAMaLGaM IDEA [4]	
LSfminbnd	1	1.3	3.2	28	130	71	<i>37e-2/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	1	1.1	14	280	<i>13e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.1	2.7	8.2	18	11	26	51	50	75	MA-LS-Chain [21]	
MCS (Neum)	1	1.8	1.9	18	130	<i>30e-2/1e4</i>	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1.5	4.4	28	23	25	95	200	300	600	NELDER (Han) [16]	
NELDER (Doe)	1	1.3	1.6	4.8	9.8	6.3	13	27	59	120	NELDER (Doe) [5]	
NEWUOA	1	1.2	2.1	29	<i>50e-2/7e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.1	37	88	340	590	2200	6200	<i>73e-4/1e6</i>	.	(1+1)-ES [1]	
POEMS	1	130	12	74	76	58	57	53	52	54	POEMS [20]	
PSO	1	1.2	2.4	6.2	59	55	89	310	300	580	PSO [7]	
PSO_Bounds	1	1.2	2.4	36	140	140	320	620	<i>16e-3/1e5</i>	.	PSO_Bounds [8]	
Monte Carlo	1	1.1	3.5	510	<i>30e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1.8	40	1200	<i>36e-1/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.1	2.1	5	3.5	1	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	1.2	2.8	12	12	9.1	12	16	34	45	VNS (Garcia) [11]	

Table 65: 05-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

17 Schaffer F7, condition 10												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1	1.1	2.4	12	8	4.8	7.1	10	21	68	ALPS [17]	
AMaLGaM IDEA	1	1.1	3.9	1.5	2.7	2.6	2.7	3.5	3.4	3.5	AMaLGaM IDEA [4]	
avg NEWUOA	1	1.2	3.1	42	410	<i>24e-2/1e4</i>	.	.	.	.	avg NEWUOA [31]	
BayEDAcG	1	1.3	2.2	6.7	5.4	4.1	7.5	15	<i>47e-4/2e3</i>	.	BayEDAcG [10]	
BFGS	1	3.4	120	650	<i>19e-1/4e3</i>	.	.	.	.	.	BFGS [30]	
Cauchy EDA	1	1	44	13	7	3.8	4.3	4.3	5.3	13	Cauchy EDA [24]	
BIPOP-CMA-ES	1	2.3	3.4	1	1	1	1	1	1	1.2	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	1.1	4.5	27	110	<i>17e-2/1e4</i>	.	.	.	.	(1+1)-CMA-ES [2]	
DASA	1	25	170	380	730	1800	1.9e4	<i>82e-4/1e6</i>	.	.	DASA [19]	
DEPSO	1	1	7.6	3.5	2.8	3.1	4.5	5.6	12	<i>31e-4/2e3</i>	DEPSO [12]	
DIRECT	1	1	1	1.4	1.7	2.7	4.4	6.7	9.5	10	DIRECT [25]	
EDA-PSO	1	1.1	2.4	27	28	16	18	18	17	19	EDA-PSO [6]	
full NEWUOA	1	1.1	4.9	25	76	250	<i>13e-2/1e4</i>	.	.	.	full NEWUOA [31]	
G3-PCX	1	1.1	2.2	130	290	<i>60e-3/5e4</i>	.	.	.	.	G3-PCX [26]	
simple GA	1	1.3	5.4	46	36	52	190	320	550	<i>13e-4/1e5</i>	simple GA [22]	
GLOBAL	1	1.3	3.5	5	<i>47e-2/600</i>	.	.	.	.	.	GLOBAL [23]	
iAMaLGaM IDEA	1	1	2.7	1.1	3.8	2.9	4.6	5	6.3	6.8	iAMaLGaM IDEA [4]	
LSfminbnd	1	1.3	240	64	180	260	<i>16e-2/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	1	1.1	150	680	<i>26e-1/1e4</i>	.	.	.	.	.	LSstep [28]	
MA-LS-Chain	1	1.2	3.8	2.8	3.1	4.1	9.3	7.5	7.3	11	MA-LS-Chain [21]	
MCS (Neum)	1	1	1.9	24	63	<i>87e-3/1e4</i>	.	.	.	.	MCS (Neum) [18]	
NELDER (Han)	1	2	55	170	290	2500	<i>54e-3/1e5</i>	.	.	.	NELDER (Han) [16]	
NELDER (Doe)	1	1.1	1.9	10	48	<i>36e-3/2e4</i>	.	.	.	.	NELDER (Doe) [5]	
NEWUOA	1	1.2	2.3	40	620	<i>32e-2/7e3</i>	.	.	.	.	NEWUOA [31]	
(1+1)-ES	1	2	1200	7900	3.8e4	<i>48e-2/1e6</i>	.	.	.	.	(1+1)-ES [1]	
POEMS	1	140	170	15	14	21	19	17	29	41	POEMS [20]	
PSO	1	1.1	3.3	170	140	160	550	420	510	420	PSO [7]	
PSO_Bounds	1	1.1	3.4	7.9	52	35	51	49	61	120	PSO_Bounds [8]	
Monte Carlo	1	1.3	4	840	<i>48e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	1	1	2700	<i>57e-1/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	1	1.1	3.8	3.4	1.3	1	1	1.1	1.1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	1	6.6	1.6	4.8	4.8	7.9	9.8	18	82	VNS (Garcia) [11]	

Table 66: 05-D, running time excess ERT/ERT_{best} on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1	1.5	8.1	14	3.3	14	49	240	420	<i>53e-7/1e6</i>	ALPS [17]	
AMaLGaM IDEA	1.1	2.1	1.6	1.7	2	1.5	2.4	3.1	3.4	3.1	AMaLGaM IDEA [4]	
avg NEWUOA	1	5.4	10	270	<i>57e-2/3e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	2.6	4.4	9.6	11	8.7	<i>14e-2/2e3</i>	.	.	.	BayEDAcG [10]	
BFGS	1.8	100	57	<i>51e-1/4e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	2.5	83	13	12	2.4	2.1	2.7	2.8	3.7	8.6	Cauchy EDA [24]	
BIPOP-CMA-ES	1	2.8	1	3.4	1	1	1	1.1	1.2	1.3	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	2.9	4.9	57	84	<i>37e-2/1e4</i>	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1.9	47	270	930	1600	<i>64e-3/1e6</i>	.	.	.	.	DASA [19]
DEPSO	1.1	2.4	2.6	5.5	2.2	4.1	<i>57e-3/2e3</i>	.	.	.	DEPSO [12]	
DIRECT	1	1	1.4	2.9	1.9	6.2	6.5	8.1	<i>44e-6/2e4</i>	.	DIRECT [25]	
EDA-PSO	1	1.3	3.6	41	8.8	6.4	17	34	41	58	EDA-PSO [6]	
full NEWUOA	1	8.6	10	84	90	88	<i>78e-2/1e4</i>	.	.	.	full NEWUOA [31]	
G3-PCX	1	1.7	130	800	<i>12e-1/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1.1	2.3	22	59	34	130	<i>15e-3/1e5</i>	.	.	.	simple GA [22]	
GLOBAL	1.1	2.4	3.9	15	14	<i>12e-1/500</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.2	2	1.1	1	1.4	1.6	1.9	2.3	3.1	4.8	iAMaLGaM IDEA [4]	
LSfminbnd	1	3.2	64	71	<i>31e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1.1	160	150	400	86	<i>60e-1/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.8	2.5	4.9	1.3	23	88	84	160	140	MA-LS-Chain [21]	
MCS (Neum)	1	1.5	19	150	<i>75e-2/1e4</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1.1	2.9	45	230	320	<i>17e-2/1e5</i>	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	2.2	4.3	28	43	<i>15e-2/2e4</i>	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1.2	5.7	31	1400	<i>11e-1/2e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.9	3100	3.1e4	<i>22e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	41	560	18	24	14	71	150	200	300	570	POEMS [20]	
PSO	1	2.6	2.2	6.6	110	250	<i>53e-3/1e5</i>	.	.	.	PSO [7]	
PSO_Bounds	1.1	2.5	3.8	21	69	72	120	330	<i>10e-3/1e5</i>	.	PSO_Bounds [8]	
Monte Carlo	1	1.2	18	9.4e4	<i>15e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.1	2600	3400	<i>16e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	3	1.3	5	1.6	1	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	1.5	2.2	4.9	3.6	8.6	26	46	300	1200	VNS (Garcia) [11]	

Table 67: 05-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

19 Griewank-Rosenbrock F8F2											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.1	58	5100	500	15	39	40	40	40	ALPS [17]
AMaLGaM IDEA	1	1.3	38	1100	360	4.5	4.2	4.2	4.2	4.2	AMaLGaM IDEA [4]
avg NEWUOA	1	1	24	1.6e4	1e3	<i>55e-3/1e5</i>	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.1	37	2100	<i>45e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	2.2	1700	2.2e4	1800	<i>62e-2/6e3</i>	.	.	.	.	BFGS [30]
Cauchy EDA	1	9.4	300	2.1e4	<i>48e-2/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	20	2800	160	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	20	4100	970	<i>19e-2/1e4</i>	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	4.8	290	6.7e4	4.7e4	<i>13e-2/1e6</i>	.	.	.	.	DASA [19]
DEPSO	1	1	93	3100	<i>71e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1	1	1.1	4.2	3.7	<i>16e-3/2e4</i>	.	.	DIRECT [25]
EDA-PSO	1	1.2	37	6700	1600	71	<i>66e-3/1e5</i>	.	.	.	EDA-PSO [6]
full NEWUOA	1	2.7	31	1.1e4	860	6.9	<i>19e-2/1e4</i>	.	.	.	full NEWUOA [31]
G3-PCX	1	1.1	39	9.5e4	1.4e4	<i>50e-2/5e4</i>	.	.	.	.	G3-PCX [26]
simple GA	1	1.1	35	1.2e4	700	68	60	<i>59e-3/1e5</i>	.	.	simple GA [22]
GLOBAL	1	1.3	46	7300	<i>10e-1/900</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.1	28	1100	370	10	12	12	12	12	iAMaLGaM IDEA [4]
LSfminbnd	1	5.9	54	3e3	<i>38e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1	29	910	9500	1500	<i>23e-2/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.2	32	1300	250	8.4	<i>47e-3/2e4</i>	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	<i>16e-3/1e4</i>	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1.3	12	2900	590	<i>59e-3/1e5</i>	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1.2	12	340	110	14	<i>47e-3/2e4</i>	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1.9	14	2.7e4	1400	<i>79e-3/1e5</i>	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.3	100	4.1e5	2.9e5	<i>49e-2/1e6</i>	.	.	.	.	(1+1)-ES [1]
POEMS	1	200	1e3	7200	1.4e4	<i>18e-2/1e5</i>	.	.	.	.	POEMS [20]
PSO	1	1.1	35	3400	2400	67	60	60	61	61	PSO [7]
PSO_Bounds	1	1.4	27	1.6e4	2500	70	<i>80e-3/1e5</i>	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1.3	38	1.4e5	<i>36e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	3.2	1.3e4	7.1e5	<i>38e-1/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.1	22	1900	160	2.2	3	3	3	3	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	55	7600	1300	20	75	81	130	260	VNS (Garcia) [11]

Table 68: 05-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

20 Schwefel $x*\sin(x)$											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	5.3	15	18	7	1.3	1	1	1.1	1.1	1.3	ALPS [17]
AMaLGaM IDEA	3.2	3.8	3.9	29	24	18	17	17	17	17	AMaLGaM IDEA [4]
avg NEWUOA	1.2	1.1	1	8.4	12	8.6	8.2	8.1	8.1	8	avg NEWUOA [31]
BayEDAcG	2.5	4	8	<i>20e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.1	1.5	1.8	2.5	10	7.6	7.2	7.2	7.1	7.1	BFGS [30]
Cauchy EDA	44	49	48	460	<i>11e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	2.2	2.9	3.3	8.2	2.8	2.2	2.1	2.2	2.2	2.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.5	2.1	2.4	6.4	5.9	4.4	4.1	4.1	4.1	4.1	(1+1)-CMA-ES [2]
DASA	24	29	32	13	47	35	33	33	33	33	DASA [19]
DEPSO	3.6	7.7	8.6	3.2	<i>24e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	4.5	4.1	3.8	1.5	<i>47e-2/2e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	3.3	4.9	5.7	13	2.5	2	2	2.1	2.3	2.5	EDA-PSO [6]
full NEWUOA	1.6	1.5	1.4	6.4	<i>47e-2/6e3</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	3.2	7.7	7.4	36	88	66	62	62	61	61	G3-PCX [26]
simple GA	5.5	22	47	21	1	1	1.3	2.2	2.6	5	simple GA [22]
GLOBAL	4.8	12	17	18	<i>13e-1/500</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	2.1	3	3.2	30	25	19	18	18	18	18	iAMaLGaM IDEA [4]
LSfminbnd	5.8	7	8.2	18	<i>65e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	110	190	230	41	18	14	13	13	13	13	LSstep [28]
MA-LS-Chain	2.9	5.6	5.8	4.1	1.4	1.1	1	1	1	1	MA-LS-Chain [21]
MCS (Neum)	2.5	2.8	2.7	1	9.1	6.8	6.4	6.4	6.4	6.3	MCS (Neum) [18]
NELDER (Han)	1.1	1.5	1.5	25	<i>24e-2/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1.8	2.1	2.2	8.5	37	28	26	26	26	26	NELDER (Doe) [5]
NEWUOA	1	1	1	3.3	<i>43e-2/6e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	3.4	3.9	4	16	43	32	30	30	30	30	(1+1)-ES [1]
POEMS	83	80	78	8.5	14	10	9.9	9.9	10	10	POEMS [20]
PSO	2.5	6	8.7	3.1	27	20	19	19	19	18	PSO [7]
PSO_Bounds	3.1	7	8.1	8.6	21	16	15	15	15	16	PSO_Bounds [8]
Monte Carlo	6.7	20	29	9200	<i>99e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.6	2.8	2.9	4.6	<i>47e-2/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.1	3	3.3	6.6	2.3	1.7	1.7	1.7	1.7	1.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	3.7	11	10	7.8	4.3	3.9	4.3	4.5	4.6	5.7	VNS (Garcia) [11]

Table 69: 05-D, running time excess ERT/ERT_{best} on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

21 Gallagher 101 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	3.4	2.2	2.9	3.9	4.7	5.6	6.4	8.1	ALPS [17]
AMaLGaM IDEA	1	1	3	37	34	35	36	38	38	38	AMaLGaM IDEA [4]
avg NEWUOA	1	1	1.7	2.5	3.6	3.5	3.5	3.5	3.5	3.5	avg NEWUOA [31]
BayEDAcG	1	1	4.1	8.6	40	85	84	84	83	82	BayEDAcG [10]
BFGS	1	1	3.8	1.4	1.9	1.9	1.9	1.9	1.9	2	BFGS [30]
Cauchy EDA	1	1	20	27	190	430	420	420	420	410	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	2.3	14	24	25	25	25	25	25	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	4.2	4.6	6.6	6.6	6.5	6.5	6.5	6.4	(1+1)-CMA-ES [2]
DASA	1	1	10	210	320	320	320	310	310	310	DASA [19]
DEPSO	1	1	4.2	5.5	4.2	4.7	5	5.3	6.2	6.7	DEPSO [12]
DIRECT	1	1	1	1	1.1	1.8	2.1	2.9	19	19	DIRECT [25]
EDA-PSO	1	1	4	160	110	110	120	120	120	120	EDA-PSO [6]
full NEWUOA	1	1	2.4	2.3	2.8	2.8	2.8	2.7	2.7	2.7	full NEWUOA [31]
G3-PCX	1	1	2.1	4.7	6.8	6.7	6.7	6.7	6.7	6.6	G3-PCX [26]
simple GA	1	1	4.6	5.5	61	68	70	77	140	290	simple GA [22]
GLOBAL	1	1	2.3	1.1	1	1	1	1	1	1	GLOBAL [23]
iAMaLGaM IDEA	1	1	2.2	27	22	22	22	22	22	22	iAMaLGaM IDEA [4]
LSfminbnd	1	1	30	38	39	45	44	44	44	44	LSfminbnd [28]
LSstep	1	1	560	120	120	120	130	130	130	130	LSstep [28]
MA-LS-Chain	1	1	3.6	22	16	16	16	16	16	16	MA-LS-Chain [21]
MCS (Neum)	1	1	1	3.9	5.1	5.1	5	5	5	5	MCS (Neum) [18]
NELDER (Han)	1	1	12	8.4	10	10	10	10	9.9	9.8	NELDER (Han) [16]
NELDER (Doe)	1	1	2.9	1.5	1.2	1.2	1.2	1.2	1.2	1.2	NELDER (Doe) [5]
NEWUOA	1	1	1.1	2.2	1.8	1.8	1.8	1.8	1.8	1.9	NEWUOA [31]
(1+1)-ES	1	1	45	19	18	18	18	18	18	18	(1+1)-ES [1]
POEMS	1	1	34	330	290	290	290	290	290	290	POEMS [20]
PSO	1	1	2	380	260	260	260	260	260	250	PSO [7]
PSO_Bounds	1	1	3.5	380	340	340	340	340	340	340	PSO_Bounds [8]
Monte Carlo	1	1	3.2	8.5	270	1.4e4	<i>14e-3/1e6</i>	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	9.7	7.9	15	15	15	15	15	15	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	3.6	14	9.9	10	10	10	10	10	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.4	7.5	6.5	6.6	6.9	7.8	8.3	9.1	VNS (Garcia) [11]

Table 70: 05-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

22 Gallagher 21 peaks												
Δ target	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ target	
ERT_{best}/D	0.2	0.2	14.2	77.3	188	196	202	205	208	214	ERT_{best}/D	
ALPS	1	1	6.6	9.3	8.8	13	17	21	24	34	ALPS [17]	
AMaLGaM IDEA	1	1	3	19	59	69	69	69	68	67	AMaLGaM IDEA [4]	
avg NEWUOA	1	1	3.4	2.6	2.3	2.3	2.3	2.3	2.4	2.4	avg NEWUOA [31]	
BayEDAcG	1	1	13	75	<i>22e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]	
BFGS	1	1	3.1	2.9	2.1	2.1	2	2	2	2.6	BFGS [30]	
Cauchy EDA	1	1	11	280	780	1700	3500	3400	3400	3300	Cauchy EDA [24]	
BIPOP-CMA-ES	1	1	6.9	20	45	43	42	42	41	40	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	1	2.8	7.1	4.7	4.6	4.5	4.5	4.4	4.4	(1+1)-CMA-ES [2]	
DASA	1	1	96	270	130	130	130	140	140	150	DASA [19]	
DEPSO	1	1	6.5	6.3	7.5	10	11	14	16	32	DEPSO [12]	
DIRECT	1	1	1	1	12	19	22	62	130	400	DIRECT [25]	
EDA-PSO	1	1	6.7	12	89	90	92	95	98	100	EDA-PSO [6]	
full NEWUOA	1	1	4.3	3.7	3	2.9	2.9	3	3	3.1	full NEWUOA [31]	
G3-PCX	1	1	12	15	13	12	12	12	12	12	G3-PCX [26]	
simple GA	1	1	6	18	390	650	1500	6900	6800	<i>24e-3/1e5</i>	simple GA [22]	
GLOBAL	1	1	3.6	1.3	1	1	1	1	1	1	GLOBAL [23]	
iAMaLGaM IDEA	1	1	1.8	22	40	41	41	41	41	40	iAMaLGaM IDEA [4]	
LSfminbnd	1	1	13	47	29	60	62	120	120	220	LSfminbnd [28]	
LSstep	1	1	190	180	380	<i>11e-1/1e4</i>	.	.	.	.	LSstep [28]	
MA-LS-Chain	1	1	3.3	15	22	22	22	22	22	22	MA-LS-Chain [21]	
MCS (Neum)	1	1	1	1.1	12	11	11	11	11	15	MCS (Neum) [18]	
NELDER (Han)	1	1	19	13	13	13	13	12	12	12	NELDER (Han) [16]	
NELDER (Doe)	1	1	2.5	2.5	2.1	2	2	2	2	2.1	NELDER (Doe) [5]	
NEWUOA	1	1	2.1	2.1	2	2	2.1	2.2	2.3	2.4	NEWUOA [31]	
(1+1)-ES	1	1	21	37	30	29	29	29	29	30	(1+1)-ES [1]	
POEMS	1	1	470	1100	1300	1200	1200	1200	1200	1200	POEMS [20]	
PSO	1	1	2.6	330	470	450	440	430	430	420	PSO [7]	
PSO_Bounds	1	1	510	870	820	820	810	820	820	820	PSO_Bounds [8]	
Monte Carlo	1	1	7.6	73	390	7500	7.1e4	7e4	<i>93e-4/1e6</i>	.	Monte Carlo [3]	
Rosenbrock	1	1	19	13	10	10	10	10	10	11	Rosenbrock [27]	
IPOP-SEP-CMA-ES	1	1	7.5	23	60	58	57	57	56	55	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	1	5.8	16	18	18	18	18	19	20	VNS (Garcia) [11]	

Table 71: 05-D, running time excess ERT/ERT_{best} on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

23 Katsuuras											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	2.2	21	29	100	3100	<i>54e-4/1e6</i>	.	.	ALPS [17]
AMaLGaM IDEA	1	1	1.7	7	1.8	1	1	1	1	1	AMaLGaM IDEA [4]
avg NEWUOA	1	1	6	2.5	14	<i>15e-2/9e3</i>	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1	1.8	62	<i>12e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	11	31	<i>69e-2/5e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	1	2.2	230	<i>68e-2/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	1.7	13	3.7	2.1	1.8	1.8	1.8	1.8	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	4.2	3.3	7.5	26	<i>11e-2/1e4</i>	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	9	20	360	<i>88e-3/1e6</i>	.	.	.	.	DASA [19]
DEPSO	1	1	2	66	<i>15e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1.5	3.5	5.7	3.7	6	<i>93e-4/2e4</i>	.	.	DIRECT [25]
EDA-PSO	1	1	2.4	28	<i>59e-2/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	5.4	2	3.8	<i>87e-3/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1	2.6	2.4	8.6	60	<i>44e-3/5e4</i>	.	.	.	G3-PCX [26]
simple GA	1	1	1.5	59	<i>49e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	1.6	1	4.8	<i>23e-2/1e3</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	2.6	7.8	2.1	1.3	1.2	1.2	1.1	1.1	iAMaLGaM IDEA [4]
LSfminbnd	1	1	1.8	11	<i>45e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1	1	1.4	6.6	51	<i>31e-2/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	2.6	2.5	1.7	4	3.6	3.5	3.4	3.3	MA-LS-Chain [21]
MCS (Neum)	1	1	3.4	2.4	51	<i>16e-2/1e4</i>	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	2.9	3.5	2.7	3.2	4	4.6	4.6	5.6	NELDER (Han) [16]
NELDER (Doe)	1	1	1.5	1	1	3.6	15	46	<i>38e-4/2e4</i>	.	NELDER (Doe) [5]
NEWUOA	1	1	6.2	2.4	7.1	<i>20e-2/7e3</i>	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1	3.1	4.8	52	590	<i>14e-3/1e6</i>	.	.	.	(1+1)-ES [1]
POEMS	1	1	13	23	26	22	25	33	33	32	POEMS [20]
PSO	1	1	2.2	20	240	<i>15e-2/1e5</i>	.	.	.	.	PSO [7]
PSO_Bounds	1	1	2.1	58	240	<i>30e-2/1e5</i>	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1	2.3	49	<i>38e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	1.6	1.8	4.6	13	<i>17e-2/5e3</i>	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	3.1	9.7	3.7	1.9	1.7	1.7	1.7	1.6	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1	9.6	15	26	23	26	25	24	VNS (Garcia) [11]

Table 72: 05-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

24 Lunacek bi-Rastrigin												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1	5	8.1	9.6	<i>75e-2/1e6</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	5.3	3.3	2.4	2.1	3.8	3.7	3.7	5.6	5.6	AMaLGaM IDEA [4]	
avg NEWUOA	1	14	2	2.2	<i>30e-1/7e3</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	5.4	15	<i>11e+0/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	160	69	<i>17e+0/3e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1.1	75	30	<i>81e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	7.8	2.1	1.6	1	1	1	1	1	1	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	76	6.7	1.7	<i>39e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	79	250	<i>32e-1/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	5	29	<i>14e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	7.5	1.9	<i>72e-1/2e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	3.6	9.7	<i>61e-1/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	21	2.5	1.1	<i>31e-1/7e3</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	4.9	44	<i>61e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1	7.3	21	<i>54e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	1	6.3	4.2	<i>91e-1/1e3</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	6.3	3.1	2.2	2.2	7.5	7.5	7.5	5.6	5.6	iAMaLGaM IDEA [4]	
LSfminbnd	1	30	9.1	<i>63e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	3	360	200	<i>15e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	3.8	2.1	<i>52e-1/2e4</i>	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	7	3.5	<i>37e-1/1e4</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	10	11	5.6	<i>12e-1/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	4.3	1	1.4	<i>15e-1/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	12	2.9	2.1	<i>26e-1/6e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	14	31	68	<i>14e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	620	47	<i>70e-1/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	1	6.5	5.7	<i>63e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1	5.2	10	33	<i>60e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	4.1	2900	<i>96e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	200	210	<i>19e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	7.5	1.8	1	<i>53e-1/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	3.4	3.3	49	13	16	46	200	<i>69e-4/3e7</i>	.	VNS (Garcia) [11]	

Table 73: 10-D, running time excess ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

1 Sphere											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	8.9	84	230	410	590	780	950	1100	1500	ALPS [17]
AMaLGaM IDEA	1	5	18	45	73	100	130	160	190	240	AMaLGaM IDEA [4]
avg NEWUOA	1	27	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	avg NEWUOA [31]
BayEDAcG	1	6.5	39	100	230	300	370	440	500	640	BayEDAcG [10]
BFGS	1	13	1	1	1	1	1	1	1	1	BFGS [30]
Cauchy EDA	1	240	160	350	510	700	870	1100	1200	1600	Cauchy EDA [24]
BIPOP-CMA-ES	1	7.8	5.7	12	18	25	31	38	44	58	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	5.3	3.8	7.5	11	15	18	22	25	33	(1+1)-CMA-ES [2]
DASA	1	110	29	45	59	77	95	110	130	180	DASA [19]
DEPSO	1	3.2	19	45	84	130	170	220	280	390	DEPSO [12]
DIRECT	1	1	8.8	31	64	97	140	190	240	400	DIRECT [25]
EDA-PSO	1	9.2	22	800	1500	2300	3100	3900	4700	6400	EDA-PSO [6]
full NEWUOA	1	40	3.1	3	3	3	3	3	3	3	full NEWUOA [31]
G3-PCX	1	4.7	7.9	11	15	20	24	28	33	43	G3-PCX [26]
simple GA	1	4.4	310	1200	2100	3200	4400	7100	1.2e4	6.1e4	simple GA [22]
GLOBAL	1	5.3	15	14	14	14	14	14	14	14	GLOBAL [23]
iAMaLGaM IDEA	1	5.7	8.5	25	41	57	72	87	100	140	iAMaLGaM IDEA [4]
LSfminbnd	1	39	7.1	8.1	8.3	8.3	8.3	8.3	8.3	8.3	LSfminbnd [28]
LSstep	1	960	140	150	160	160	160	160	160	160	LSstep [28]
MA-LS-Chain	1	4.7	12	36	58	80	110	120	140	180	MA-LS-Chain [21]
MCS (Neum)	1	1	1.2	2	2.1	2.2	2.9	2.9	2.9	2.9	MCS (Neum) [18]
NELDER (Han)	1	7.1	2.5	6.1	9.5	13	16	19	23	31	NELDER (Han) [16]
NELDER (Doe)	1	8.3	2.4	5.3	8.1	11	14	17	21	32	NELDER (Doe) [5]
NEWUOA	1	14	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	17	3.9	6.9	10	13	16	19	22	28	(1+1)-ES [1]
POEMS	1	1600	140	220	620	1e3	1500	2e3	2400	3300	POEMS [20]
PSO	1	5.8	10	55	100	150	210	280	330	450	PSO [7]
PSO_Bounds	1	5.7	18	180	700	1400	1700	2100	2500	5300	PSO_Bounds [8]
Monte Carlo	1	5.4	3e3	<i>35e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	37	3.4	4.9	6.5	8.1	9.7	11	13	16	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	5.3	4.8	11	16	21	26	33	37	48	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	12	12	18	26	32	38	44	51	65	VNS (Garcia) [11]

Table 74: 10-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	47	58	80	100	130	150	170	200	220	280	ALPS [17]
AMaLgAM IDEA	8.7	11	15	20	25	29	32	35	39	46	AMaLgAM IDEA [4]
avg NEWUOA	2.5	6.1	16	39	67	90	120	160	180	250	avg NEWUOA [31]
BayEDAcG	32	34	42	57	66	74	81	89	97	110	BayEDAcG [10]
BFGS	4.7	7.5	10	12	14	14	14	14	15	15	BFGS [30]
Cauchy EDA	60	72	95	120	140	160	190	210	230	270	Cauchy EDA [24]
BIPOP-CMA-ES	11	14	20	24	26	27	28	28	29	30	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	7.9	10	16	20	21	22	23	23	24	25	(1+1)-CMA-ES [2]
DASA	6.4	6.7	8.6	11	13	15	18	21	25	34	DASA [19]
DEPSO	8.9	11	16	22	28	34	42	48	55	69	DEPSO [12]
DIRECT	11	12	15	150	150	160	170	380	410	1e3	DIRECT [25]
EDA-PSO	200	250	350	440	520	620	710	810	890	1100	EDA-PSO [6]
full NEWUOA	6.2	18	53	150	300	590	2500	7700	<i>53e-4/1e4</i>	.	full NEWUOA [31]
G3-PCX	13	31	89	190	290	370	460	540	640	860	G3-PCX [26]
simple GA	240	300	820	1400	2700	4400	7e3	1.2e4	7.4e4	<i>53e-4/1e5</i>	simple GA [22]
GLOBAL	6.5	8.6	12	13	14	14	15	15	15	16	GLOBAL [23]
iAMaLgAM IDEA	5.9	7.9	11	14	16	18	19	21	23	27	iAMaLgAM IDEA [4]
LSfminbnd	1.2	1	1	1	1	1	1	1	1	1	LSfminbnd [28]
LSstep	19	16	16	16	16	16	16	16	16	16	LSstep [28]
MA-LS-Chain	7	9.6	14	18	23	27	32	37	42	52	MA-LS-Chain [21]
MCS (Neum)	1	1.3	3.2	4.6	6.5	7.5	10	11	11	110	MCS (Neum) [18]
NELDER (Han)	3.9	5.1	6.1	7	8.1	8.6	9.2	9.7	10	11	NELDER (Han) [16]
NELDER (Doe)	4.2	10	22	52	83	100	120	130	130	200	NELDER (Doe) [5]
NEWUOA	1.2	4.4	13	37	74	100	150	180	220	300	NEWUOA [31]
(1+1)-ES	280	1300	5600	1.4e4	2.3e4	3.1e4	4.9e4	1.4e5	2.4e5	7.5e5	(1+1)-ES [1]
POEMS	130	180	220	280	320	380	430	470	540	650	POEMS [20]
PSO	17	26	41	420	420	430	430	440	440	450	PSO [7]
PSO_Bounds	120	190	290	420	530	600	890	1200	1500	1800	PSO_Bounds [8]
Monte Carlo	<i>67e+2/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.6	3.4	39	100	160	210	220	280	370	650	Rosenbrock [27]
IPOP-SEP-CMA-ES	4.9	5.6	6.9	7.7	8.5	9.3	9.9	11	11	12	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	20	24	29	33	37	39	41	43	44	47	VNS (Garcia) [11]

Table 75: 10-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

3 Rastrigin separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	2.6	30	11	40	59	59	61	64	67	81	ALPS [17]
AMaLGaM IDEA	3.7	6.7	4.6	1300	3.9e4	3.9e4	3.8e4	3.8e4	3.8e4	3.8e4	AMaLGaM IDEA [4]
avg NEWUOA	11	16	<i>21e+0/7e3</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	2.1	18	<i>22e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	30	370	<i>70e+0/5e3</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	160	69	4100	<i>15e+0/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	4.5	3.4	3.6	310	5900	5900	5900	5900	5900	5900	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.3	14	390	<i>17e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	17	7.2	1	11	19	19	19	19	19	20	DASA [19]
DEPSO	1.5	8	170	<i>19e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	5.6	87	<i>26e+0/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	2.6	34	18	1800	<i>20e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	9.3	14	<i>17e+0/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.7	71	<i>20e+0/5e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	2.6	150	26	23	73	140	460	610	830	3900	simple GA [22]
GLOBAL	2.3	6.8	140	<i>34e+0/2e3</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	2.7	3.6	4.4	270	2300	2300	2300	2300	2300	2300	iAMaLGaM IDEA [4]
LSfminbnd	57	2.2	47	<i>11e+0/5e3</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1300	46	2.1	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	1.9	5.6	3.9	43	79	79	79	79	79	79	MA-LS-Chain [21]
MCS (Neum)	1	1	11	<i>40e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	5.1	31	320	<i>90e-1/1e5</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	4.4	1.1	180	<i>11e+0/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	5.1	20	<i>23e+0/6e3</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	5.9	74	6400	<i>90e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	470	42	6.7	29	66	68	73	75	79	84	POEMS [20]
PSO	3.9	6.4	150	1800	1800	1800	1800	1800	1800	1800	PSO [7]
PSO_Bounds	2	11	50	44	51	52	54	55	70	95	PSO_Bounds [8]
Monte Carlo	2.4	2900	<i>63e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	18	330	<i>53e+0/8e3</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.5	2.7	3.1	62	<i>20e-1/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	2	5.6	3.2	24	190	210	230	230	260	290	VNS (Garcia) [11]

Table 76: 10-D, running time excess ERT/ERT_{best} on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

4 Skew Rastrigin-Bueche separable											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	2.4	39	14	100	170	170	170	180	190	30	ALPS [17]
AMaLGaM IDEA	2.6	8.9	41	<i>50e-1/1e6</i>	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	13	42	<i>27e+0/1e4</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	2.1	28	<i>18e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	89	850	<i>10e+1/5e3</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	190	100	<i>31e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	5.8	2.8	6.5	<i>50e-1/3e5</i>	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.3	20	<i>33e+0/1e4</i>	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	130	7.8	1	16	52	51	51	51	51	6.8	DASA [19]
DEPSO	3.1	9.4	66	<i>18e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	4.2	180	<i>19e+0/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	2.5	83	20	<i>50e-1/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	35	13	<i>27e+0/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	2.9	500	<i>35e+0/5e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	2.7	140	22	26	79	310	1800	<i>84e-4/1e5</i>	.	.	simple GA [22]
GLOBAL	2.5	33	<i>57e+0/2e3</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	3.5	5.5	29	<i>50e-1/1e6</i>	.	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	56	1.6	<i>21e+0/6e3</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	670	31	1.6	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	2.8	6.1	5.1	290	2e3	2e3	2e3	2e3	2e3	260	MA-LS-Chain [21]
MCS (Neum)	1	1	27	<i>12e+0/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	5.1	46	3300	<i>17e+0/1e5</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	3.1	2.8	<i>20e+0/2e4</i>	.	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	11	110	<i>55e+0/7e3</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	9.5	120	6.3e4	<i>15e+0/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	570	35	6.4	43	85	89	91	94	97	13	POEMS [20]
PSO	3.3	8.5	120	<i>80e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	3.5	28	37	190	200	200	200	200	210	30	PSO_Bounds [8]
Monte Carlo	2.3	2e4	<i>86e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	32	780	<i>70e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	6.5	2.7	6.6	<i>60e-1/1e4</i>	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	3.2	5	7.2	2900	2.5e4	2.5e4	2.7e4	2.7e4	2.7e4	4600	VNS (Garcia) [11]

Table 77: 10-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

5 Linear slope											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	7.4	130	190	220	240	250	250	250	260	ALPS [17]
AMaLGaM IDEA	1	4.6	39	45	46	46	46	46	46	46	AMaLGaM IDEA [4]
avg NEWUOA	1	1.9	2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	avg NEWUOA [31]
BayEDAcG	1	5.9	91	120	140	140	140	140	140	140	BayEDAcG [10]
BFGS	1	1.3	2.2	2.8	2.8	2.8	2.8	2.8	2.8	2.8	BFGS [30]
Cauchy EDA	1	24	68	70	72	72	72	72	72	72	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.2	4.8	6	6.1	6.1	6.1	6.1	6.1	6.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	3.2	3.9	3.9	3.9	3.9	3.9	3.9	3.9	(1+1)-CMA-ES [2]
DASA	1	13	23	31	36	40	43	47	50	58	DASA [19]
DEPSO	1	7	33	47	50	50	50	50	50	50	DEPSO [12]
DIRECT	1	6	36	52	53	53	53	53	53	53	DIRECT [25]
EDA-PSO	1	2.9	11	17	20	20	21	21	21	21	EDA-PSO [6]
full NEWUOA	1	2.8	3.6	4	4	4	4	4	4	4	full NEWUOA [31]
G3-PCX	1	6.8	17	26	27	28	28	28	28	28	G3-PCX [26]
simple GA	1	5.8	1400	3100	5400	8200	1.1e4	1.5e4	1.9e4	3e4	simple GA [22]
GLOBAL	1	5.2	17	18	18	18	18	18	18	18	GLOBAL [23]
iAMaLGaM IDEA	1	2.4	8.8	11	12	12	12	12	12	12	iAMaLGaM IDEA [4]
LSfminbnd	1	8.3	14	15	15	15	15	15	15	15	LSfminbnd [28]
LSstep	1	83	170	180	180	180	180	180	180	180	LSstep [28]
MA-LS-Chain	1	4.7	41	45	49	49	49	49	49	49	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	1.6	3.4	4.2	4.3	4.3	4.3	4.3	4.3	4.3	NELDER (Han) [16]
NELDER (Doe)	1	1.2	3.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	NELDER (Doe) [5]
NEWUOA	1	1.3	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	NEWUOA [31]
(1+1)-ES	1	1.1	2.1	2.6	2.8	2.8	2.8	2.8	2.8	2.8	(1+1)-ES [1]
POEMS	1	130	190	230	260	270	270	270	270	270	POEMS [20]
PSO	1	2.9	13	17	19	19	20	20	20	20	PSO [7]
PSO_Bounds	1	3.1	10	14	15	15	16	16	16	16	PSO_Bounds [8]
Monte Carlo	1	11	<i>27e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	3.7	4.1	4.3	4.4	4.4	4.4	4.4	4.4	4.4	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.2	5.4	7.1	7.2	7.3	7.3	7.3	7.3	7.3	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	5.6	9.6	10	11	11	11	11	11	11	VNS (Garcia) [11]

Table 78: 10-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

6 Attractive sector												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	30	24	32	43	51	59	64	67	68	87	ALPS [17]	
AMaLGaM IDEA	8	6.1	7.9	9.8	11	12	12	11	11	11	AMaLGaM IDEA [4]	
avg NEWUOA	1.5	1.6	1	1	1	1	1.1	1.1	1.1	1.1	avg NEWUOA [31]	
BayEDAcG	23	20	360	<i>25e+0/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.9	3.7	3.9	4.2	4.5	4.6	4.5	4.4	4.5	66	BFGS [30]	
Cauchy EDA	690	550	190	150	140	130	120	110	100	99	Cauchy EDA [24]	
BIPOP-CMA-ES	2.2	3.6	2.1	2.1	2	1.9	1.9	1.8	1.7	1.7	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1.7	1.4	1.1	2.6	20	69	150	<i>21e-4/1e4</i>	.	.	(1+1)-CMA-ES [2]	
DASA	15	9.9	75	150	350	490	570	620	670	700	DASA [19]	
DEPSO	11	5.5	6.8	11	14	24	37	<i>50e-4/2e3</i>	.	.	DEPSO [12]	
DIRECT	4.9	3.1	98	<i>34e-1/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	5.7	14	49	62	68	73	72	71	71	71	EDA-PSO [6]	
full NEWUOA	2.4	2.1	1	1	1	1	1	1	1	1	full NEWUOA [31]	
G3-PCX	5	2.2	1.7	2.4	3.6	3.8	3.9	4.1	4.5	5.4	G3-PCX [26]	
simple GA	160	80	140	4700	<i>28e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	9.3	4.6	3.2	3.3	3.5	3.4	3.4	3.3	4	83	GLOBAL [23]	
iAMaLGaM IDEA	3.8	3.8	3.2	4.2	4.8	5.1	5.1	5.1	5	4.9	iAMaLGaM IDEA [4]	
LSfminbnd	8.2	85	220	370	300	680	1100	920	790	<i>40e-1/1e4</i>	LSfminbnd [28]	
LSstep	120	160	600	2400	<i>24e+0/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	10	4.9	6.6	9.1	9.7	9.5	8.6	7.8	7.3	6.4	MA-LS-Chain [21]	
MCS (Neum)	1.8	3.6	19	180	170	280	<i>16e-1/4e3</i>	.	.	.	MCS (Neum) [18]	
NELDER (Han)	1.8	4.6	4.2	5.3	5.5	5.8	5.7	6.1	6.3	9	NELDER (Han) [16]	
NELDER (Doe)	1.3	1.1	3.8	10	15	18	25	58	260	<i>14e-6/2e4</i>	NELDER (Doe) [5]	
NEWUOA	1	1.1	2.1	3.3	4	4.9	5.5	5.9	5.9	6.2	NEWUOA [31]	
(1+1)-ES	2	2.8	1.8	1.9	2.1	2.5	2.4	2.4	2.4	2.6	(1+1)-ES [1]	
POEMS	92	36	30	40	44	46	46	45	44	45	POEMS [20]	
PSO	4.9	4.7	400	420	320	260	210	180	160	130	PSO [7]	
PSO_Bounds	4.8	5.6	45	120	140	150	140	130	130	160	PSO_Bounds [8]	
Monte Carlo	1300	1500	<i>25e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.5	1	10	38	41	37	34	33	31	29	Rosenbrock [27]	
IPOP-SEP-CMA-ES	3	4.2	2.2	2.3	2.4	2.4	2.4	2.3	2.2	2.1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	6	6.1	2.6	2.4	2.3	2.2	2.1	2	1.9	1.8	VNS (Garcia) [11]	

Table 79: 10-D, running time excess ERT/ERT_{best} on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

7 Step-ellipsoid											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.1	3.29	17.2	161	420	510	514	514	514	539	ERT_{best}/D
ALPS	1.6	15	25	9.8	25	57	59	59	59	56	ALPS [17]
AMaLGaM IDEA	1.5	4.9	3.9	1	2.3	2.6	2.6	2.6	2.6	2.5	AMaLGaM IDEA [4]
avg NEWUOA	3	1.4	16	38	<i>73e-2/1e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	2.4	13	23	<i>47e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	14	150	<i>13e+1/100</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	93	50	31	7.2	4.4	4.7	4.9	4.9	4.9	4.9	Cauchy EDA [24]
BIPOP-CMA-ES	3.2	2.8	2.3	1.2	1.3	1.3	1.3	1.3	1.3	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.5	2.1	7.4	5.9	5	20	20	20	20	19	(1+1)-CMA-ES [2]
DASA	37	33	280	8800	<i>13e-1/6e5</i>	.	.	.	.	.	DASA [19]
DEPSO	2.1	6.6	9.2	21	32	<i>14e-1/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	1	1.7	16	68	<i>70e-2/1e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1.7	5.6	57	17	130	110	110	110	110	100	EDA-PSO [6]
full NEWUOA	3.7	2.1	1	7.6	110	<i>51e-2/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX	2.1	3.7	21	520	<i>19e-1/2e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	2.7	23	140	270	680	2900	2800	2800	2800	<i>48e-2/1e5</i>	simple GA [22]
GLOBAL	1.8	6.1	11	50	<i>45e-1/500</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.8	4	3	1	1	2.1	2.1	2.1	2.1	2	iAMaLGaM IDEA [4]
LSfminbnd	16	12	95	270	<i>40e-1/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	110	160	720	<i>93e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	2.7	4.8	7.7	15	110	120	120	120	120	110	MA-LS-Chain [21]
MCS (Neum)	1	1.3	53	<i>50e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3	1.4	69	940	<i>11e-1/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	4.5	1.1	59	400	<i>19e-1/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	4.1	1	27	1e3	<i>24e-1/1e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	6.3	2.7	190	7e3	<i>85e-2/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	1100	88	40	12	74	80	80	80	80	76	POEMS [20]
PSO	2.2	3.4	10	770	<i>11e-1/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1.9	4.2	19	730	3300	<i>13e-1/1e5</i>	.	.	.	.	PSO_Bounds [8]
Monte Carlo	2.2	32	6e4	<i>94e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	150	400	<i>67e+0/3e3</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.4	2.2	2.5	1.5	1.1	1	1	1	1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.4	8.3	3.2	4.1	19	31	34	34	34	33	VNS (Garcia) [11]

Table 80: 10-D, running time excess ERT/ERT_{best} on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

8 Rosenbrock original												
Δ ftarget ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ ftarget ERT_{best}/D	Comparison
ALPS	53	43	43	120	170	250	330	450	570	3300	ALPS [17]	P-11-1000
AMaLGaM IDEA	10	7.4	7.4	13	14	14	15	15	15	16	AMaLGaM IDEA [4]	
avg NEWUOA	1.2	1.2	1	1	1	1	1	1	1	1	avg NEWUOA [31]	P-11-1000
BayEDAcG	29	22	75	<i>93e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]	
BFGS	1.9	2.3	1.7	1.7	1.6	1.5	1.5	1.5	1.5	1.5	BFGS [30]	P-11-1000
Cauchy EDA	110	82	66	120	110	110	110	110	120	120	Cauchy EDA [24]	
BIPOP-CMA-ES	4	2.4	1.9	4.7	5	5.1	5.2	5.3	5.4	5.6	BIPOP-CMA-ES [15]	P-11-1000
(1+1)-CMA-ES	3.1	2.9	1.9	6.8	6.7	6.5	6.5	6.6	6.6	6.7	(1+1)-CMA-ES [2]	
DASA	18	21	22	200	420	630	900	1200	1400	1900	DASA [19]	P-11-1000
DEPSO	11	9	12	<i>54e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]	
DIRECT	9.1	7.7	32	550	<i>64e-1/1e4</i>	.	.	.	.	.	DIRECT [25]	P-11-1000
EDA-PSO	65	130	140	220	300	410	530	640	760	<i>46e-8/1e5</i>	EDA-PSO [6]	
full NEWUOA	2.8	2	1.3	1.1	1.2	1.2	1.2	1.2	1.2	1.2	full NEWUOA [31]	P-11-1000
G3-PCX	4.6	3.5	2.9	6.9	6.8	6.7	6.7	6.7	6.8	7	G3-PCX [26]	
simple GA	280	230	210	<i>53e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]	P-11-1000
GLOBAL	7.7	3.2	2.1	1.7	1.6	1.5	1.5	1.5	1.5	1.5	GLOBAL [23]	
iAMaLGaM IDEA	6.5	4.7	4	8.4	8.8	8.9	9.1	9.3	9.6	10	iAMaLGaM IDEA [4]	P-11-1000
LSfminbnd	7.2	7.3	19	190	180	440	1300	1400	<i>40e-1/1e4</i>	.	LSfminbnd [28]	
LSstep	140	80	63	180	470	1500	<i>12e-1/1e4</i>	.	.	.	LSstep [28]	P-11-1000
MA-LS-Chain	7.9	6.7	7.3	13	14	14	15	15	15	15	MA-LS-Chain [21]	
MCS (Neum)	1.6	1	1	1.6	1.5	1.6	1.6	1.6	1.6	1.6	MCS (Neum) [18]	P-11-1000
NELDER (Han)	1.6	2.5	2	5.4	5.1	5	5	5.1	5.1	5.2	NELDER (Han) [16]	
NELDER (Doe)	2.2	1.3	1.4	2.5	3.3	3.5	3.7	3.8	4	4.4	NELDER (Doe) [5]	P-11-1000
NEWUOA	1	1.4	1	1.7	1.6	1.6	1.6	1.6	1.6	1.6	NEWUOA [31]	
(1+1)-ES	3.7	13	22	160	150	170	200	240	270	340	(1+1)-ES [1]	P-11-1000
POEMS	80	59	64	470	840	<i>45e-3/1e5</i>	.	.	.	.	POEMS [20]	
PSO	9.1	10	13	270	350	470	620	790	1500	6700	PSO [7]	P-11-1000
PSO_Bounds	17	44	66	690	750	820	1700	1.4e4	1.4e4	<i>93e-5/1e5</i>	PSO_Bounds [8]	
Monte Carlo	5400	<i>36e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]	P-11-1000
Rosenbrock	2.1	3.6	12	59	81	110	170	320	430	1300	Rosenbrock [27]	
IPOP-SEP-CMA-ES	3.2	2.4	2.9	7.5	7.5	7.4	7.5	7.5	7.5	7.7	IPOP-SEP-CMA-ES [29]	P-11-1000
VNS (Garcia)	10	5.6	3.5	8.4	8.7	8.6	8.8	8.8	8.9	9	VNS (Garcia) [11]	

Table 81: 10-D, running time excess ERT/ERT_{best} on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

9 Rosenbrock rotated												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1700	5e3	66	320	470	730	1900	3e3	4400	6.1e4	ALPS [17]	
AMaLGaM IDEA	350	700	9.3	17	15	15	15	15	15	16	AMaLGaM IDEA [4]	
avg NEWUOA	69	150	1.3	1.8	1.5	1.4	1.3	1.3	1.2	1.2	avg NEWUOA [31]	
BayEDAcG	860	2500	56	<i>88e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	88	230	2.1	1.9	1.6	1.4	1.4	1.3	1.3	1.3	BFGS [30]	
Cauchy EDA	4400	1e4	100	150	130	120	110	110	110	120	Cauchy EDA [24]	
BIPOP-CMA-ES	130	350	3.4	6.3	5.9	5.5	5.4	5.4	5.5	5.5	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	100	350	3.3	7.7	6.6	6.1	5.9	5.8	5.8	5.8	(1+1)-CMA-ES [2]	
DASA	750	1.6e4	160	2200	2e3	2400	2900	3700	4300	5800	DASA [19]	
DEPSO	420	1100	15	<i>70e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	9.4	350	<i>17e-1/1e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	3200	1.7e4	220	340	540	1500	<i>85e-4/1e5</i>	.	.	.	EDA-PSO [6]	
full NEWUOA	140	250	1.6	2	1.7	1.6	1.5	1.5	1.5	1.4	full NEWUOA [31]	
G3-PCX	190	470	4.7	15	12	11	10	10	10	9.9	G3-PCX [26]	
simple GA	9e3	2.8e4	370	<i>79e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	330	450	2.9	2.2	1.8	1.6	1.5	1.5	1.5	1.4	GLOBAL [23]	
iAMaLGaM IDEA	250	560	6.3	10	9.6	9	8.9	8.9	9.1	9.3	iAMaLGaM IDEA [4]	
LSfminbnd	230	1200	51	120	860	<i>14e-2/1e4</i>	.	.	.	.	LSfminbnd [28]
LSstep	5800	3.3e4	420	<i>90e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	290	870	12	36	31	28	27	26	26	25	MA-LS-Chain [21]	
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]	
NELDER (Han)	45	240	2.4	3.7	3.4	3.1	3.2	3.2	3.2	3.3	NELDER (Han) [16]	
NELDER (Doe)	49	150	2.7	7.1	6.5	6.1	6	5.9	6	6	NELDER (Doe) [5]	
NEWUOA	39	140	1.7	1.7	1.4	1.3	1.2	1.2	1.2	1.2	NEWUOA [31]	
(1+1)-ES	100	1600	9.5	230	190	190	220	240	280	330	(1+1)-ES [1]	
POEMS	3100	6200	110	770	1.7e4	<i>18e-2/1e5</i>	.	.	.	.	POEMS [20]
PSO	320	1700	24	840	1900	<i>11e-2/1e5</i>	.	.	.	.	PSO [7]
PSO_Bounds	770	4.3e4	450	1100	1600	<i>78e-3/1e5</i>	.	.	.	.	PSO_Bounds [8]
Monte Carlo	3.7e5	<i>33e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	79	200	27	77	70	87	130	180	<i>12e-5/1e4</i>	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	130	780	6.9	10	8.9	8.1	7.8	7.7	7.7	7.7	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	340	580	4.6	9.8	12	13	13	12	12	12	VNS (Garcia) [11]	

Table 82: 10-D, running time excess ERT/ERT_{best} on f_{10} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	10 Ellipsoid											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	59	180	850	7800	<i>30e-1/5e5</i>	.	.	.	.	.	ALPS [17]
AMaLGA M IDEA	2.9	2.2	1.8	1.9	2	2	2.2	2.2	1.6	1.9	AMaLGA M IDEA [4]	
avg NEWUOA	1.3	1.3	1.9	3.5	5.4	6.6	9	9.9	8.1	10	avg NEWUOA [31]	
BayEDAcG	<i>16e+3/2e3</i>	.	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.8	1.3	1	1	1	1	1	1	1.3	920	BFGS [30]	
Cauchy EDA	22	14	10	11	11	12	13	13	10	11	Cauchy EDA [24]	
BIPOP-CMA-ES	3.8	2.7	2.3	2.1	1.9	1.8	1.8	1.7	1.2	1.2	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	2.8	2.1	1.7	1.8	1.7	1.6	1.5	1.4	1	1	(1+1)-CMA-ES [2]	
DASA	320	1500	7200	2.2e4	6.1e4	<i>76e-1/1e6</i>	.	.	.	.	DASA [19]
DEPSO	310	<i>19e+2/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	89	<i>37e+1/1e4</i>	.	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	300	830	<i>56e+0/1e5</i>	.	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1.9	5.3	10	20	33	54	260	240	<i>79e-4/1e4</i>	.	full NEWUOA [31]	
G3-PCX	6.1	6.9	10	19	26	30	37	40	31	38	G3-PCX [26]	
simple GA	3500	1.4e4	<i>12e+2/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	2.6	1.6	1.2	1.2	1.3	1.2	1.2	1.2	1.6	<i>29e-7/1e3</i>	GLOBAL [23]	
iAMaLGA M IDEA	2.1	1.5	1.2	1.3	1.3	1.3	1.4	1.4	1	1.1	iAMaLGA M IDEA [4]	
LSfminbnd	440	<i>14e+2/1e4</i>	.	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1600	<i>88e+2/1e4</i>	.	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	10	8	11	11	9.8	9	9	8.3	5.7	5.6	MA-LS-Chain [21]	
MCS (Neum)	170	<i>11e+2/4e3</i>	.	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1.8	2.2	4.1	16	43	100	240	820	1600	<i>27e-5/1e5</i>	NELDER (Han) [16]	
NELDER (Doe)	2.7	3.7	9.5	25	34	57	330	970	<i>31e-4/2e4</i>	.	NELDER (Doe) [5]	
NEWUOA	1	1	2.1	3.8	6	7.4	10	11	9.2	12	NEWUOA [31]	
(1+1)-ES	43	170	530	1100	1700	2400	3700	9100	1.1e4	<i>43e-5/1e6</i>	(1+1)-ES [1]	
POEMS	300	1300	<i>10e+1/1e5</i>	.	.	.	.	.	.	.	POEMS [20]
PSO	110	1e3	3900	<i>74e+0/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	640	2200	<i>12e+1/1e5</i>	.	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	<i>72e+2/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	57	80	120	230	<i>22e+0/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	9.3	5.6	4	3.7	3.4	3.2	3.2	2.9	2	2	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	6	3.7	2.8	2.7	2.5	2.3	2.3	2.2	1.5	1.5	VNS (Garcia) [11]	

Table 83: 10-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	
Δf_{target} ERT_{best}/D											Δf_{target} ERT_{best}/D
ALPS	6.3	83	370	460	490	990	4300	<i>14e-4/5e5</i>	.	.	ALPS [17]
AMaLGaM IDEA	5.5	14	4.4	1.9	1.1	1.2	1.3	1.4	1.4	1.5	AMaLGaM IDEA [4]
avg NEWUOA	10	220	36	18	9.5	12	14	14	15	15	avg NEWUOA [31]
BayEDAcG	4	58	<i>62e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.2	7.1	1	1	1.7	6	56	<i>12e-4/8e3</i>	.	.	BFGS [30]
Cauchy EDA	37	200	36	13	7	7.5	7.8	8.1	8.3	8.8	Cauchy EDA [24]
BIPOP-CMA-ES	6	82	13	3.8	1.7	1.6	1.5	1.4	1.3	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.2	42	9.9	3.8	1.9	2	1.9	1.8	1.7	1.5	(1+1)-CMA-ES [2]
DASA	5.9	850	1300	1e3	750	1100	1400	1600	2e3	3500	DASA [19]
DEPSO	7.1	140	<i>47e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1.8	7.9	<i>20e+0/1e4</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	6.7	200	550	990	5700	<i>57e-2/1e5</i>	.	.	.	.	EDA-PSO [6]
full NEWUOA	15	820	290	<i>31e-1/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	5.7	65	40	22	14	16	17	18	19	21	G3-PCX [26]
simple GA	5.3	100	1.6e4	<i>17e+0/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	5	17	2.5	1.7	1.5	8.1	<i>11e-3/2e3</i>	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	5	25	5.7	2	1	1	1	1	1	1	iAMaLGaM IDEA [4]
LSfminbnd	2.2	9400	<i>13e+1/1e4</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	4.3	6.1e4	<i>14e+1/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	7	31	39	14	6	5.6	5.1	4.6	4.3	3.8	MA-LS-Chain [21]
MCS (Neum)	1	1	<i>30e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3.8	17	15	8.8	6.9	13	37	85	440	<i>24e-6/1e5</i>	NELDER (Han) [16]
NELDER (Doe)	5.2	17	13	7.8	5.4	9.7	17	34	93	<i>32e-6/2e4</i>	NELDER (Doe) [5]
NEWUOA	1.4	41	11	5.5	3.1	3.4	4	4.1	4.3	4.6	NEWUOA [31]
(1+1)-ES	840	2.1e4	5300	2400	1300	1500	1700	1800	1900	3e3	(1+1)-ES [1]
POEMS	86	200	220	200	140	160	210	270	350	1500	POEMS [20]
PSO	6.7	240	220	150	100	130	160	170	190	500	PSO [7]
PSO_Bounds	6.5	670	1400	920	670	1200	1400	3900	3600	<i>12e-2/1e5</i>	PSO_Bounds [8]
Monte Carlo	7.9	120	5.3e5	<i>12e+0/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.3	1e3	5500	1400	570	500	440	390	360	300	Rosenbrock [27]
IPOP-SEP-CMA-ES	5.3	260	29	8.4	3.5	3.2	2.9	2.6	2.4	2.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	5.9	160	17	4.7	2	1.9	1.7	1.6	1.5	1.3	VNS (Garcia) [11]

Table 84: 10-D, running time excess ERT/ERT_{best} on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

12 Bent cigar											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	86	84	57	120	210	1100	5400	1.1e4	1.9e4	<i>13e-4/5e5</i>	ALPS [17]
AMaLgAM IDEA	14	13	8.5	6.6	6.6	7.9	9.1	9.2	5.9	5.3	AMaLgAM IDEA [4]
avg NEWUOA	1.1	1.7	4.7	8	10	12	12	12	6.9	10	avg NEWUOA [31]
BayEDAcG	73	72	48	59	<i>71e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1.5	1.3	1.3	1.4	1.4	1.3	1.3	2.2	2.6	23	BFGS [30]
Cauchy EDA	100	110	84	69	68	71	74	68	42	34	Cauchy EDA [24]
BIPOP-CMA-ES	3.7	3.3	3.7	4.6	5.3	5.6	5.6	5.2	3.1	2.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2	2.3	4.2	5.5	6.1	7.4	7.2	6.4	3.8	3.5	(1+1)-CMA-ES [2]
DASA	12	10	7100	4.5e4	1.1e5	<i>39e-1/1e6</i>	.	.	.	.	DASA [19]
DEPSO	19	19	19	42	110	<i>55e-1/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	35	31	29	130	170	340	<i>64e-2/1e4</i>	.	.	.	DIRECT [25]
EDA-PSO	300	290	490	300	810	4800	<i>66e-3/1e5</i>	.	.	.	EDA-PSO [6]
full NEWUOA	1.2	1.4	2.9	4.1	4.6	6.2	6.6	6.2	4.4	4.7	full NEWUOA [31]
G3-PCX	2.5	2.3	2.8	3.7	4	4.4	4.6	4.1	2.5	2	G3-PCX [26]
simple GA	460	490	1300	1900	1.1e4	<i>18e-1/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	1.8	1.4	1	1	1	1	1	1	1	2.9	GLOBAL [23]
iAMaLgAM IDEA	7.7	7.2	5	4.8	4.9	5.4	5.7	5.5	3.4	3	iAMaLgAM IDEA [4]
LSfminbnd	2.6	2.4	98	170	1100	1e3	890	<i>51e-1/1e4</i>	.	.	LSfminbnd [28]
LSstep	74	67	170	730	<i>63e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	12	11	8	7.2	9.7	16	25	29	16	12	MA-LS-Chain [21]
MCS (Neum)	1.2	1	3.2	3.9	7	11	13	27	76	110	MCS (Neum) [18]
NELDER (Han)	1.6	1.8	3	4.7	5.3	5.3	5.4	4.8	2.8	2.3	NELDER (Han) [16]
NELDER (Doe)	1.8	1.6	3	6	7.2	7.6	7.7	6.9	4.3	6.5	NELDER (Doe) [5]
NEWUOA	1.1	1	1.9	2	2.1	2.3	2.3	2.1	1.2	1	NEWUOA [31]
(1+1)-ES	1.9	1600	1.5e4	4.8e4	<i>56e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	160	160	1100	2300	3300	<i>25e-1/1e5</i>	.	.	.	.	POEMS [20]
PSO	19	20	310	1700	5200	<i>41e-1/1e5</i>	.	.	.	.	PSO [7]
PSO_Bounds	160	160	580	1800	3300	<i>27e-1/1e5</i>	.	.	.	.	PSO_Bounds [8]
Monte Carlo	<i>20e+5/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	27	38	340	1200	<i>14e-1/1e4</i>	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	3	2.9	3	4.5	5.6	6.3	6.3	5.7	3.4	2.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	4.4	5.1	4.9	5.6	17	16	15	12	6.9	5.2	VNS (Garcia) [11]

Table 85: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	13 Sharp ridge											
$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	
ALPS	22	93	53	110	480	830	1100	3e3	<i>54e-5/5e5</i>	.	ALPS [17]	
AMaLGaM IDEA	12	15	6.8	6.9	7	6.8	1.8	1.8	1.8	1.8	AMaLGaM IDEA [4]	
avg NEWUOA	3.6	1.4	3	13	30	76	32	70	280	<i>39e-5/1e4</i>	avg NEWUOA [31]	
BayEDAcG	17	99	230	<i>26e+0/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]	
BFGS	2.8	1.5	1	1	1	1	86	<i>14e-4/1e4</i>	.	.	BFGS [30]	
Cauchy EDA	160	130	46	43	42	41	11	11	11	11	Cauchy EDA [24]	
BIPOP-CMA-ES	4.5	5.3	3.6	4.2	5.6	4.8	1.3	1.3	1.5	1.8	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	3.9	3.3	4.7	5.7	6.9	9.7	3.5	3.7	4.4	6.9	(1+1)-CMA-ES [2]	
DASA	24	20	220	380	1200	3600	1800	2900	1.1e4	<i>14e-5/1e6</i>	DASA [19]	
DEPSO	8.8	19	58	<i>73e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]	
DIRECT	2.9	22	62	160	580	<i>28e-2/1e4</i>	.	.	.	.	DIRECT [25]	
EDA-PSO	5.9	300	140	150	990	2900	3100	<i>22e-3/1e5</i>	.	.	EDA-PSO [6]	
full NEWUOA	6.2	2.1	1.8	12	25	66	40	130	<i>14e-4/1e4</i>	.	full NEWUOA [31]	
G3-PCX	9.8	4.9	13	50	96	160	72	290	820	<i>26e-5/3e4</i>	G3-PCX [26]	
simple GA	22	490	480	1.1e4	<i>33e-1/1e5</i>	.	.	.	.	.	simple GA [22]	
GLOBAL	11	4.9	1.7	1.4	1.3	1.2	5.3	<i>23e-4/600</i>	.	.	GLOBAL [23]	
iAMaLGaM IDEA	4.7	9.6	3.9	3.8	3.9	3.8	1	1	1	1	iAMaLGaM IDEA [4]	
LSfminbnd	9	16	28	70	180	460	<i>53e-3/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	250	300	470	750	1800	1500	<i>12e+0/1e4</i>	.	.	.	LSstep [28]	
MA-LS-Chain	6.6	19	16	33	140	160	50	43	43	43	MA-LS-Chain [21]	
MCS (Neum)	1	4.2	37	44	59	280	<i>86e-3/4e3</i>	.	.	.	MCS (Neum) [18]	
NELDER (Han)	2	3.8	4.4	9.1	15	21	5.9	6.2	9	13	NELDER (Han) [16]	
NELDER (Doe)	2	2.4	7.2	16	40	76	64	160	480	<i>11e-4/2e4</i>	NELDER (Doe) [5]	
NEWUOA	2.3	1	2	9	20	42	29	69	<i>20e-4/8e3</i>	.	NEWUOA [31]	
(1+1)-ES	4.4	8.1	11	21	44	99	130	390	940	1.9e4	(1+1)-ES [1]	
POEMS	190	130	270	2e3	5100	<i>31e-1/1e5</i>	.	.	.	.	POEMS [20]	
PSO	6	25	950	1.1e4	1.8e4	1.4e4	<i>44e-1/1e5</i>	.	.	.	PSO [7]	
PSO_Bounds	5.2	98	2300	6800	1.8e4	1.4e4	<i>86e-1/1e5</i>	.	.	.	PSO_Bounds [8]	
Monte Carlo	25	<i>28e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	5.2	2	3.4	11	15	33	15	42	110	<i>31e-5/1e4</i>	Rosenbrock [27]	
IPOP-SEP-CMA-ES	4.2	5.2	8.7	10	9.2	8.4	2.1	1.9	1.8	2	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	13	7.7	4.9	16	20	17	9.4	14	14	20	VNS (Garcia) [11]	

Table 86: 10-D, running time excess ERT/ERT_{best} on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

14 Sum of different powers											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	2.7	19	50	74	76	85	320	1400	<i>28e-7/5e5</i>	ALPS [17]
AMaLGaM IDEA	1	3.1	4.7	9	13	12	8.5	8.4	7.5	1.6	AMaLGaM IDEA [4]
avg NEWUOA	1	9.2	1.7	1.3	1.3	1.2	1.1	2.2	7.1	64	avg NEWUOA [31]
BayEDAcG	1	2.5	7.8	75	110	210	<i>11e-3/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	1	11	1.6	1.6	1.6	1.4	1	1	1	<i>11e-7/9e3</i>	BFGS [30]
Cauchy EDA	1	230	71	85	94	88	60	57	51	11	Cauchy EDA [24]
BIPOP-CMA-ES	1	9.2	2.6	3.3	3.8	4.1	4.3	4.9	5.2	1.4	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	4.9	2	1.9	2.3	2.4	2.5	3.7	4.4	1.1	(1+1)-CMA-ES [2]
DASA	1	27	14	13	14	15	80	600	3600	<i>18e-7/1e6</i>	DASA [19]
DEPSO	1.1	2.5	6.6	9.5	15	21	33	<i>35e-5/2e3</i>	.	.	DEPSO [12]
DIRECT	1	1	2.5	11	50	110	500	<i>23e-4/1e4</i>	.	.	DIRECT [25]
EDA-PSO	1	4	4.2	130	240	250	170	190	1100	<i>68e-7/1e5</i>	EDA-PSO [6]
full NEWUOA	1	7	3.1	1.8	2	1.7	1.4	2.8	12	<i>37e-8/1e4</i>	full NEWUOA [31]
G3-PCX	1	2.5	3.9	2.8	3	3.1	2.9	5.5	16	120	G3-PCX [26]
simple GA	1	3.2	18	250	370	400	4200	<i>13e-4/1e5</i>	.	.	simple GA [22]
GLOBAL	1.1	3.1	8	3.7	3.1	2.3	1.4	1.3	1.1	<i>23e-7/300</i>	GLOBAL [23]
iAMaLGaM IDEA	1.1	3.4	2.2	5	7.2	7	5	5.1	4.5	1	iAMaLGaM IDEA [4]
LSfminbnd	1	45	7.5	5.5	5.6	8.1	52	<i>30e-5/1e4</i>	.	.	LSfminbnd [28]
LSstep	1	560	150	120	110	170	<i>29e-4/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1	2.7	4.4	8.3	12	13	13	15	16	3.6	MA-LS-Chain [21]
MCS (Neum)	1	1	1.1	2.4	2.9	2.8	2.8	6.9	<i>32e-6/4e3</i>	.	MCS (Neum) [18]
NELDER (Han)	1	3.7	1.2	2.1	2.9	2.9	2.6	3.2	4.2	8.8	NELDER (Han) [16]
NELDER (Doe)	1	4.9	1.1	2.4	2.8	3.5	3.7	4.5	6.3	43	NELDER (Doe) [5]
NEWUOA	1	7.2	1	1	1	1	1	2.3	7.3	570	NEWUOA [31]
(1+1)-ES	1	6.8	2.2	2	2.2	2.3	4.6	44	580	<i>82e-8/1e6</i>	(1+1)-ES [1]
POEMS	110	970	68	50	110	140	120	170	3e3	<i>12e-6/1e5</i>	POEMS [20]
PSO	1.1	2.9	3.2	8.6	17	22	28	140	2100	<i>83e-7/1e5</i>	PSO [7]
PSO_Bounds	1	3.2	3.7	29	93	180	230	560	<i>13e-6/1e5</i>	.	PSO_Bounds [8]
Monte Carlo	1	2.5	17	<i>15e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	25	2.1	1.3	1.4	1.7	6.3	46	190	<i>96e-7/1e4</i>	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	4.4	3	3.2	3.7	3.9	5.2	9	8.9	2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	3	7.6	5.3	5.6	5.5	6.1	7.6	7.4	1.8	VNS (Garcia) [11]

Table 87: 10-D, running time excess ERT/ERT_{best} on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	15 Rastrigin										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1.9	12	15	<i>30e-1/5e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1.9	2.5	1	3.5	3.7	3.7	3.7	3.7	3.7	3.6	AMaLGaM IDEA [4]
avg NEWUOA	5.5	4.3	230	<i>25e+0/7e3</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1.8	7.6	<i>28e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	59	110	<i>70e+0/4e3</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	80	22	<i>16e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1.9	1	1	1.7	1.3	1.3	1.3	1.3	1.3	1.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.2	2.9	150	<i>18e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	29	270	<i>2.9e4</i>	<i>19e+0/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1.6	3.4	<i>37e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	2.2	84	<i>17e+0/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	2.5	23	7	170	190	190	190	180	180	180	EDA-PSO [6]
full NEWUOA	5.4	2.6	300	<i>21e+0/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.7	100	1500	<i>24e+0/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1.7	56	27	<i>41e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	1.4	13	<i>67e+0/900</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.7	1.6	2.6	9.4	10	10	10	10	10	9.9	iAMaLGaM IDEA [4]
LSfminbnd	14	14	<i>29e+0/1e4</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	450	310	<i>74e+0/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1.8	2.3	3.6	23	98	96	95	94	92	90	MA-LS-Chain [21]
MCS (Neum)	1	1.7	<i>24e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3.3	8.1	240	<i>99e-1/1e5</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	2.9	3.7	47	<i>90e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	5.1	4.5	170	<i>22e+0/6e3</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	5.4	17	2100	<i>99e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	240	19	320	<i>11e+0/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	1.6	2.1	840	<i>23e+0/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1.7	5.7	360	<i>11e+0/1e5</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1.3	1e3	<i>68e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	13	710	<i>89e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.3	1	1.2	1	1	1	1	1	1	1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.6	1.8	6.5	4300	6200	6100	6e3	5900	5900	7700	VNS (Garcia) [11]

Table 88: 10-D, running time excess ERT/ERT_{best} on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.5	8.2	3	56	470	<i>23e-3/5e5</i>	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1.4	8.5	4.9	5.8	4.5	5.1	4.2	4.2	3.9	AMaLGaM IDEA [4]
avg NEWUOA	1	1.5	3.3	41	<i>13e-1/1e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.3	41	<i>95e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	190	<i>18e+0/1e4</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	4.3	400	<i>76e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.1	3	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.3	5.4	49	<i>12e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1.7	190	3e3	<i>11e-1/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	1	1.2	170	<i>11e+0/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	2.2	2.5	1.6	2.4	9.9	<i>21e-3/1e4</i>	.	.	.	DIRECT [25]
EDA-PSO	1	1.5	55	130	190	95	130	100	100	95	EDA-PSO [6]
full NEWUOA	1	1.1	3.6	16	90	<i>99e-2/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.3	4.7	69	<i>75e-2/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1	1.5	28	130	910	<i>91e-2/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	1	1.3	1	1.7	<i>11e-1/800</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.2	3.3	1.8	6.5	8.2	9.8	8.6	8.6	8	iAMaLGaM IDEA [4]
LSfminbnd	1	1.4	7.9	<i>28e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1	2.1	51	<i>47e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.2	2	16	460	<i>30e-2/5e4</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	2.4	17	86	<i>33e-1/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1.5	17	100	<i>75e-2/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1.3	1.4	23	<i>69e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	2.3	4.7	<i>25e-1/9e3</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.6	65	3700	<i>12e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	1	12	4.4	58	61	79	62	62	92	POEMS [20]
PSO	1	1.4	5.2	130	<i>92e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1.5	42	140	260	<i>89e-2/1e5</i>	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1.6	43	<i>31e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	2.9	770	<i>12e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.5	2.9	1.2	1.6	1.2	1.3	1.3	1.3	1.2	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.4	4.1	3.7	28	37	180	370	670	1600	VNS (Garcia) [11]

Table 89: 10-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

17 Schaffer F7, condition 10											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.2	3.5	18	19	130	1100	<i>14e-4/5e5</i>	.	.	ALPS [17]
AMaLGaM IDEA	1	1	2.8	3.8	1.5	1.7	2.3	3.2	4.1	4	AMaLGaM IDEA [4]
avg NEWUOA	1	1.1	2.2	990	<i>10e-1/3e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.3	4	11	6.4	7.3	<i>18e-3/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	1	79	53	<i>36e-1/8e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	56	67	35	27	12	9.4	6.9	6.2	6.6	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.4	1.6	1.1	1.7	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	3.9	14	620	<i>15e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	110	2e4	<i>83e-2/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	1	1.5	5.5	6.7	4.9	15	<i>28e-3/2e3</i>	.	.	.	DEPSO [12]
DIRECT	1	1	1.3	3.7	7.2	23	<i>44e-4/1e4</i>	.	.	.	DIRECT [25]
EDA-PSO	1	1.1	2.4	44	22	13	11	9.4	8.8	9.4	EDA-PSO [6]
full NEWUOA	1	2.1	3.1	290	<i>95e-2/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.2	3	5400	<i>15e-1/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1	1.5	4.8	77	45	210	1500	<i>11e-3/1e5</i>	.	.	simple GA [22]
GLOBAL	1	1.2	3.9	<i>27e-1/2e3</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.6	1.8	3.3	2.2	3.6	5	8.6	12	iAMaLGaM IDEA [4]
LSfminbnd	1	4.1	35	<i>26e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1	110	960	<i>73e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.2	2.8	5	8.9	15	21	21	26	53	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1400	<i>18e-1/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	2.4	19	4200	6600	<i>11e-1/1e5</i>	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1.2	1.2	450	<i>77e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	2.9	1.4	2100	<i>14e-1/2e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.9	3500	<i>32e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	290	91	23	15	33	58	63	140	250	POEMS [20]
PSO	1	1.3	1.6	5	230	1e3	<i>52e-3/1e5</i>	.	.	.	PSO [7]
PSO_Bounds	1	1.2	1.5	29	320	1e3	1400	<i>71e-3/1e5</i>	.	.	PSO_Bounds [8]
Monte Carlo	1	1.3	3.2	<i>21e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1.5e4	8300	<i>12e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1.6	1	1.1	1.3	1.3	1	1	1.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	5.7	1.4	1	2.2	7.7	28	330	<i>39e-8/7e6</i>	VNS (Garcia) [11]

Table 90: 10-D, running time excess $\text{ERT}/\text{ERT}_{\text{best}}$ on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000												Comparison
$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	$\Delta\text{ftarget}$ $\text{ERT}_{\text{best}}/D$	
ALPS	1	3.2	13	20	60	4700	<i>19e-3/5e5</i>	.	.	.	ALPS [17]	
AMaLGaM IDEA	1.2	1.8	2.9	2.8	1.4	1.5	2.2	2.3	2.7	2.4	AMaLGaM IDEA [4]	
avg NEWUOA	1	10	73	<i>32e-1/9e4</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	2.3	8.8	13	6.4	19	<i>17e-2/2e3</i>	.	.	.	BayEDAcG [10]	
BFGS	1.7	160	5e3	<i>16e+0/8e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1.1	110	31	24	5.2	3.6	2.8	3	3.1	4.1	Cauchy EDA [24]	
BIPOP-CMA-ES	1	3.1	1	1	1	1	1.2	1.1	1.1	1.2	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	4	110	<i>40e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1.4	17	1400	8.1e4	<i>19e-1/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	1	4.4	4.3	10	13	<i>19e-2/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	1	1	2.3	8.1	4.2	28	<i>38e-3/1e4</i>	.	.	.	DIRECT [25]	
EDA-PSO	1	2.1	28	42	9.2	6	7.5	21	79	<i>43e-6/1e5</i>	EDA-PSO [6]	
full NEWUOA	1.1	13	120	1700	<i>39e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.1	1.6	800	<i>51e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1	1	57	85	120	<i>88e-3/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	1	1.9	84	<i>90e-1/2e3</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.1	2.1	1.6	3.3	1.4	2.9	3.1	4.8	6.5	9.1	iAMaLGaM IDEA [4]	
LSfminbnd	1	15	210	<i>66e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1.1	230	<i>19e+0/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1.1	3.4	2.5	6.1	12	49	<i>13e-3/5e4</i>	.	.	.	MA-LS-Chain [21]	
MCS (Neum)	1	1	57	<i>51e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	3.5	510	8400	<i>32e-1/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1.1	2.8	72	3500	<i>34e-1/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1.1	99	560	<i>51e-1/4e4</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	2	10	2.8e5	<i>14e+0/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	2.1	530	19	28	42	130	240	450	<i>24e-3/1e5</i>	.	POEMS [20]	
PSO	1	1.7	3.5	2400	2e3	<i>11e-1/1e5</i>	.	.	.	.	PSO [7]
PSO_Bounds	1.1	2.5	10	140	580	880	<i>38e-2/1e5</i>	.	.	.	PSO_Bounds [8]	
Monte Carlo	1	1.4	3300	<i>72e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	8700	<i>40e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	3.3	4.4	2.8	1.2	1.1	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	2.7	1.7	1.1	1.8	22	93	1500	<i>85e-6/6e6</i>	.	VNS (Garcia) [11]	

Table 91: 10-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

19 Griewank-Rosenbrock F8F2											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	410	7.7e4	550	<i>74e-3/5e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1.1	160	7300	83	7.7	8.8	8.7	8.7	8.6	AMaLGaM IDEA [4]
avg NEWUOA	1	1	48	7.1e5	<i>83e-2/1e5</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.3	210	<i>20e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1.7	1.9e4	<i>51e-1/8e3</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	6.8	1400	3.4e6	<i>14e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	52	9400	9.8	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	63	8.7e4	<i>55e-2/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1.1	7100	1.5e7	<i>13e-1/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	1	1	210	<i>29e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1	1	16	<i>11e-2/1e4</i>	.	.	.	.	DIRECT [25]
EDA-PSO	1	1.1	130	3.7e5	1300	<i>73e-2/1e5</i>	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1.4	150	1.4e5	<i>11e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.1	3.6e4	1.5e6	<i>16e-1/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1	1.1	1e3	1.7e5	290	<i>14e-2/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	1	1.2	370	1.2e5	<i>15e-1/2e3</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	78	2.5e5	370	73	110	110	110	110	iAMaLGaM IDEA [4]
LSfminbnd	1	3.1	200	1.4e6	<i>18e-1/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1	55	2700	<i>17e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.1	120	8600	87	<i>13e-2/5e4</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	<i>16e-3/4e3</i>	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	28	2.8e4	<i>24e-2/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1.1	24	1.2e4	<i>26e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	2.1	27	3.2e5	<i>63e-2/1e5</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.5	6500	2.8e7	<i>18e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	380	2500	2.1e5	1400	<i>57e-2/1e5</i>	.	.	.	.	POEMS [20]
PSO	1	1.3	110	3.7e5	<i>51e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1.1	120	9.2e5	<i>57e-2/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1.1	500	<i>31e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	2.5	6.5e5	<i>24e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	54	1.6e4	17	<i>10e-2/1e4</i>	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.4	220	3.1e4	1900	<i>60e-3/5e6</i>	.	.	.	.	VNS (Garcia) [11]

Table 92: 10-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

20 Schwefel $x*\sin(x)$											
Δt_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δt_{target}
ERT_{best}/D	2.58	3	3.19	1540	55000	56700	57300	57600	58100	58900	ERT_{best}/D
ALPS	31	52	61	1.5	10	9.7	9.6	9.6	9.6	9.7	ALPS [17]
AMaLGaM IDEA	8.1	9.6	11	18	270	260	260	260	260	250	AMaLGaM IDEA [4]
avg NEWUOA	1.5	1.3	1.2	37	<i>12e-1/8e3</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	16	22	30	<i>27e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.6	1.9	2.4	1.1	<i>65e-2/1e4</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	110	140	140	<i>21e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	4.4	5.1	5.5	3.6	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.9	3.2	3.3	3.3	<i>83e-2/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	27	29	30	1.9	270	260	260	260	250	250	DASA [19]
DEPSO	11	14	15	1.1	<i>68e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	7.2	17	16	<i>14e-1/1e4</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	15	44	92	7.8	3.8	3.7	3.7	3.7	3.7	3.7	EDA-PSO [6]
full NEWUOA	2.6	2.2	2.1	10	<i>10e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	5.8	6	6.1	12	<i>85e-2/5e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	130	310	360	3.2	1.8	2	2.6	25	<i>18e-4/1e5</i>	.	simple GA [22]
GLOBAL	12	11	11	2.6	<i>11e-1/1e3</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	4.8	5.8	6.2	38	<i>24e-2/1e6</i>	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	9.6	11	13	3.5	<i>81e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	200	250	300	8.3	<i>98e-2/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	7.4	8.5	9.3	2.2	1.1	1.1	1.1	1.1	1.1	1.1	MA-LS-Chain [21]
MCS (Neum)	4.8	4.6	4.4	1	<i>77e-2/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1.5	1.9	2.3	16	<i>75e-2/1e5</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1.7	2.1	2.3	5.7	<i>81e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1	1	1.9	<i>69e-2/1e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	2.7	3	3.1	7.2	<i>47e-2/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	95	95	97	1.1	12	12	12	12	12	12	POEMS [20]
PSO	6.8	8.9	10	1.5	<i>57e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	9.4	29	38	2	5.1	7.1	7.1	7.1	7	7.4	PSO_Bounds [8]
Monte Carlo	210	2400	8200	<i>29e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	3	3.1	3.1	1.7	<i>67e-2/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.4	4.6	4.8	3.1	<i>55e-2/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	11	11	11	1.2	52	50	50	49	49	51	VNS (Garcia) [11]

Table 93: 10-D, running time excess ERT/ERT_{best} on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

21 Gallagher 101 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	21	4.5	5	5.8	6.6	7.3	8	4.6	ALPS [17]
AMaLGaM IDEA	1	1	27	140	120	120	110	110	100	48	AMaLGaM IDEA [4]
avg NEWUOA	1	1	3.2	8.2	4.7	4.7	4.5	4.3	4.1	1.9	avg NEWUOA [31]
BayEDAcG	1	1	48	27	32	<i>19e-1/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1	1	4.6	2.9	2.8	2.7	2.7	2.6	2.5	2	BFGS [30]
Cauchy EDA	1	1	79	340	320	310	300	290	280	120	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	5.9	28	16	15	15	14	14	6.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	9.7	6.1	5.1	5	4.9	4.6	4.5	2	(1+1)-CMA-ES [2]
DASA	1	1	170	500	430	420	410	390	370	170	DASA [19]
DEPSO	1	1	11	26	19	19	18	18	17	7.8	DEPSO [12]
DIRECT	1	1	2.5	7.5	17	36	35	33	34	17	DIRECT [25]
EDA-PSO	1	1	53	1200	920	900	870	830	800	360	EDA-PSO [6]
full NEWUOA	1	1	4.4	7.3	4.4	4.3	4.2	4	3.8	1.7	full NEWUOA [31]
G3-PCX	1	1	5	13	9	8.8	8.6	8.2	7.8	3.5	G3-PCX [26]
simple GA	1	1	91	85	95	97	130	120	120	260	simple GA [22]
GLOBAL	1	1	3.6	1	1	1	1	1	1	1	GLOBAL [23]
iAMaLGaM IDEA	1	1	3.2	49	44	44	43	41	40	18	iAMaLGaM IDEA [4]
LSfminbnd	1	1	99	100	170	160	160	150	140	65	LSfminbnd [28]
LSstep	1	1	690	630	330	320	320	300	290	<i>91e-1/1e4</i>	LSstep [28]
MA-LS-Chain	1	1	7.5	66	43	42	41	39	38	17	MA-LS-Chain [21]
MCS (Neum)	1	1	1	20	10	10	10	9.5	9.1	4.9	MCS (Neum) [18]
NELDER (Han)	1	1	20	16	16	16	15	14	14	6.2	NELDER (Han) [16]
NELDER (Doe)	1	1	8.4	6	3.7	3.6	3.5	3.4	3.3	1.6	NELDER (Doe) [5]
NEWUOA	1	1	2.1	7.4	4.8	4.7	4.6	4.4	4.2	1.9	NEWUOA [31]
(1+1)-ES	1	1	9.8	20	18	18	17	17	16	7.1	(1+1)-ES [1]
POEMS	1	1	290	1800	1500	1500	1400	1300	1300	580	POEMS [20]
PSO	1	1	1200	510	340	330	330	310	300	130	PSO [7]
PSO_Bounds	1	1	560	1200	1500	1500	1400	1300	1300	580	PSO_Bounds [8]
Monte Carlo	1	1	570	6.3e4	<i>20e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	16	18	12	12	12	11	11	4.8	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	5.9	14	10	10	9.9	9.5	9.1	4.1	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	10	22	30	46	66	68	68	32	VNS (Garcia) [11]

Table 94: 10-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

22 Gallagher 21 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	33	7	12	15	18	24	24	27	ALPS [17]
AMaLGaM IDEA	1	1	8.8	490	4900	4700	4600	4500	3800	3e3	AMaLGaM IDEA [4]
avg NEWUOA	1	1	3.6	2.6	2.1	2.1	2	2	1.7	1.4	avg NEWUOA [31]
BayEDAcG	1	1	62	31	<i>20e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	6.6	3.1	4.4	4.2	4.2	4.1	3.5	5.7	BFGS [30]
Cauchy EDA	1	1	450	360	<i>20e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	29	58	200	190	190	180	150	120	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	9.3	3.7	3.4	3.3	3.2	3.2	2.7	2.2	(1+1)-CMA-ES [2]
DASA	1	1	320	220	190	190	190	190	160	140	DASA [19]
DEPSO	1	1	66	47	<i>51e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	3.5	5.1	<i>69e-2/1e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1	1600	980	<i>20e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	3.6	1.1	1.9	1.8	1.8	1.8	1.5	1.3	full NEWUOA [31]
G3-PCX	1	1	9.3	5.6	5.6	5.5	5.4	5.3	4.5	3.7	G3-PCX [26]
simple GA	1	1	130	720	<i>20e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	4.5	1	1	1	1	1	1	1	GLOBAL [23]
iAMaLGaM IDEA	1	1	24	170	1200	1200	1100	1100	930	750	iAMaLGaM IDEA [4]
LSfminbnd	1	1	170	26	48	47	48	49	42	72	LSfminbnd [28]
LSstep	1	1	330	89	230	<i>20e-1/1e4</i>	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	55	510	540	520	500	490	410	330	MA-LS-Chain [21]
MCS (Neum)	1	1	1.1	3.2	6.4	6.1	6	5.9	4.9	12	MCS (Neum) [18]
NELDER (Han)	1	1	1	7.4	10	9.6	9.4	9.3	7.8	6.2	NELDER (Han) [16]
NELDER (Doe)	1	1	18	2.5	5	4.9	4.9	4.8	4	3.3	NELDER (Doe) [5]
NEWUOA	1	1	6.7	1.8	2.5	2.4	2.4	2.4	2	1.7	NEWUOA [31]
(1+1)-ES	1	1	47	17	13	13	13	13	11	8.9	(1+1)-ES [1]
POEMS	1	1	4400	1400	1e3	990	960	940	790	640	POEMS [20]
PSO	1	1	3700	1400	2200	2100	2100	2e3	1700	1400	PSO [7]
PSO_Bounds	1	1	740	1400	2200	2100	2100	2100	1700	1400	PSO_Bounds [8]
Monte Carlo	1	1	2500	<i>20e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	35	5	5.4	5.3	5.3	5.4	4.7	4.1	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	22	61	220	210	210	200	170	140	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	39	160	1100	1400	1500	1500	1200	980	VNS (Garcia) [11]

Table 95: 10-D, running time excess ERT/ERT_{best} on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

23 Katsuuras											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	1.7	42	1e3	<i>14e-2/5e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1	1.6	10	1	1	1	1	1	1	AMaLGaM IDEA [4]
avg NEWUOA	1	1	11	2.6	<i>21e-2/1e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1	1.3	<i>16e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	17	130	<i>11e-1/5e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	1	2.3	1700	<i>11e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	2	21	2.7	1.3	1.2	1.2	1.2	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	3.4	2.9	<i>22e-2/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	5	28	4300	<i>15e-2/1e6</i>	.	.	.	.	DASA [19]
DEPSO	1	1	1.7	<i>18e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	2.1	2.1	<i>65e-2/1e4</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1	1.7	590	<i>87e-2/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	13	2.9	44	<i>19e-2/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1	1.8	4.9	98	<i>19e-2/4e4</i>	.	.	.	.	G3-PCX [26]
simple GA	1	1	1.4	390	<i>85e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	2.1	1	<i>32e-2/700</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.8	5.7	3.6	1.1	1	1	1	1	iAMaLGaM IDEA [4]
LSfminbnd	1	1	2.1	26	<i>66e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1	1	1.2	31	<i>51e-2/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	2	2.3	17	38	35	<i>44e-3/5e4</i>	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	3.4	15	<i>56e-2/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	1	5.7	40	80	<i>59e-3/1e5</i>	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1	1.7	1.4	11	<i>97e-3/2e4</i>	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1	7.5	3.6	<i>34e-2/7e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1	4.4	7.6	2900	<i>14e-2/1e6</i>	.	.	.	.	(1+1)-ES [1]
POEMS	1	1	15	31	19	36	69	<i>63e-3/1e5</i>	.	.	POEMS [20]
PSO	1	1	1.7	91	<i>42e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1	1.5	130	<i>67e-2/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1	1.6	530	<i>61e-2/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	2.1	2.2	<i>32e-2/5e3</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	2.4	17	12	<i>11e-2/1e4</i>	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	2.6	18	34	140	420	680	670	650	VNS (Garcia) [11]

Table 96: 10-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

24 Lunacek bi-Rastrigin												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1	24	10	<i>44e-1/5e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	5.5	18	8.3	<i>78e-2/1e6</i>	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	1	1.4	<i>21e+0/8e3</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	19	<i>37e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	350	<i>81e+0/4e3</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	51	<i>27e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.2	2.7	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	8.6	14	<i>20e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1300	<i>31e+0/1e6</i>	.	.	.	.	.	.	.	DASA [19]
DEPSO	1	6.8	<i>38e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	5.9	<i>19e+0/1e4</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	56	<i>23e+0/1e5</i>	.	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	2.6	<i>16e+0/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	16	<i>31e+0/5e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	1	120	<i>14e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	1	7.2	<i>62e+0/1e3</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	4.2	4.2	4.2	<i>66e-2/1e6</i>	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	1	20	<i>33e+0/1e4</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	3	170	<i>49e+0/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	5.7	<i>11e+0/5e4</i>	.	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	15	<i>30e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	8.2	22	<i>11e+0/1e5</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	4.7	2.6	<i>96e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1	<i>26e+0/7e3</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	140	740	<i>17e+0/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	48	140	<i>19e+0/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	1	8.1	140	<i>20e+0/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1	22	140	<i>22e+0/1e5</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	820	<i>60e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1e4	<i>12e+1/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.2	1	<i>91e-1/1e4</i>	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	4.8	3.7	<i>21e-1/8e6</i>	.	.	.	.	.	.	VNS (Garcia) [11]

Table 97: 20-D, running time excess ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

1 Sphere											
Δ target	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ target
ERT_{best}/D	0.05	0.28	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	ERT_{best}/D
ALPS	1	64	150	320	520	710	920	1100	1400	1800	ALPS [17]
AMaLGaM IDEA	1	58	55	130	200	260	320	390	440	550	AMaLGaM IDEA [4]
avg NEWUOA	1	18	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	avg NEWUOA [31]
BayEDAcG	1	49	110	200	310	410	500	610	710	1e3	BayEDAcG [10]
BFGS	1	7.4	1	1	1	1	1	1	1	1	BFGS [30]
Cauchy EDA	1	840	730	1600	2500	3500	4300	5200	6100	7800	Cauchy EDA [24]
BIPOP-CMA-ES	1	9.2	7.9	14	20	26	33	39	45	57	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	12	5.4	9.2	13	17	21	25	29	37	(1+1)-CMA-ES [2]
DASA	1	60	26	45	66	86	120	150	200	300	DASA [19]
DEPSO	1	31	30	81	190	330	560	810	1400	<i>44e-7/2e3</i>	DEPSO [12]
DIRECT	1	8.6	48	110	220	360	490	680	870	1400	DIRECT [25]
EDA-PSO	1	19	450	1100	1700	2300	2900	3600	4200	5400	EDA-PSO [6]
full NEWUOA	1	41	5.4	5.4	5.5	5.5	5.5	5.5	5.5	5.5	full NEWUOA [31]
G3-PCX	1	31	8	13	18	23	27	32	37	48	G3-PCX [26]
simple GA	1	130	880	1900	3200	<i>1.2e4</i>	<i>3.1e4</i>	2e5	6.7e5	<i>74e-5/1e5</i>	simple GA [22]
GLOBAL	1	37	8	8	8	8	8	8	8	8	GLOBAL [23]
iAMaLGaM IDEA	1	13	27	57	88	120	150	180	210	270	iAMaLGaM IDEA [4]
LSfminbnd	1	43	9.3	10	10	10	10	10	10	10	LSfminbnd [28]
LSstep	1	850	160	170	180	180	180	180	180	180	LSstep [28]
MA-LS-Chain	1	19	21	51	78	100	120	140	160	200	MA-LS-Chain [21]
MCS (Neum)	1	1	2.4	6.4	6.8	7	7	7	7	7	MCS (Neum) [18]
NELDER (Han)	1	9.1	5.2	12	19	27	32	36	40	49	NELDER (Han) [16]
NELDER (Doe)	1	6.8	3.3	6.7	11	16	21	27	32	40	NELDER (Doe) [5]
NEWUOA	1	7.5	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	11	4.9	8.1	11	15	18	22	25	31	(1+1)-ES [1]
POEMS	1	830	180	400	870	1400	1800	2300	2800	3800	POEMS [20]
PSO	1	16	22	3400	3400	3500	3600	3600	3700	3800	PSO [7]
PSO_Bounds	1	19	120	1500	2100	2800	3300	3800	4500	1.6e4	PSO_Bounds [8]
Monte Carlo	1	170	<i>29e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	19	3.8	5.8	7.2	9.1	11	12	14	17	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	13	7.1	12	18	23	29	34	39	50	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	28	10	17	23	29	36	41	48	60	VNS (Garcia) [11]

Table 98: 20-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	45	66	88	110	140	160	190	220	260	370	ALPS [17]	
AMaLGaM IDEA	22	29	35	43	50	56	62	68	76	88	AMaLGaM IDEA [4]	
avg NEWUOA	3.5	10	21	43	63	89	120	140	160	200	avg NEWUOA [31]	
BayEDAcG	31	42	54	64	76	94	100	<i>34e-5/2e3</i>	.	.	BayEDAcG [10]	
BFGS	9.1	15	20	24	26	27	27	27	28	28	BFGS [30]	
Cauchy EDA	190	310	410	510	610	710	800	900	990	1200	Cauchy EDA [24]	
BIPOP-CMA-ES	15	26	35	40	44	45	47	47	48	50	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	14	22	30	37	39	41	41	42	43	44	(1+1)-CMA-ES [2]	
DASA	5.6	7.8	10	14	18	23	28	34	39	49	DASA [19]	
DEPSO	12	23	42	66	110	500	<i>39e-3/2e3</i>	.	.	.	DEPSO [12]	
DIRECT	38	53	130	470	490	510	540	1200	<i>14e-1/5e3</i>	.	DIRECT [25]	
EDA-PSO	200	270	330	400	470	540	600	670	740	880	EDA-PSO [6]	
full NEWUOA	23	94	450	3800	<i>47e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]	
G3-PCX	15	47	130	210	320	420	550	650	760	990	G3-PCX [26]	
simple GA	300	460	3200	6800	7.3e4	<i>29e-1/1e5</i>	.	.	.	.	simple GA [22]	
GLOBAL	8.4	13	18	23	26	30	33	49	51	63	GLOBAL [23]	
iAMaLGaM IDEA	11	17	22	27	30	33	36	40	43	49	iAMaLGaM IDEA [4]	
LSfminbnd	1	1	1	1	1	1	1	1	1	1	LSfminbnd [28]	
LSstep	17	17	17	17	17	17	17	17	17	17	LSstep [28]	
MA-LS-Chain	7.6	11	15	19	23	27	32	36	43	76	MA-LS-Chain [21]	
MCS (Neum)	1	2.2	5.4	14	21	41	43	45	45	<i>30e-8/4e3</i>	MCS (Neum) [18]	
NELDER (Han)	4.3	6	7	7.8	8.6	9.2	9.7	10	11	12	NELDER (Han) [16]	
NELDER (Doe)	5.3	8.5	13	17	19	23	28	32	36	48	NELDER (Doe) [5]	
NEWUOA	1.9	6.8	18	42	71	92	130	150	170	220	NEWUOA [31]	
(1+1)-ES	270	1800	6900	1.6e4	2.6e4	3.8e4	7.4e4	1.8e5	3.7e5	<i>59e-5/1e6</i>	(1+1)-ES [1]	
POEMS	150	190	250	300	340	410	450	500	560	660	POEMS [20]	
PSO	16	1900	4600	4600	4600	4600	4500	4500	4500	4500	PSO [7]	
PSO_Bounds	120	230	360	530	840	1400	1800	2100	2300	2600	PSO_Bounds [8]	
Monte Carlo	<i>12e+4/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]	
Rosenbrock	1	1.2	1.4	1.6	5.8	18	29	66	73	73	Rosenbrock [27]	
IPOP-SEP-CMA-ES	4.8	6.2	7.5	8.3	9.1	9.7	10	11	11	13	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	35	57	72	82	88	95	97	98	98	99	VNS (Garcia) [11]	

Table 99: 20-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

3 Rastrigin separable											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.05	12.7	253	381	382	382	382	382	382	383	ERT_{best}/D
ALPS	19	54	50	190	230	240	270	310	400	3200	ALPS [17]
AMaLGaM IDEA	17	43	27	<i>40e-1/1e6</i>	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	88	1e3	<i>97e+0/1e4</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	15	85	<i>73e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	570	<i>28e+1/6e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	2900	450	<i>69e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	25	6.7	12	<i>40e-1/3e5</i>	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	37	840	<i>92e+0/1e4</i>	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	210	5.9	1	8.3	35	35	35	35	36	36	DASA [19]
DEPSO	42	130	<i>84e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	28	<i>43e+0/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	22	150	44	<i>70e-1/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	180	650	<i>88e+0/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	24	1.2e4	<i>13e+1/5e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	26	190	29	3700	<i>21e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	19	1400	<i>15e+1/2e3</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	24	19	38	1.8e4	<i>20e-1/1e6</i>	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	190	1.3	<i>19e+0/6e3</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	4e3	27	1.5	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	20	12	7	95	160	160	160	160	160	160	MA-LS-Chain [21]
MCS (Neum)	1	1	28	<i>13e+0/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	42	260	<i>81e+0/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	24	71	<i>47e+0/2e4</i>	.	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	41	7500	<i>13e+1/6e3</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	360	2.3e4	<i>81e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	4e3	43	9.6	69	140	140	150	150	150	160	POEMS [20]
PSO	19	21	<i>21e+0/1e5</i>	.	.	.	.	.	.	.	PSO [7]
PSO_Bounds	28	330	120	190	360	360	360	380	400	430	PSO_Bounds [8]
Monte Carlo	32	<i>26e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	560	<i>23e+1/7e3</i>	.	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	28	5.2	10	<i>60e-1/1e4</i>	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	20	8.1	8.3	340	490	520	560	620	630	630	VNS (Garcia) [11]

Table 100: 20-D, running time excess ERT/ERT_{best} on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

4 Skew Rastrigin-Bueche separable											
Δ target	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ target
ERT_{best}/D	0.05	37.3	236	381	383	384	385	386	388	7050	ERT_{best}/D
ALPS	92	29	150	9800	<i>30e-1/2e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	79	20	<i>14e+0/1e6</i>	.	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	110	1400	<i>12e+1/2e4</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	83	40	<i>69e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1700	<i>40e+1/8e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	5100	4300	<i>11e+1/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	37	2.4	<i>12e+0/3e5</i>	.	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	46	<i>14e+1/1e4</i>	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	290	2.1	1	130	1700	1700	1700	1700	1700	91	DASA [19]
DEPSO	120	120	<i>10e+1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	11	<i>88e+0/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	20	56	6e3	<i>15e+0/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	270	4e3	<i>13e+1/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	79	<i>19e+1/5e4</i>	.	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	100	80	65	3800	<i>34e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	160	<i>20e+1/4e3</i>	.	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	61	7.1	<i>13e+0/1e6</i>	.	.	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	280	1.2	<i>49e+0/7e3</i>	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	4400	9.5	1.6	1	1	1	1	1	1	1	LSstep [28]
MA-LS-Chain	60	6.2	53	<i>30e-1/1e5</i>	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	<i>21e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	40	<i>13e+1/1e4</i>	.	.	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	35	1600	<i>11e+1/2e4</i>	.	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	55	4300	<i>17e+1/1e4</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	82	3.8e5	<i>13e+1/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	4e3	18	13	140	220	240	250	250	250	14	POEMS [20]
PSO	44	8.6	5900	<i>23e+0/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	66	130	190	290	300	360	360	370	380	21	PSO_Bounds [8]
Monte Carlo	130	<i>33e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	650	<i>20e+1/8e3</i>	.	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	55	2.5	<i>14e+0/1e4</i>	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	110	3.2	27	2.8e4	1.3e5	1.3e5	<i>20e-1/4e6</i>	.	.	.	VNS (Garcia) [11]

Table 101: 20-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

5 Linear slope											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	51	160	210	250	280	300	310	320	330	ALPS [17]
AMaLGaM IDEA	1	34	75	80	80	80	80	80	80	80	AMaLGaM IDEA [4]
avg NEWUOA	1	2.7	2.7	3.2	3.3	3.3	3.3	3.3	3.3	3.3	avg NEWUOA [31]
BayEDAcG	1	67	150	200	200	200	210	210	210	210	BayEDAcG [10]
BFGS	1	1.4	2.4	2.7	2.8	2.8	2.8	2.8	2.8	2.8	BFGS [30]
Cauchy EDA	1	110	160	170	170	170	170	170	170	170	Cauchy EDA [24]
BIPOP-CMA-ES	1	2.7	5.1	6.2	6.3	6.3	6.3	6.3	6.3	6.3	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.6	3.1	3.6	3.7	3.7	3.7	3.7	3.7	3.7	(1+1)-CMA-ES [2]
DASA	1	14	24	29	34	38	43	47	52	64	DASA [19]
DEPSO	1	16	39	46	48	48	48	48	48	48	DEPSO [12]
DIRECT	1	62	180	220	230	230	230	230	230	230	DIRECT [25]
EDA-PSO	1	5.2	27	34	37	39	39	39	39	39	EDA-PSO [6]
full NEWUOA	1	6.4	6.2	6.5	6.6	6.6	6.6	6.6	6.6	6.6	full NEWUOA [31]
G3-PCX	1	7.5	19	25	26	27	27	27	27	27	G3-PCX [26]
simple GA	1	570	2200	4600	7500	1.1e4	1.4e4	1.8e4	2.2e4	2.3e5	simple GA [22]
GLOBAL	1	9.5	9.9	11	11	11	11	11	11	11	GLOBAL [23]
iAMaLGaM IDEA	1	4.4	9.8	11	11	11	11	11	11	11	iAMaLGaM IDEA [4]
LSfminbnd	1	14	16	16	16	16	16	16	16	16	LSfminbnd [28]
LSstep	1	150	180	190	190	190	190	190	190	190	LSstep [28]
MA-LS-Chain	1	22	41	44	46	46	46	46	46	46	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	1	1	1	1	1	MCS (Neum) [18]
NELDER (Han)	1	3.8	7.4	8.8	9.2	9.2	9.2	9.2	9.2	9.2	NELDER (Han) [16]
NELDER (Doe)	1	2.6	5.2	6.2	6.3	6.4	6.4	6.4	6.4	6.4	NELDER (Doe) [5]
NEWUOA	1	1.2	1.2	1.5	1.6	1.6	1.6	1.6	1.6	1.6	NEWUOA [31]
(1+1)-ES	1	1.6	3.1	3.5	3.6	3.6	3.6	3.6	3.6	3.6	(1+1)-ES [1]
POEMS	1	180	260	310	330	350	350	350	350	350	POEMS [20]
PSO	1	4.7	4.3e4	4.3e4	4.3e4	4.3e4	4.3e4	4.3e4	4.3e4	4.3e4	PSO [7]
PSO_Bounds	1	4.5	160	160	160	160	160	160	160	160	PSO_Bounds [8]
Monte Carlo	1	2.5e6	<i>11e+1/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	3.8	4.2	4.3	4.3	4.3	4.3	4.3	4.3	4.3	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	2.9	6.2	7.3	7.7	7.7	7.7	7.7	7.7	7.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	4.9	6.8	7.6	7.8	7.8	7.8	7.8	7.8	7.8	VNS (Garcia) [11]

Table 102: 20-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	6 Attractive sector											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	59	25	34	54	64	78	100	150	370	<i>14e-7/2e5</i>	ALPS [17]	
AMaLGaM IDEA	26	22	19	22	21	22	22	21	22	22	AMaLGaM IDEA [4]	
avg NEWUOA	2.3	1.1	1	1	1	1	1	1	1	1	avg NEWUOA [31]	
BayEDAcG	46	41	<i>60e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.2	2.7	3.6	4.7	4.7	4.9	5	4.8	4.9	61	BFGS [30]	
Cauchy EDA	6200	1500	1e3	1700	<i>17e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	2.9	2.2	1.5	1.7	1.6	1.6	1.6	1.5	1.6	1.6	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1.9	4.5	13	180	1200	<i>13e-1/1e4</i>	.	.	.	.	(1+1)-CMA-ES [2]
DASA	12	6.8	9.9	19	25	33	49	58	63	74	DASA [19]	
DEPSO	11	7.5	12	64	<i>13e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	18	31	<i>40e+0/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	27	46	40	45	44	44	44	44	44	44	EDA-PSO [6]	
full NEWUOA	5	1.9	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	full NEWUOA [31]	
G3-PCX	4.1	1.4	1.4	2	2.1	2.1	2.2	2.2	2.3	2.4	G3-PCX [26]	
simple GA	320	130	2e3	<i>11e+0/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	5	2.9	3.6	4.9	8.5	<i>42e-3/2e3</i>	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	5.1	5.6	5.4	6.8	7.1	7.7	7.8	7.7	8	8.3	iAMaLGaM IDEA [4]	
LSfminbnd	9	31	160	760	1100	960	<i>72e-1/1e4</i>	.	.	.	LSfminbnd [28]	
LSstep	140	260	2300	<i>59e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	11	4.9	7.5	8.9	8	7.7	7.2	6.7	6.5	6	MA-LS-Chain [21]	
MCS (Neum)	1.8	33	<i>42e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	2.2	2.4	2.7	3.3	3.2	3.5	3.5	3.5	4	7.4	NELDER (Han) [16]	
NELDER (Doe)	1.5	2.3	9.1	20	28	65	110	430	<i>46e-5/2e4</i>	.	NELDER (Doe) [5]	
NEWUOA	1	1	1	1.3	1.4	1.5	1.6	1.6	1.7	1.7	NEWUOA [31]	
(1+1)-ES	2	2.2	2.1	2.8	3.9	5.2	6.1	6.5	6.4	6.7	(1+1)-ES [1]	
POEMS	89	26	31	37	36	36	36	35	36	37	POEMS [20]	
PSO	6.4	280	1100	1400	980	820	710	620	570	790	PSO [7]	
PSO_Bounds	9.5	45	120	150	140	140	140	130	160	220	PSO_Bounds [8]	
Monte Carlo	<i>2.4e5</i>	<i>48e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.1	3.9	31	76	210	230	810	<i>21e-2/1e4</i>	.	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	3.2	2.1	1.7	1.9	1.9	1.9	1.9	1.9	2	2	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	5	2.8	1.9	1.9	1.7	1.7	1.7	1.6	1.6	1.6	VNS (Garcia) [11]	

Table 103: 20-D, running time excess ERT/ERT_{best} on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

7 Step-ellipsoid											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	5	26	30	850	930	<i>48e-2/2e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	3	10	3.6	2.1	1.3	1	1	1	1	1	AMaLGaM IDEA [4]
avg NEWUOA	7.1	1.4	100	<i>51e-1/2e4</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	4.3	31	57	<i>11e+0/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	69	<i>67e+1/100</i>	.	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	130	130	44	29	18	14	14	14	14	14	Cauchy EDA [24]
BIPOP-CMA-ES	2.5	2.8	1	4.9	3.5	2.2	2.2	2.2	2.2	2.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.6	16	30	54	300	<i>92e-2/1e4</i>	.	.	.	.	(1+1)-CMA-ES [2]
DASA	16	49	1.8e4	<i>13e+0/4e5</i>	.	.	.	.	.	.	DASA [19]
DEPSO	2.7	7.9	18	<i>77e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	3.5	7	<i>15e+0/6e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	2.5	65	26	950	<i>15e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	14	1.9	4.6	700	<i>27e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	4.7	2.8	760	<i>12e+0/1e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	5.8	180	77	<i>32e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	4.6	2.9	<i>22e+0/700</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	2	5.8	1.7	1	1	1.3	1.3	1.3	1.3	1.3	iAMaLGaM IDEA [4]
LSfminbnd	23	21	1e3	<i>15e+0/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	230	180	2200	<i>29e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	3.4	5.4	4.3	120	360	390	390	390	390	380	MA-LS-Chain [21]
MCS (Neum)	1	57	<i>38e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	4.5	4.6	2200	<i>16e+0/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	2.5	1	370	<i>97e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	3.6	43	<i>18e+0/2e4</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	3.1	1100	<i>27e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	440	55	21	2e3	3100	<i>12e-1/1e5</i>	.	.	.	.	POEMS [20]
PSO	2.5	4.8	430	<i>62e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	3.3	26	9700	<i>22e+0/1e5</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	3.2	2.1e5	<i>10e+1/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	500	<i>38e+1/3e3</i>	.	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.4	2.8	2.3	4	2.4	1.5	1.5	1.5	1.5	1.5	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1.1	3.7	5.4	78	72	2400	2400	2400	2400	2300	VNS (Garcia) [11]

Table 104: 20-D, running time excess ERT/ERT_{best} on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

8 Rosenbrock original											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	70	51	100	460	600	740	1e3	1200	3100	<i>26e-6/2e5</i>	ALPS [17]
AMaLGaM IDEA	25	16	20	18	19	20	20	21	21	22	AMaLGaM IDEA [4]
avg NEWUOA	2	1.6	1	1	1	1	1	1	1	1	avg NEWUOA [31]
BayEDAcG	55	35	<i>48e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.9	2	1.9	1.3	1.2	1.2	1.2	1.2	1.2	1.2	BFGS [30]
Cauchy EDA	360	200	200	180	210	250	260	290	360	550	Cauchy EDA [24]
BIPOP-CMA-ES	4	2.4	4.2	4.2	4.3	4.5	4.5	4.6	4.6	4.7	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.7	1.8	3.9	6.5	6.6	6.6	6.6	6.7	6.6	6.7	(1+1)-CMA-ES [2]
DASA	15	26	34	57	120	200	280	350	420	550	DASA [19]
DEPSO	16	16	<i>17e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	25	82	<i>64e+0/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	220	110	190	220	260	330	410	<i>17e-5/1e5</i>	.	.	EDA-PSO [6]
full NEWUOA	3.4	2.6	1.4	1.6	1.6	1.7	1.7	1.7	1.7	1.7	full NEWUOA [31]
G3-PCX	3.9	2	2.7	5.6	5.5	5.5	5.5	5.5	5.5	5.7	G3-PCX [26]
simple GA	480	250	<i>17e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	4.1	2.4	1.7	1.3	1.2	1.2	1.2	1.2	1.2	1.2	GLOBAL [23]
iAMaLGaM IDEA	13	6.4	8.6	9.2	9.5	9.8	10	10	10	11	iAMaLGaM IDEA [4]
LSfminbnd	7.1	17	9.6	120	710	720	<i>40e-1/1e4</i>	.	.	.	LSfminbnd [28]
LSstep	150	71	25	130	220	350	<i>12e-1/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	12	10	14	13	13	13	14	13	13	14	MA-LS-Chain [21]
MCS (Neum)	1.4	1.2	1.6	1.8	1.8	1.8	1.8	1.8	1.8	1.8	MCS (Neum) [18]
NELDER (Han)	3.2	2.9	3.4	3.9	4.1	4.5	4.9	5.1	5.3	5.6	NELDER (Han) [16]
NELDER (Doe)	3.2	3	2.9	4.9	5.5	6	6.5	7.2	7.7	9.2	NELDER (Doe) [5]
NEWUOA	1	1	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	2.5	11	13	120	120	140	160	180	200	240	(1+1)-ES [1]
POEMS	100	84	590	7600	<i>74e-1/1e5</i>	.	.	.	.	.	POEMS [20]
PSO	15	19	93	320	350	410	470	580	890	3300	PSO [7]
PSO_Bounds	88	160	540	450	1800	7200	<i>15e-2/1e5</i>	.	.	.	PSO_Bounds [8]
Monte Carlo	<i>80e+2/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2	1.1	4	25	28	35	42	55	62	670	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.5	1.7	5.6	5.6	5.7	5.7	5.8	5.8	5.8	5.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	6	3.1	6	6.3	6.3	6.4	6.4	6.4	6.4	6.4	VNS (Garcia) [11]

Table 105: 20-D, running time excess ERT/ERT_{best} on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	9 Rosenbrock rotated											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	4800	37	350	<i>48e-1/2e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	2e3	11	22	22	23	24	24	25	25	25	AMaLGaM IDEA [4]	
avg NEWUOA	230	1.5	1	1.2	1.2	1.3	1.3	1.2	1.2	1.2	avg NEWUOA [31]	
BayEDAcG	4800	27	<i>18e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	210	1.9	2.2	2.2	2.1	2.1	2	2	2	1.9	BFGS [30]	
Cauchy EDA	3.3e4	220	190	270	290	300	310	340	470	630	Cauchy EDA [24]	
BIPOP-CMA-ES	390	2.6	4.7	5.7	6	6.1	6.1	6.1	6.1	6.1	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	260	2.4	4.5	6.7	7	7	7	7	7	6.9	(1+1)-CMA-ES [2]	
DASA	2e3	77	210	1300	1500	1800	2100	2400	2700	3700	DASA [19]	
DEPSO	1400	25	<i>18e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	4.7	<i>22e+0/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	2.2e4	130	280	450	<i>14e-2/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	460	3	1.8	2.2	2.3	2.3	2.3	2.3	2.3	2.2	full NEWUOA [31]	
G3-PCX	410	3.6	2.9	3.8	4	4.1	4.1	4.1	4.1	4.2	G3-PCX [26]	
simple GA	4.4e4	270	<i>19e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	420	2	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	GLOBAL [23]	
iAMaLGaM IDEA	1400	7.5	9.6	11	12	12	12	12	12	13	iAMaLGaM IDEA [4]	
LSfminbnd	740	6.5	52	470	<i>32e-1/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1.5e4	130	<i>18e+0/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	820	7.3	17	25	27	29	31	31	30	30	MA-LS-Chain [21]	
MCS (Neum)	1	1	1	1.3	1.5	1.6	1.6	1.7	1.7	1.6	MCS (Neum) [18]	
NELDER (Han)	200	2.3	3.6	6.6	7.2	7.8	8.4	8.6	8.8	8.9	NELDER (Han) [16]	
NELDER (Doe)	150	1.4	3.3	6.1	6.6	7	7.5	7.9	8.4	9.4	NELDER (Doe) [5]	
NEWUOA	130	1.3	1	1	1	1	1	1	1	1	NEWUOA [31]	
(1+1)-ES	260	2.2	12	52	65	86	110	130	160	200	(1+1)-ES [1]	
POEMS	1e4	74	2e3	<i>99e-1/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	1600	40	670	<i>75e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	8.2e4	650	700	9700	<i>20e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	<i>68e+2/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	190	1.2	8.4	31	37	49	63	850	<i>35e-5/1e4</i>	.	Rosenbrock [27]	
IPOP-SEP-CMA-ES	320	2.2	6.9	7	7.2	7.3	7.3	7.3	7.2	7.2	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	510	3.2	6.9	8.2	8.7	8.7	8.7	8.6	8.6	8.5	VNS (Garcia) [11]	

Table 106: 20-D, running time excess ERT/ERT_{best} on f_{10} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

10 Ellipsoid											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	330	2500	<i>16e+1/2e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	3.9	1.9	1.8	2	1.9	1.7	1.7	1.8	1.8	2.1	AMaLGaM IDEA [4]
avg NEWUOA	1	1	1.5	2.6	3.1	3.1	3.6	3.9	4.2	5	avg NEWUOA [31]
BayEDAcG	<i>42e+3/2e3</i>	.	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.6	1	1	1	1	1.1	1.1	1.3	3.1	<i>77e-8/5e4</i>	BFGS [30]
Cauchy EDA	36	21	20	22	20	19	20	21	21	25	Cauchy EDA [24]
BIPOP-CMA-ES	3.1	1.9	1.9	1.8	1.6	1.3	1.2	1.1	1.1	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.5	1.7	1.7	1.7	1.4	1.2	1.1	1	1	1	(1+1)-CMA-ES [2]
DASA	390	1200	3400	<i>72e-1/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	<i>17e+3/2e3</i>	.	.	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	<i>94e+2/5e3</i>	.	.	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	480	<i>36e+1/1e5</i>	.	.	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	9.9	15	34	<i>67e-1/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	3.1	3.4	6.5	10	12	13	15	16	18	23	G3-PCX [26]
simple GA	<i>15e+3/1e5</i>	.	.	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	1.7	1	1	1.1	1.1	1.2	2	2.6	5.9	<i>19e-6/2e3</i>	GLOBAL [23]
iAMaLGaM IDEA	2.3	1.3	1.3	1.3	1.2	1	1	1	1	1.1	iAMaLGaM IDEA [4]
LSfminbnd	290	<i>22e+2/1e4</i>	.	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	<i>18e+3/1e4</i>	.	.	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	11	12	11	13	11	8.5	7.8	7.2	6.9	6.8	MA-LS-Chain [21]
MCS (Neum)	<i>72e+2/4e3</i>	.	.	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	2.9	5.3	390	<i>30e+0/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	2.2	4.2	30	<i>57e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1.2	1.1	1.7	2.6	3.3	3.3	4	4.3	4.7	5.8	NEWUOA [31]
(1+1)-ES	50	110	300	700	1e3	1e3	2200	3500	8700	<i>94e-5/1e6</i>	(1+1)-ES [1]
POEMS	5100	<i>12e+2/1e5</i>	.	.	.	.	.	.	.	.	POEMS [20]
PSO	1200	5600	<i>84e+1/1e5</i>	.	.	.	.	.	.	.	PSO [7]
PSO_Bounds	650	<i>41e+1/1e5</i>	.	.	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	<i>11e+4/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	27	140	<i>27e+1/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	7.2	3.8	3.1	2.9	2.4	2	1.8	1.7	1.6	1.6	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	8.2	5.7	4.8	4.7	4.2	3.4	3.1	2.9	2.8	2.7	VNS (Garcia) [11]

Table 107: 20-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	
Δf_{target} ERT_{best}/D											Δf_{target} ERT_{best}/D
ALPS	5	59	490	980	2200	<i>12e-2/2e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	7	3.3	5	3.7	1.9	1.6	1.7	1.8	1.8	1.9	AMaLGaM IDEA [4]
avg NEWUOA	6	11	15	11	5.7	5.1	5.6	5.5	5.8	6.1	avg NEWUOA [31]
BayEDAcG	4.9	250	<i>14e+1/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.9	1	1	1	1.3	2.6	150	<i>31e-4/1e4</i>	.	.	BFGS [30]
Cauchy EDA	100	71	64	44	22	20	22	24	25	26	Cauchy EDA [24]
BIPOP-CMA-ES	4.1	18	10	5.1	1.9	1.5	1.4	1.3	1.2	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.4	5.6	7	5.1	2.4	2.3	2.4	2.4	2.3	2	(1+1)-CMA-ES [2]
DASA	4.4	120	570	690	420	550	730	810	980	1500	DASA [19]
DEPSO	8.2	110	<i>95e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	2.1	23	<i>76e+0/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	4.3	74	1900	1.3e4	<i>79e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	5	40	57	45	21	18	36	88	<i>75e-5/1e4</i>	.	full NEWUOA [31]
G3-PCX	4	9.7	18	14	7	6.5	7.1	7.3	7.6	8	G3-PCX [26]
simple GA	4.2	120	2.9e4	<i>20e+0/1e5</i>	.	.	.	.	.	.	simple GA [22]
GLOBAL	5	1.5	1.2	1	1	2.2	<i>74e-4/1e3</i>	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	4.4	5.2	4.4	2.7	1.2	1	1	1	1	1	iAMaLGaM IDEA [4]
LSfminbnd	2	<i>22e+1/1e4</i>	.	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	2.4	<i>29e+1/1e4</i>	.	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	2.6	30	63	35	14	12	11	10	9.3	7.8	MA-LS-Chain [21]
MCS (Neum)	1	53	<i>62e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3.3	5.2	41	290	<i>16e-1/1e4</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	4.4	4.4	17	24	74	<i>75e-3/2e4</i>	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1.5	15	15	13	5.8	5.6	6.1	6.2	6.6	6.5	NEWUOA [31]
(1+1)-ES	2100	1400	1600	1200	580	560	610	620	670	680	(1+1)-ES [1]
POEMS	130	52	440	410	190	190	980	<i>34e-4/1e5</i>	.	.	POEMS [20]
PSO	4.1	46	140	190	110	110	130	140	150	2e3	PSO [7]
PSO_Bounds	4.4	210	570	440	220	240	480	660	1200	<i>12e-4/1e5</i>	PSO_Bounds [8]
Monte Carlo	5.5	930	<i>67e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.9	880	<i>11e+1/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.1	34	20	10	3.7	2.8	2.5	2.3	2.1	1.8	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	44	23	12	6.2	2.4	1.9	1.8	1.6	1.6	1.4	VNS (Garcia) [11]

Table 108: 20-D, running time excess ERT/ERT_{best} on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	12 Bent cigar											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07		Δf_{target} ERT_{best}/D
ALPS	80	90	87	240	840	3500	<i>33e-3/2e5</i>	.	.	.	.	ALPS [17]
AMaLgAM IDEA	28	29	19	12	13	16	15	12	7.6	8.4	.	AMaLgAM IDEA [4]
avg NEWUOA	1.4	1.3	11	15	18	24	24	20	12	21	.	avg NEWUOA [31]
BayEDAcG	55	60	42	77	<i>21e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.6	1.6	1.6	1.6	1.6	1.7	1.6	2.2	1.8	45	.	BFGS [30]
Cauchy EDA	450	520	510	440	420	400	380	360	390	1100	.	Cauchy EDA [24]
BIPOP-CMA-ES	3	3	3	4	4.5	4.9	4.5	3.3	1.9	2	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.8	3.1	7.7	9.6	9.9	9.6	8.3	6	3.4	3.6	.	(1+1)-CMA-ES [2]
DASA	13	16	2.2e4	2.8e4	4.7e4	8.9e4	6.8e4	4.4e4	2.3e4	<i>13e+0/1e6</i>	.	DASA [19]
DEPSO	39	48	68	<i>77e-1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	340	330	420	240	<i>25e+3/5e3</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	230	250	300	260	720	2600	6800	4400	2300	<i>57e-3/1e5</i>	.	EDA-PSO [6]
full NEWUOA	2.3	6.7	11	15	26	27	38	37	35	100	.	full NEWUOA [31]
G3-PCX	2.4	2.5	2.7	2.8	3	3.3	2.9	2.1	1.2	1.3	.	G3-PCX [26]
simple GA	7100	1.5e4	<i>14e+2/1e5</i>	.	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	1.1	1.1	1	1	1	1	1	1	1.1	3.4	.	GLOBAL [23]
iAMaLgAM IDEA	12	13	8.7	6.6	7.2	8.1	7.8	6	3.6	3.9	.	iAMaLgAM IDEA [4]
LSfminbnd	2.9	3	97	410	<i>76e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	29	35	230	680	<i>16e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	11	12	7.4	9.8	130	140	150	97	51	47	.	MA-LS-Chain [21]
MCS (Neum)	1.3	1.3	1.1	8.4	12	24	43	87	94	<i>16e-4/4e3</i>	.	MCS (Neum) [18]
NELDER (Han)	2.7	5.5	19	26	57	78	340	460	<i>54e-4/1e4</i>	.	.	NELDER (Han) [16]
NELDER (Doe)	2.3	4.1	13	45	61	400	1400	<i>21e-3/2e4</i>	.	.	.	NELDER (Doe) [5]
NEWUOA	1.3	1.3	3	3	3	3	2.5	1.8	1	1	.	NEWUOA [31]
(1+1)-ES	1.7	1.7	1.2e4	6.7e4	<i>52e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	160	170	420	2100	<i>37e-1/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	640	550	1700	<i>64e-1/1e5</i>	.	.	.	.	.	.	.	PSO [7]
PSO_Bounds	240	270	700	3e3	5100	<i>64e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	<i>28e+6/1e6</i>	.	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	14	56	210	910	<i>70e-2/1e4</i>	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	2.7	2.8	5.8	6.7	6.4	6.8	5.9	4.3	2.4	2.5	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	3.3	3.4	5.9	5.9	6.6	9.1	8.3	7.4	4.1	4.4	.	VNS (Garcia) [11]

Table 109: 20-D, running time excess ERT/ERT_{best} on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

13 Sharp ridge												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	Comparison
ALPS	49	130	97	130	420	2700	<i>14e-3/2e5</i>	.	.	.	.	ALPS [17]
AMaLgAM IDEA	18	41	18	8	8	7.7	1.7	1.7	1.7	1.7	.	AMaLgAM IDEA [4]
avg NEWUOA	2.1	1.8	1.5	5.3	14	30	14	57	170	<i>67e-5/2e4</i>	.	avg NEWUOA [31]
BayEDAcG	45	150	910	<i>49e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.2	1.6	1.7	1	1	1	23	87	<i>96e-5/2e4</i>	.	.	BFGS [30]
Cauchy EDA	260	410	210	100	100	100	23	23	23	23	.	Cauchy EDA [24]
BIPOP-CMA-ES	3.6	5.1	4.3	2.7	5.1	6.2	1.5	1.6	2.3	3	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.9	3.4	4.9	7.1	10	11	4.2	5.7	6.3	14	.	(1+1)-CMA-ES [2]
DASA	15	22	380	230	570	1600	670	1200	3700	<i>51e-6/1e6</i>	.	DASA [19]
DEPSO	11	40	64	<i>53e-1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	15	2400	<i>13e+1/5e3</i>	.	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	110	330	160	330	1200	<i>12e-2/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	4.1	3.6	1.8	6	18	49	26	40	120	<i>30e-4/1e4</i>	.	full NEWUOA [31]
G3-PCX	4.3	4.8	9.3	17	43	75	47	110	130	330	.	G3-PCX [26]
simple GA	290	700	5100	<i>10e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	5.7	3.1	2	1.1	1.1	1.1	4.5	4.2	<i>16e-4/1e3</i>	.	.	GLOBAL [23]
iAMaLgAM IDEA	9.2	18	8.7	4.1	4.3	4.4	1	1	1	1	.	iAMaLgAM IDEA [4]
LSfminbnd	6.2	8.7	19	19	68	150	160	130	<i>53e-3/1e4</i>	.	.	LSfminbnd [28]
LSstep	180	310	460	1400	<i>12e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	7.3	22	11	390	700	1800	1500	1300	<i>27e-3/1e5</i>	.	.	MA-LS-Chain [21]
MCS (Neum)	1.3	8.4	34	37	61	330	<i>60e-2/4e3</i>	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	2.3	6.4	11	29	60	180	77	130	<i>35e-3/1e4</i>	.	.	NELDER (Han) [16]
NELDER (Doe)	1.5	3.4	12	18	31	87	98	270	<i>36e-4/2e4</i>	.	.	NELDER (Doe) [5]
NEWUOA	1	1	1	3	9.3	37	19	130	<i>43e-4/9e3</i>	.	.	NEWUOA [31]
(1+1)-ES	2.5	3.3	7.4	13	26	95	50	110	410	2e3	.	(1+1)-ES [1]
POEMS	100	200	1700	1.4e4	<i>59e-1/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	6.1	1800	6200	6400	1e4	8e3	1500	1300	<i>22e+0/1e5</i>	.	.	PSO [7]
PSO_Bounds	12	310	2300	4100	<i>50e-1/1e5</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1.5e5	<i>92e+1/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	2.2	2	2.5	4.2	8.3	31	17	43	120	<i>18e-4/1e4</i>	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	3.6	5	5.8	5.4	7.7	8	1.7	1.9	1.9	2	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	5.8	6.2	4.3	55	120	180	130	320	540	1500	.	VNS (Garcia) [11]

Table 110: 20-D, running time excess ERT/ERT_{best} on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

14 Sum of different powers											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	3.7	41	56	78	93	190	1200	<i>34e-6/2e5</i>	.	ALPS [17]
AMaLGaM IDEA	1	4.7	19	22	30	28	17	15	14	1.9	AMaLGaM IDEA [4]
avg NEWUOA	1	38	2.7	1.5	1.6	1.6	1.3	2.7	9.3	26	avg NEWUOA [31]
BayEDAcG	1	7.2	55	67	150	250	<i>15e-3/2e3</i>	.	.	.	BayEDAcG [10]
BFGS	1	23	2.7	1.8	2	1.8	1.2	1.1	1.1	<i>18e-7/1e4</i>	BFGS [30]
Cauchy EDA	1	930	280	270	350	340	210	180	180	25	Cauchy EDA [24]
BIPOP-CMA-ES	1	7.6	3.9	2.9	3.7	4.3	4.1	5	6.2	1.2	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	18	3.1	1.9	2.3	2.5	2.3	3.4	5.6	1.2	(1+1)-CMA-ES [2]
DASA	1	93	16	10	12	22	75	560	5200	<i>43e-7/1e6</i>	DASA [19]
DEPSO	1	13	14	14	25	49	<i>44e-4/2e3</i>	.	.	.	DEPSO [12]
DIRECT	1	1	8.4	150	290	<i>90e-3/5e3</i>	.	.	.	.	DIRECT [25]
EDA-PSO	1	3.8	85	140	200	190	130	350	<i>21e-6/1e5</i>	.	EDA-PSO [6]
full NEWUOA	1	47	5.9	3	3.6	3.3	2.6	5	20	<i>12e-7/1e4</i>	full NEWUOA [31]
G3-PCX	1	5.7	4.1	2.4	2.8	3	2.7	4.5	13	59	G3-PCX [26]
simple GA	1	4.1	280	320	480	2900	<i>72e-4/1e5</i>	.	.	.	simple GA [22]
GLOBAL	1	7.5	5	2.2	2.1	1.8	1.1	1	1	<i>28e-7/400</i>	GLOBAL [23]
iAMaLGaM IDEA	1	4.3	11	9.3	13	12	7.8	6.9	6.9	1	iAMaLGaM IDEA [4]
LSfminbnd	1	83	8.4	5.2	5.6	9.3	57	<i>31e-5/1e4</i>	.	.	LSfminbnd [28]
LSstep	1	910	190	110	120	210	<i>46e-4/1e4</i>	.	.	.	LSstep [28]
MA-LS-Chain	1	4.1	7.6	11	13	16	14	23	23	6	MA-LS-Chain [21]
MCS (Neum)	1	1	1	2.1	3.4	3.7	3.2	<i>15e-5/4e3</i>	.	.	MCS (Neum) [18]
NELDER (Han)	1	23	2.3	3	3.9	3.6	2.9	4.9	36	<i>44e-7/1e4</i>	NELDER (Han) [16]
NELDER (Doe)	1	11	2	2.1	3.5	3.7	3	5.4	21	<i>26e-7/2e4</i>	NELDER (Doe) [5]
NEWUOA	1	20	1.5	1	1	1	1	2.3	9.1	43	NEWUOA [31]
(1+1)-ES	1	17	2.5	1.8	2	2.2	4.8	38	470	<i>71e-8/1e6</i>	(1+1)-ES [1]
POEMS	1	3100	110	66	120	160	130	2e3	<i>94e-6/1e5</i>	.	POEMS [20]
PSO	1	7.2	6.7	12	20	27	54	580	<i>44e-6/1e5</i>	.	PSO [7]
PSO_Bounds	1	4.6	23	100	170	240	380	1300	<i>78e-6/1e5</i>	.	PSO_Bounds [8]
Monte Carlo	1	5.3	4.5e4	<i>80e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	80	2.4	1.2	1.3	1.8	7.4	97	<i>71e-6/1e4</i>	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	14	3.3	2.6	3.2	3.7	6.8	8.8	10	1.6	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	3.6	6.4	3.9	4.4	5.1	5	6.4	7.8	1.4	VNS (Garcia) [11]

Table 111: 20-D, running time excess ERT/ERT_{best} on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

15 Rastrigin											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	18	10	<i>20e+0/2e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGA M IDEA	12	7.1	1.5	2	1.7	1.7	1.7	1.7	1.2	1.2	AMaLGA M IDEA [4]
avg NEWUOA	56	120	<i>95e+0/1e4</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	13	23	<i>93e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	670	<i>25e+1/6e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1700	68	<i>67e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	17	1.2	1	2	1.4	1.4	1.4	1.4	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	33	73	<i>85e+0/1e4</i>	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	160	3e4	<i>11e+1/1e6</i>	.	.	.	.	.	.	.	DASA [19]
DEPSO	12	<i>12e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	110	<i>10e+1/5e3</i>	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	20	22	36	<i>80e-1/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	120	81	<i>77e+0/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	21	550	<i>92e+0/5e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	21	59	<i>25e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	13	<i>25e+1/1e3</i>	.	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGA M IDEA	12	3.1	2.8	14	7.5	7.5	7.4	7.4	5.3	5.2	iAMaLGA M IDEA [4]
LSfminbnd	130	<i>14e+1/1e4</i>	.	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	2400	<i>22e+1/1e4</i>	.	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	10	3.7	6.9	<i>60e-1/1e5</i>	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	70	<i>10e+1/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	28	54	<i>80e+0/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	25	17	<i>54e+0/2e4</i>	.	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	29	1100	<i>12e+1/6e3</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	340	5400	<i>82e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	2700	23	<i>34e+0/1e5</i>	.	.	.	.	.	.	.	POEMS [20]
PSO	16	92	<i>49e+0/1e5</i>	.	.	.	.	.	.	.	PSO [7]
PSO_Bounds	14	220	<i>51e+0/1e5</i>	.	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	16	<i>26e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	7700	<i>35e+1/1e4</i>	.	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	14	1	1.1	1	1	1	1	1	1.1	6.4	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	22	1.5	310	<i>60e-1/6e6</i>	.	.	.	.	.	.	VNS (Garcia) [11]

Table 112: 20-D, running time excess ERT/ERT_{best} on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1.2	9.3	110	<i>78e-2/2e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1.1	14	3.3	5.2	5.4	6.2	6.1	6.1	5.7	AMaLGaM IDEA [4]
avg NEWUOA	1	1.5	3.6	<i>31e-1/2e4</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.2	<i>21e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	140	<i>26e+0/2e4</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	3.5	<i>16e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1.3	1.7	1	1.2	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	34	<i>53e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	2.3	980	<i>44e-1/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	1.2	<i>23e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	8.3	7	<i>12e-1/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1.3	530	55	380	<i>75e-2/1e5</i>	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1.9	4.6	110	<i>25e-1/1e4</i>	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.3	17	<i>32e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1	1.3	140	1e3	<i>24e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1.2	1	<i>42e-1/600</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.2	3.6	1.7	13	18	29	29	28	26	iAMaLGaM IDEA [4]
LSfminbnd	1	1.1	160	<i>95e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1	1	240	<i>10e+0/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.1	19	<i>18e-1/1e5</i>	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	11	<i>75e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1.3	17	<i>47e-1/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1.4	7.2	<i>30e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1.1	16	<i>53e-1/1e4</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.2	1400	<i>72e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	250	15	21	100	<i>58e-2/1e5</i>	.	.	.	.	POEMS [20]
PSO	1	1.3	110	<i>47e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1.2	130	1e3	<i>25e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1.3	6.5e4	<i>11e+0/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	3.4	<i>29e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.2	3.1	1	1	1.1	1.4	1.9	1.9	1.7	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	3.6	9.1	500	<i>72e-3/3e6</i>	.	.	.	.	VNS (Garcia) [11]

Table 113: 20-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	17 Schaffer F7, condition 10											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1	1.5	19	28	5100	<i>16e-2/2e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1.1	14	7.7	4.3	5.1	4.7	3.5	5.1	5.4	AMaLGaM IDEA [4]	
avg NEWUOA	1	2.1	2.4	<i>29e-1/4e4</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	2	19	19	48	<i>15e-2/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1	350	360	<i>56e-1/2e4</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1.1	200	260	120	62	30	16	16	23	<i>37e-7/5e4</i>	Cauchy EDA [24]	
BIPOP-CMA-ES	1	4	2.2	1	1	1	1.2	1.4	1.3	1.4	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	1.9	29	<i>49e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	8.5	6.6e4	<i>57e-1/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	1.5	8.3	18	150	<i>43e-2/2e3</i>	.	.	.	.	DEPSO [12]
DIRECT	1	1	1.8	55	<i>55e-2/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1.3	13	36	20	22	10	8.1	18	21	EDA-PSO [6]	
full NEWUOA	1	9.4	13	<i>37e-1/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.2	4	<i>35e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1	1.2	57	92	7100	<i>21e-2/1e5</i>	.	.	.	.	simple GA [22]
GLOBAL	1	1.6	6.2	<i>44e-1/3e3</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1.5	6.4	2.9	1.5	1.4	6.1	22	29	23	iAMaLGaM IDEA [4]	
LSfminbnd	1	6.8	990	<i>82e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1	55	1700	<i>78e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.3	3.5	5.1	7.7	10	12	33	59	86	MA-LS-Chain [21]	
MCS (Neum)	1	1	1	<i>42e-1/4e3</i>	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1.3	240	<i>62e-1/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	4	2.1	<i>46e-1/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	5.1	16	<i>38e-1/8e4</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	5.7	5.2e4	<i>73e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	540	94	25	19	200	270	<i>11e-3/1e5</i>	.	.	POEMS [20]	
PSO	1	1.1	3.2	2500	<i>10e-1/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1.3	3	830	<i>85e-2/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1.1	120	<i>50e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1.6e4	2.1e4	<i>19e+0/1e4</i>	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1.4	2.8	4	3.1	1.6	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	1.2	5.3	1.2	1.5	5.8	34	2500	<i>10e-5/4e6</i>	.	VNS (Garcia) [11]	

Table 114: 20-D, running time excess ERT/ERT_{best} on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1.1	3.8	15	430	<i>69e-2/2e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1.2	3.8	7.3	3	1	1	1.7	2.7	2.8	3.7	AMaLGaM IDEA [4]	
avg NEWUOA	1.3	19	3200	<i>10e+0/6e4</i>	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	6.4	15	17	<i>95e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	920	<i>21e+0/2e4</i>	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	2.5	270	96	42	15	16	12	13	38	<i>25e-6/5e4</i>	Cauchy EDA [24]	
BIPOP-CMA-ES	1	5.3	1	2.4	1.2	1.6	1.1	1.8	1.7	1.6	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	12	4800	<i>16e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	60	4.6e5	<i>25e+0/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	7.9	7.1	49	<i>16e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	6.5	9.1	110	<i>12e-1/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1.1	4.2	30	15	5.2	5.4	18	83	220	<i>47e-5/1e5</i>	EDA-PSO [6]	
full NEWUOA	1.1	23	950	<i>12e+0/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.1	2.2	7100	<i>14e+0/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1.1	7.8	76	310	<i>73e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1.1	5.9	<i>17e+0/4e3</i>	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.2	3.4	2.7	1.2	2.3	3.7	19	18	16	18	iAMaLGaM IDEA [4]	
LSfminbnd	2.2	31	4500	<i>26e+0/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1.1	610	<i>31e+0/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1.1	5.8	3.6	3.6	26	78	210	<i>43e-4/1e5</i>	.	.	MA-LS-Chain [21]	
MCS (Neum)	1	1	<i>17e+0/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	830	<i>20e+0/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	6.5	4300	<i>14e+0/2e4</i>	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	3.9	320	1.2e4	<i>11e+0/8e4</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	2.9e5	<i>24e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	5.1	1100	21	140	210	990	<i>38e-2/1e5</i>	.	.	.	POEMS [20]	
PSO	1.1	5.2	240	<i>29e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1.1	2.4	69	7100	<i>22e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1.1	7.7	<i>18e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.4e4	4.8e4	<i>97e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	8.5	1	1	1.1	1.2	1	1	1	1	IPOP-SEP-CMA-ES [29]	
VNS (Garcia)	1	2.5	1.3	1	14	250	<i>40e-4/4e6</i>	.	.	.	VNS (Garcia) [11]	

Table 115: 20-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

19 Griewank-Rosenbrock F8F2											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
	0.05	0.05	0.05	0.05	17200	2.34e5	3.11e5	3.33e5	3.34e5	3.37e5	
ALPS	1	1	1200	6.2e5	<i>31e-2/2e5</i>	.	.	.	.	.	ALPS [17]
AMaLgAM IDEA	1	1.2	740	3.4e4	7.6	4.5	8.8	8.2	8.2	8.1	AMaLgAM IDEA [4]
avg NEWUOA	1	2.9	210	8e6	<i>20e-1/1e5</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1.1	1500	<i>41e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	170	1.2e6	<i>12e+0/1e4</i>	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	3.4	8400	<i>34e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	170	2.4e4	1.2	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	1400	2.8e6	<i>18e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	2.1	1.8e6	<i>58e-1/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	1.1	430	<i>50e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	1	1	<i>21e-2/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1.1	4600	2.8e7	<i>26e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1.3	480	<i>21e-1/1e4</i>	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1.1	800	<i>26e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	1	1.1	1.4e4	6.5e5	<i>44e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	5600	<i>57e-1/3e3</i>	.	.	.	.	.	.	GLOBAL [23]
iAMaLgAM IDEA	1	1.1	460	1.8e6	44	<i>72e-3/1e6</i>	.	.	.	.	iAMaLgAM IDEA [4]
LSfminbnd	1	2.6	1200	<i>38e-1/1e4</i>	.	.	.	.	.	.	LSfminbnd [28]
LSstep	1	130	7800	<i>41e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1.1	280	2.9e4	13	<i>11e-2/1e5</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	1	1	1	<i>25e-2/4e3</i>	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	160	1.4e6	<i>19e-1/1e4</i>	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1	73	4.3e5	<i>96e-2/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1.1	76	4.3e6	<i>12e-1/1e5</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	2.5	6.3e6	<i>56e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	170	6200	1.4e6	<i>94e-2/1e5</i>	.	.	.	.	.	POEMS [20]
PSO	1	1.1	380	<i>32e-1/1e5</i>	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1.1	820	<i>31e-1/1e5</i>	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1.1	5.9e5	<i>78e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	3.1e4	<i>33e+0/1e4</i>	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	150	2.7e4	8.7	<i>29e-2/1e4</i>	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	330	8.2e4	<i>21e-2/6e6</i>	.	.	.	.	.	VNS (Garcia) [11]

Table 116: 20-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	20 Schwefel $x*\sin(x)$										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	48	54	53	9.2	<i>47e-2/2e5</i>	.	.	.	.	.	ALPS [17]
AMaLGA M IDEA	20	22	20	88	<i>68e-2/1e6</i>	.	.	.	.	.	AMaLGA M IDEA [4]
avg NEWUOA	1.8	1.4	1.3	110	<i>12e-1/2e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	47	51	49	<i>31e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.7	1.9	2.1	5.8	<i>90e-2/2e4</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	310	330	340	<i>27e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	4.7	4.4	4.3	9.2	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.5	3.6	3.4	21	<i>11e-1/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	22	21	20	2.1	<i>40e-2/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	15	16	15	<i>21e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	17	36	31	<i>18e-1/5e3</i>	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	210	230	230	15	<i>63e-2/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	4.2	3.4	3.1	64	<i>12e-1/1e4</i>	.	3.1	64	.	.	full NEWUOA [31]
G3-PCX	5.6	5.4	5	<i>12e-1/5e4</i>	.	.	.	.	.	.	G3-PCX [26]
simple GA	470	520	500	2.8	<i>32e-2/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	6.6	5.6	5.2	1.6	<i>99e-2/4e3</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGA M IDEA	14	14	14	240	<i>88e-2/1e6</i>	.	.	.	.	.	iAMaLGA M IDEA [4]
LSfminbnd	11	11	11	5.9	<i>97e-2/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	230	260	280	11	<i>10e-1/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	8	9.7	9.4	3.3	4.8	<i>24e-2/1e5</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	5.9	5.4	4.7	12	<i>12e-1/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	3.1	3.4	3.5	<i>13e-1/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1.9	2.1	2.2	28	<i>11e-1/2e4</i>	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1	1	15	<i>10e-1/2e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	3.4	3.2	3.1	110	<i>88e-2/1e6</i>	.	3.1	110	.	.	(1+1)-ES [1]
POEMS	130	120	120	1	<i>30e-2/1e5</i>	.	.	.	.	.	POEMS [20]
PSO	12	15	17	50	<i>11e-1/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	66	79	86	11	<i>53e-2/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1.7e6	<i>15e+2/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	3	2.7	2.6	2.9	<i>97e-2/1e4</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	4.4	4.7	4.5	13	<i>11e-1/1e4</i>	.	4.5	13	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	8.1	7.7	7.1	1.1	<i>30e-2/1e7</i>	.	.	.	.	.	VNS (Garcia) [11]

Table 117: 20-D, running time excess ERT/ERT_{best} on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

21 Gallagher 101 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	14	13	7	7.7	8.3	9.2	9.8	11	ALPS [17]
AMaLgAM IDEA	1	1	51	2400	1500	1500	1500	1500	1400	1300	AMaLgAM IDEA [4]
avg NEWUOA	1	1	3.2	5.7	3.5	3.5	3.4	3.3	3.3	2.9	avg NEWUOA [31]
BayEDAcG	1	1	55	<i>60e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	1.9	5.5	4.6	4.6	4.5	4.4	4.3	7.3	BFGS [30]
Cauchy EDA	1	1	1e3	<i>32e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	3.2	55	48	47	46	45	43	39	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	3.6	7.6	5.8	5.7	5.6	5.4	5.3	4.7	(1+1)-CMA-ES [2]
DASA	1	1	240	100	100	100	99	96	93	83	DASA [19]
DEPSO	1	1	22	13	8.3	8.6	8.9	9.3	19	<i>20e-1/2e3</i>	DEPSO [12]
DIRECT	1	1	3.3	27	<i>19e-1/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1	35	850	570	560	550	530	520	460	EDA-PSO [6]
full NEWUOA	1	1	7.4	3.4	4.5	4.5	4.4	4.2	4.1	3.7	full NEWUOA [31]
G3-PCX	1	1	12	7.2	5.1	5	4.9	4.8	4.6	4.1	G3-PCX [26]
simple GA	1	1	90	620	400	400	900	890	<i>20e-1/1e5</i>	.	simple GA [22]
GLOBAL	1	1	1	1	1	1	1	1	1	2.1	GLOBAL [23]
iAMaLgAM IDEA	1	1	10	670	540	540	530	520	540	490	iAMaLgAM IDEA [4]
LSfminbnd	1	1	30	27	20	20	19	19	18	16	LSfminbnd [28]
LSstep	1	1	120	200	200	200	200	190	190	170	LSstep [28]
MA-LS-Chain	1	1	140	310	230	230	220	210	210	180	MA-LS-Chain [21]
MCS (Neum)	1	1	26	32	26	25	25	24	23	32	MCS (Neum) [18]
NELDER (Han)	1	1	7.7	20	24	24	23	23	22	20	NELDER (Han) [16]
NELDER (Doe)	1	1	7.6	4	2	2.1	2.1	2	2	1.8	NELDER (Doe) [5]
NEWUOA	1	1	1.7	2.2	1.2	1.2	1.2	1.1	1.1	1	NEWUOA [31]
(1+1)-ES	1	1	8.3	13	9.4	9.3	9.1	8.8	8.6	7.6	(1+1)-ES [1]
POEMS	1	1	2500	<i>67e-1/1e5</i>	.	.	.	.	.	.	POEMS [20]
PSO	1	1	1800	4300	2e3	2e3	1900	1900	1800	1600	PSO [7]
PSO_Bounds	1	1	560	1200	2e3	2e3	1900	1900	1800	1600	PSO_Bounds [8]
Monte Carlo	1	1	<i>26e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	7.8	7.6	4.7	4.6	4.5	4.4	4.3	3.8	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	15	50	58	57	56	54	53	47	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	11	55	29	29	29	28	27	25	VNS (Garcia) [11]

Table 118: 20-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

22 Gallagher 21 peaks											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	1	19	9.7	79	81	86	110	180	130	ALPS [17]
AMaLgAM IDEA	1	1	8.2	1900	<i>69e-2/1e6</i>	.	.	.	.	.	AMaLgAM IDEA [4]
avg NEWUOA	1	1	2	5.6	14	13	13	12	12	2.4	avg NEWUOA [31]
BayEDAcG	1	1	34	31	<i>20e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	2.5	1.8	8.1	7.9	7.7	7.4	9.5	14	BFGS [30]
Cauchy EDA	1.1	1.1	470	1200	<i>51e-1/5e4</i>	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	6.8	13	210	210	200	190	190	37	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	3.5	4.2	5.6	5.5	5.3	5.1	5	1	(1+1)-CMA-ES [2]
DASA	1	1	34	75	220	210	210	200	200	40	DASA [19]
DEPSO	1	1	20	16	<i>26e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	9.8	16	<i>71e-2/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1	1600	1e3	<i>26e-1/1e5</i>	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	2.2	12	60	59	57	54	53	11	full NEWUOA [31]
G3-PCX	1	1	11	6.6	23	22	22	21	20	4	G3-PCX [26]
simple GA	1	1	110	1500	<i>20e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	1.1	1	1	1	1	1	1	1.3	GLOBAL [23]
iAMaLgAM IDEA	1	1	8.1	440	<i>69e-2/1e6</i>	.	.	.	.	.	iAMaLgAM IDEA [4]
LSfminbnd	1	1	59	16	37	36	36	35	34	7.2	LSfminbnd [28]
LSstep	1	1	280	<i>51e-1/1e4</i>	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	3.8	810	<i>20e-1/1e5</i>	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	17	20	50	48	47	<i>20e-1/4e3</i>	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	17	18	61	59	58	55	54	11	NELDER (Han) [16]
NELDER (Doe)	1	1	5.2	6.5	8.3	8.2	8	7.7	7.5	1.5	NELDER (Doe) [5]
NEWUOA	1	1	1	4.9	6.8	6.6	6.4	6.2	6	1.2	NEWUOA [31]
(1+1)-ES	1	1	11	5	11	11	11	10	10	2.1	(1+1)-ES [1]
POEMS	1	1	2300	5e3	<i>51e-1/1e5</i>	.	.	.	.	.	POEMS [20]
PSO	1	1	5	410	<i>20e-1/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1	680	730	1200	1200	1100	1100	1100	210	PSO_Bounds [8]
Monte Carlo	1	1	6.4e5	<i>30e+0/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	3.4	4.3	12	12	12	11	11	2.2	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	6.2	23	<i>69e-2/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	14	67	1300	1200	1200	1200	1100	440	VNS (Garcia) [11]

Table 119: 20-D, running time excess ERT/ERT_{best} on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

23 Katsuuras												
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D	
ALPS	1	1	1.9	82	<i>29e-2/2e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1	1.7	23	1.1	1	1	1	1	1	AMaLGaM IDEA [4]	
avg NEWUOA	1	1	15	4.7	<i>20e-2/2e4</i>	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	1	1.6	<i>23e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	47	300	<i>13e-1/5e3</i>	.	.	.	.	.	BFGS [30]
Cauchy EDA	1	1	1.9	<i>19e-1/5e4</i>	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	1	4.3	32	1	1.7	2	1.9	1.2	1.2	BIPOP-CMA-ES [15]	
(1+1)-CMA-ES	1	1	5.8	9.1	<i>37e-2/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	3.4	64	<i>31e-2/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	1	1	1.6	<i>26e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	1	4.1	52	<i>38e-2/5e3</i>	.	.	.	.	.	DIRECT [25]
EDA-PSO	1	1	2.1	<i>16e-1/1e5</i>	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	1	1	14	7	44	<i>25e-2/1e4</i>	.	.	.	.	full NEWUOA [31]
G3-PCX	1	1	2.8	7.8	<i>30e-2/3e4</i>	.	.	.	.	.	G3-PCX [26]
simple GA	1	1	1.7	4600	<i>12e-1/1e5</i>	.	.	.	.	.	simple GA [22]
GLOBAL	1	1	2.8	1	<i>43e-2/500</i>	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1	1	1.9	5.4	1.6	2.3	5.1	5.2	3.3	3.2	iAMaLGaM IDEA [4]	
LSfminbnd	1	1	4.4	210	<i>10e-1/1e4</i>	.	.	.	.	.	LSfminbnd [28]
LSstep	1	1	2.2	81	<i>91e-2/1e4</i>	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1	1	1.8	7.1	8.9	<i>61e-3/1e5</i>	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	1	1.3	120	<i>11e-1/4e3</i>	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	1	2.1	3.3	43	<i>20e-2/1e4</i>	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	1	1.9	1.4	86	<i>17e-2/2e4</i>	.	.	.	.	NELDER (Doe) [5]
NEWUOA	1	1	12	3.5	32	<i>39e-2/8e3</i>	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1	27	32	<i>31e-2/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
POEMS	1	1	23	42	13	<i>59e-3/1e5</i>	.	.	.	.	POEMS [20]
PSO	1	1	2.2	1600	<i>95e-2/1e5</i>	.	.	.	.	.	PSO [7]
PSO_Bounds	1	1	3	8400	<i>12e-1/1e5</i>	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	1	2.6	5.5e4	<i>11e-1/1e6</i>	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1	1	1.7	4.6	<i>50e-2/4e3</i>	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	4.9	18	3.8	<i>81e-3/1e4</i>	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1	1	25	10	1700	<i>23e-3/2e6</i>	.	.	.	VNS (Garcia) [11]	

Table 120: 20-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	24 Lunacek bi-Rastrigin										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	1	5.7	<i>22e+0/2e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1.1	4.2	5.1	19	<i>23e-1/1e6</i>	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	14	3.3	<i>74e+0/1e4</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	1	44	<i>11e+1/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	8	<i>31e+1/6e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
Cauchy EDA	1.7	76	<i>91e+0/5e4</i>	.	.	.	.	.	.	.	Cauchy EDA [24]
BIPOP-CMA-ES	1	5.5	1	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	24	<i>90e+0/1e4</i>	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1.1	<i>16e+1/1e6</i>	.	.	.	.	.	.	.	.	DASA [19]
DEPSO	1.1	<i>14e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
DIRECT	1	<i>15e+1/5e3</i>	.	.	.	.	.	.	.	.	DIRECT [25]
EDA-PSO	1.1	28	<i>86e+0/1e5</i>	.	.	.	.	.	.	.	EDA-PSO [6]
full NEWUOA	3.7	4.5	<i>71e+0/1e4</i>	.	.	.	.	.	.	.	full NEWUOA [31]
G3-PCX	1.1	190	<i>11e+1/5e4</i>	.	.	.	.	.	.	.	G3-PCX [26]
simple GA	1.1	35	<i>42e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
GLOBAL	1	<i>21e+1/1e3</i>	.	.	.	.	.	.	.	.	GLOBAL [23]
iAMaLGaM IDEA	1.1	1.3	2.8	<i>21e-1/1e6</i>	.	.	.	.	.	.	iAMaLGaM IDEA [4]
LSfminbnd	7.1	<i>15e+1/1e4</i>	.	.	.	.	.	.	.	.	LSfminbnd [28]
LSstep	3.1	210	<i>19e+1/1e4</i>	.	.	.	.	.	.	.	LSstep [28]
MA-LS-Chain	1.1	2.1	42	<i>25e+0/1e5</i>	.	.	.	.	.	.	MA-LS-Chain [21]
MCS (Neum)	1	12	<i>10e+1/4e3</i>	.	.	.	.	.	.	.	MCS (Neum) [18]
NELDER (Han)	1	49	<i>10e+1/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NELDER (Doe)	1	3.7	<i>50e+0/2e4</i>	.	.	.	.	.	.	.	NELDER (Doe) [5]
NEWUOA	6.5	4.3	<i>83e+0/8e3</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	4.1	3100	<i>93e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
POEMS	2.7	10	<i>46e+0/1e5</i>	.	.	.	.	.	.	.	POEMS [20]
PSO	1	63	<i>60e+0/1e5</i>	.	.	.	.	.	.	.	PSO [7]
PSO_Bounds	1.1	81	<i>66e+0/1e5</i>	.	.	.	.	.	.	.	PSO_Bounds [8]
Monte Carlo	1	<i>26e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
Rosenbrock	1.4	<i>37e+1/1e4</i>	.	.	.	.	.	.	.	.	Rosenbrock [27]
IPOP-SEP-CMA-ES	1	1	1	<i>23e+0/1e4</i>	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]
VNS (Garcia)	1	1.8	68	<i>88e-1/1e7</i>	.	.	.	.	.	.	VNS (Garcia) [11]

Table 121: 40-D, running time excess ERT/ERT_{best} on f_1 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	1 Sphere										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	2.07	2.08	2.08	2.08	2.08	2.08	2.08	2.08	2.08	ERT_{best}/D
ALPS	1	46	220	420	640	870	1100	1400	1700	2800	ALPS [17]
AMaLGaM IDEA	1	46	150	290	430	560	690	810	970	1200	AMaLGaM IDEA [4]
avg NEWUOA	1	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	avg NEWUOA [31]
BayEDAcG	1	60	210	350	500	650	790	940	<i>64e-6/2e3</i>	.	BayEDAcG [10]
BFGS	1	1	1	1	1	1	1	1	1	1	BFGS [30]
BIPOP-CMA-ES	1	3.1	9.6	15	21	28	34	40	45	58	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	3	7	11	15	19	23	27	31	39	(1+1)-CMA-ES [2]
DASA	1	13	33	57	94	130	180	220	260	340	DASA [19]
DEPSO	1	12	65	360	1.4e4	<i>15e-2/2e3</i>	.	.	.	.	DEPSO [12]
simple GA	1	400	1500	3e3	2.3e4	6.8e5	<i>45e-3/1e5</i>	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	17	73	130	180	240	290	350	410	520	iAMaLGaM IDEA [4]
NELDER (Han)	1	3.9	13	21	28	35	42	49	55	67	NELDER (Han) [16]
NEWUOA	1	1	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	2.5	5.8	9.2	13	16	19	23	26	33	(1+1)-ES [1]
Monte Carlo	1	<i>13e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	3	8.7	14	19	25	30	35	41	51	IPOP-SEP-CMA-ES [29]

Table 122: 40-D, running time excess ERT/ERT_{best} on f_2 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

2 Ellipsoid separable											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	74.3	96.6	118	137	155	172	190	208	221	256	ERT_{best}/D
ALPS	14	15	17	19	20	23	26	32	46	140	ALPS [17]
AMaLGaM IDEA	14	14	14	14	14	14	14	14	14	14	AMaLGaM IDEA [4]
avg NEWUOA	2	4.7	6	9	10	12	12	13	13	14	avg NEWUOA [31]
BayEDAcG	13	13	13	14	<i>33e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	4.3	5.5	6	6.1	5.9	5.6	5.4	5	4.8	4.4	BFGS [30]
BIPOP-CMA-ES	7.7	9.8	11	10	10	9.5	9	8.4	8	7.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	6	8.1	9.3	9.5	9.5	9.3	8.7	8.2	7.8	6.8	(1+1)-CMA-ES [2]
DASA	1.7	2.1	2.5	2.8	3	3.3	3.4	3.5	3.7	3.8	DASA [19]
DEPSO	28	310	<i>65e+1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	610	2200	<i>24e+1/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	6.2	7.4	7.7	7.7	7.7	7.6	7.4	7.3	7.4	7.3	iAMaLGaM IDEA [4]
NELDER (Han)	1.1	1	1	1	1	1	1	1	1	1	NELDER (Han) [16]
NEWUOA	1	2.6	4.4	6.4	8.8	9.9	11	12	13	13	NEWUOA [31]
(1+1)-ES	140	630	1500	2500	3400	4400	8900	1.4e4	6.8e4	<i>93e-5/1e6</i>	(1+1)-ES [1]
Monte Carlo	<i>12e+5/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1.4	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.2	1.1	IPOP-SEP-CMA-ES [29]

Table 123: 40-D, running time excess ERT/ERT_{best} on f_3 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	3 Rastrigin separable										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	5.56	116	440	24600	1.59e5	1.59e5	1.59e5	1.59e5	1.59e5	1.59e5	ERT_{best}/D
ALPS	11	32	<i>16e+0/1e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	13	16	2800	<i>11e+0/1e6</i>	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	21	<i>38e+1/1e4</i>	.	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	19	<i>24e+1/2e3</i>	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	110	<i>64e+1/8e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1	1.1	<i>12e+0/3e5</i>	.	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	4.1	<i>33e+1/1e4</i>	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	3.5	1	1	1	1	1	1	1	1	1	DASA [19]
DEPSO	3.1	<i>28e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	92	39	420	<i>11e+0/1e5</i>	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	4	4.6	770	<i>90e-1/1e6</i>	.	.	.	.	.	.	iAMaLGaM IDEA [4]
NELDER (Han)	1.9	<i>38e+1/1e4</i>	.	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	7.7	<i>46e+1/7e3</i>	.	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	300	<i>42e+1/1e6</i>	.	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	1.5e4	<i>87e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1.2	<i>16e+0/1e4</i>	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 124: 40-D, running time excess ERT/ERT_{best} on f_4 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	4 Skew Rastrigin-Bueche separable										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
	11	134	574	1.7e6	nan	nan	nan	nan	nan	nan	
ALPS	12	66	<i>26e+0/1e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	24	18	<i>32e+0/1e6</i>	.	.	.	.	.	.	.	AMaLGaM IDEA [4]
avg NEWUOA	7.5	<i>36e+1/3e4</i>	.	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	27	<i>25e+1/2e3</i>	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1200	<i>97e+1/1e4</i>	.	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1.1	3.9	<i>27e+0/3e5</i>	.	.	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	16	<i>54e+1/1e4</i>	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	2.5	1	1	1	<i>20e-1/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	3.4	<i>33e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	85	39	2500	<i>17e+0/1e5</i>	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	6.4	4.3	<i>34e+0/1e6</i>	.	.	.	.	.	.	.	iAMaLGaM IDEA [4]
NELDER (Han)	110	<i>63e+1/1e4</i>	.	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	14	<i>54e+1/2e4</i>	.	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	2900	<i>67e+1/1e6</i>	.	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	6.3e5	<i>11e+2/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	5.3	<i>30e+0/1e4</i>	.	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 125: 40-D, running time excess ERT/ERT_{best} on f_5 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

5 Linear slope											
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
	0.025	2.13	2.45	2.89	3	3.01	3.01	3.01	3.01	3.01	
ALPS	1	81	140	160	180	200	210	220	230	230	ALPS [17]
AMaLGaM IDEA	1	97	120	100	100	100	100	100	100	100	AMaLGaM IDEA [4]
avg NEWUOA	1	3.1	3.1	3.2	3.4	3.4	3.4	3.4	3.4	3.4	avg NEWUOA [31]
BayEDAcG	1	140	210	220	220	220	220	220	220	220	BayEDAcG [10]
BFGS	1	1.4	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	BFGS [30]
BIPOP-CMA-ES	1	3.2	4.5	4.5	4.4	4.4	4.4	4.4	4.4	4.4	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.9	3	3	2.9	3	3	3	3	3	(1+1)-CMA-ES [2]
DASA	1	12	17	19	23	27	34	41	50	69	DASA [19]
DEPSO	1	18	29	30	30	31	31	31	31	31	DEPSO [12]
simple GA	1	1100	3e3	4800	7e3	9500	1.2e4	1.5e4	1.9e4	<i>19e-8/1e5</i>	simple GA [22]
iAMaLGaM IDEA	1	5.6	8.1	7.4	7.2	7.1	7.1	7.1	7.1	7.1	iAMaLGaM IDEA [4]
NELDER (Han)	1	9.1	14	13	13	13	13	13	13	13	NELDER (Han) [16]
NEWUOA	1	1	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	1.8	2.9	3	2.9	2.9	2.9	2.9	2.9	2.9	(1+1)-ES [1]
Monte Carlo	1	<i>36e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	3.3	5.2	5.4	5.3	5.2	5.3	5.3	5.3	5.3	IPOP-SEP-CMA-ES [29]

Table 126: 40-D, running time excess ERT/ERT_{best} on f_6 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	6 Attractive sector										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	4.87	46	87.7	138	179	237	288	332	375	481	ERT_{best}/D
ALPS	56	28	53	93	330	<i>24e-3/1e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	280	67	56	48	47	43	42	41	41	40	AMaLGaM IDEA [4]
avg NEWUOA	4.7	1.5	1.3	1.3	1.2	1.2	1.1	1.2	1.1	1.1	avg NEWUOA [31]
BayEDAcG	70	160	<i>13e+1/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.9	3.3	4.2	4.4	4.6	4.5	4.5	4.6	4.9	18	BFGS [30]
BIPOP-CMA-ES	6.1	1.9	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.4	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.6	6.6	360	<i>12e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	9	8.8	18	25	36	41	46	52	56	59	DASA [19]
DEPSO	12	19	<i>38e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	350	730	<i>65e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	26	9.4	10	9.9	11	10	10	11	11	11	iAMaLGaM IDEA [4]
NELDER (Han)	3.3	2.7	2.7	2.5	2.6	2.8	3.5	5.5	16	68	NELDER (Han) [16]
NEWUOA	1	1	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	3.1	1.9	3.2	4.6	6.1	6.8	7.4	8.1	8.6	9	(1+1)-ES [1]
Monte Carlo	<i>12e+4/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	6.5	1.9	1.9	1.8	1.9	1.8	1.8	2	2	2	IPOP-SEP-CMA-ES [29]

Table 127: 40-D, running time excess ERT/ERT_{best} on f_7 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	7 Step-ellipsoid										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	2.64	30.6	267	446	1030	1660	1660	1660	1660	1700	ERT_{best}/D
ALPS	14	14	2e3	<i>13e+0/1e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	14	12	2.5	2.2	1.3	1	1	1	1	1	AMaLGaM IDEA [4]
avg NEWUOA	2.6	5.4	<i>24e+0/4e4</i>	.	.	.	.	.	.	.	avg NEWUOA [31]
BayEDAcG	24	23	<i>26e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	<i>20e+2/100</i>	.	.	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1.5	1	1.2	8.3	4	2.6	2.6	2.6	2.6	2.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.8	73	100	<i>12e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	6	2200	<i>76e+0/2e5</i>	.	.	.	.	.	.	.	DASA [19]
DEPSO	4.9	7.5	<i>27e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	96	110	<i>36e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	3.9	4	1	1	1	1.7	1.7	1.7	1.7	1.7	iAMaLGaM IDEA [4]
NELDER (Han)	1.8	100	<i>70e+0/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	880	<i>77e+0/6e4</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	770	<i>24e+1/1e6</i>	.	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	260	<i>54e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1.4	1	2.3	5.2	2.5	1.6	1.6	1.6	1.6	1.6	IPOP-SEP-CMA-ES [29]

Table 128: 40-D, running time excess ERT/ERT_{best} on f_8 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

8 Rosenbrock original											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	15.2	40.4	177	266	275	282	286	289	293	299	ERT_{best}/D
ALPS	40	84	530	1100	1900	2e3	3200	<i>14e-1/1e5</i>	.	.	ALPS [17]
AMaLGaM IDEA	27	20	47	40	41	42	43	43	43	44	AMaLGaM IDEA [4]
avg NEWUOA	1.6	1.7	1.2	1.6	1.6	1.6	1.6	1.6	1.6	1.6	avg NEWUOA [31]
BayEDAcG	38	50	<i>87e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.1	1.7	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	BFGS [30]
BIPOP-CMA-ES	1.8	1.7	7.3	7.7	7.9	7.9	7.9	7.9	7.9	7.8	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.2	1	8.3	8.3	8.6	8.7	8.8	8.8	8.8	8.9	(1+1)-CMA-ES [2]
DASA	6.6	27	55	61	85	120	150	190	220	290	DASA [19]
DEPSO	16	130	<i>13e+1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	270	1200	<i>91e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	11	7.5	17	15	15	15	16	16	16	16	iAMaLGaM IDEA [4]
NELDER (Han)	2.4	4	150	280	550	540	530	530	520	510	NELDER (Han) [16]
NEWUOA	1	1.4	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	5.5	27	67	73	85	100	120	130	170	(1+1)-ES [1]
Monte Carlo	<i>87e+3/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1.6	2	9.7	9.1	9.2	9.1	9.1	9.1	9.1	9	IPOP-SEP-CMA-ES [29]

Table 129: 40-D, running time excess ERT/ERT_{best} on f_9 , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

9 Rosenbrock rotated											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	12.7	34.9	153	325	333	337	341	345	348	354	ERT_{best}/D
ALPS	21	36	<i>28e+0/1e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	28	18	54	32	34	35	35	36	36	37	AMaLGaM IDEA [4]
avg NEWUOA	1.7	1.3	1.4	1.1	1.1	1.2	1.2	1.2	1.2	1.2	avg NEWUOA [31]
BayEDAcG	38	26	<i>38e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.1	1.4	2.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	BFGS [30]
BIPOP-CMA-ES	1.8	1.5	8.2	6.2	6.4	6.5	6.5	6.5	6.5	6.5	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.2	1.2	9.7	9.7	10	10	10	10	10	10	(1+1)-CMA-ES [2]
DASA	7.7	12	410	420	520	650	820	980	1100	1600	DASA [19]
DEPSO	14	110	<i>11e+1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	270	3500	<i>11e+1/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	13	8.5	20	12	13	13	13	13	13	14	iAMaLGaM IDEA [4]
NELDER (Han)	1.6	2.3	160	230	460	450	440	440	<i>14e+0/1e4</i>	.	NELDER (Han) [16]
NEWUOA	1	1	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1.2	1.4	33	91	95	110	120	130	150	170	(1+1)-ES [1]
Monte Carlo	<i>83e+3/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1.6	1.2	10	6.9	7.1	7.1	7.1	7.1	7.1	7.1	IPOP-SEP-CMA-ES [29]

Table 130: 40-D, running time excess ERT/ERT_{best} on f_{10} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	10 Ellipsoid										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	165	402	647	759	920	1290	1400	1520	1630	1770	ERT_{best}/D
ALPS	<i>28e+2/1e5</i>	.	.	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	6.3	3.2	2.4	2.4	2.2	1.8	1.9	1.9	1.9	2.1	AMaLGaM IDEA [4]
avg NEWUOA	1.3	1.6	1.4	1.9	1.8	1.7	1.8	1.9	1.9	2.1	avg NEWUOA [31]
BayEDAcG	<i>16e+4/2e3</i>	.	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.7	1.2	1	1	1	2.1	7.8	34	220	<i>40e-6/1e5</i>	BFGS [30]
BIPOP-CMA-ES	3.6	2.3	1.9	1.9	1.7	1.3	1.2	1.2	1.1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.8	2	1.7	1.7	1.6	1.3	1.2	1.1	1.1	1	(1+1)-CMA-ES [2]
DASA	290	1e3	2.3e4	<i>23e+0/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	<i>14e+4/2e3</i>	.	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	<i>83e+3/1e5</i>	.	.	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	2.9	1.9	1.4	1.4	1.3	1	1	1	1	1.1	iAMaLGaM IDEA [4]
NELDER (Han)	5.9	<i>35e+1/1e4</i>	.	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	1	1.2	1.6	1.8	1.5	1.7	1.8	1.9	2.1	NEWUOA [31]
(1+1)-ES	46	130	260	430	580	620	1e3	1600	<i>33e-5/1e6</i>	.	(1+1)-ES [1]
Monte Carlo	<i>13e+5/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	6.2	3.8	2.9	2.7	2.4	1.8	1.7	1.5	1.5	1.4	IPOP-SEP-CMA-ES [29]

Table 131: 40-D, running time excess ERT/ERT_{best} on f_{11} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	11 Discus										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	1.78	22.6	59.2	121	292	562	674	769	888	1090	ERT_{best}/D
ALPS	2.7	240	970	<i>33e-1/1e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	2.6	11	9.5	6.8	3.8	2.5	2.4	2.5	2.5	2.5	AMaLGaM IDEA [4]
avg NEWUOA	3.4	5.5	3.9	2.8	1.5	1	1	1	1	1	avg NEWUOA [31]
BayEDAcG	2.3	<i>26e+1/2e3</i>	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	2.8	1	1	1	1	2.5	72	<i>29e-4/1e4</i>	.	.	BFGS [30]
BIPOP-CMA-ES	99	35	15	8	3.5	1.9	1.6	1.5	1.3	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	21	9.8	7.1	5.5	3.1	2.1	2.2	2.3	2.4	2.6	(1+1)-CMA-ES [2]
DASA	1	230	590	790	500	440	490	540	630	1e3	DASA [19]
DEPSO	6	<i>24e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	3.5	820	<i>43e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1.8	8.5	5	3.3	1.8	1.1	1.1	1.1	1.1	1.1	iAMaLGaM IDEA [4]
NELDER (Han)	1.6	88	<i>53e+0/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	18	13	9.9	4.9	3.2	3	3	3	3	NEWUOA [31]
(1+1)-ES	2300	1100	870	650	350	240	240	240	240	250	(1+1)-ES [1]
Monte Carlo	2.4	<i>20e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	130	57	25	13	5.7	3	2.6	2.3	2.1	1.7	IPOP-SEP-CMA-ES [29]

Table 132: 40-D, running time excess ERT/ERT_{best} on f_{12} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

12 Bent cigar											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	36	39.9	104	186	229	269	329	526	569	630	ERT_{best}/D
ALPS	67	81	180	690	8100	<i>83e-2/1e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	46	48	21	13	14	16	17	13	14	15	AMaLGaM IDEA [4]
avg NEWUOA	1.5	6.5	21	24	31	38	42	32	39	86	avg NEWUOA [31]
BayEDAcG	66	<i>44e+1/2e3</i>	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1.1	1	1	1	1	1	4.6	15	660	BFGS [30]
BIPOP-CMA-ES	2.1	2.8	2.2	2.3	2.5	2.5	2.5	1.8	1.9	1.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1.4	1.7	2.1	3.1	4.1	4.4	4.6	3.4	3.6	4.1	(1+1)-CMA-ES [2]
DASA	20	27	3.8e4	3.5e4	<i>22e+0/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	<i>12e+4/2e3</i>	.	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	<i>40e+3/1e5</i>	.	.	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	17	18	8.6	6.4	7	7.3	7.2	5.2	5.4	5.7	iAMaLGaM IDEA [4]
NELDER (Han)	2.4	2.5	15	24	52	190	<i>42e-3/1e4</i>	.	.	.	NELDER (Han) [16]
NEWUOA	1	1	1.4	1.4	1.4	1.5	1.4	1	1	1	NEWUOA [31]
(1+1)-ES	1.2	1300	4800	7700	<i>14e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	<i>16e+7/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1.8	2.8	2.8	3.6	4.2	4.2	3.9	2.7	2.7	2.7	IPOP-SEP-CMA-ES [29]

Table 133: 40-D, running time excess ERT/ERT_{best} on f_{13} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	13 Sharp ridge										
Δf_{target} ERT_{best}/D	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target} ERT_{best}/D
ALPS	80	180	130	190	860	<i>85e-3/1e5</i>	.	.	.	.	ALPS [17]
AMaLGaM IDEA	88	93	28	12	12	10	2	2	1.9	1.9	AMaLGaM IDEA [4]
BayEDAcG	100	160	<i>52e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.2	1.8	1.4	1	1	1	46	73	<i>16e-4/4e4</i>	.	BFGS [30]
BIPOP-CMA-ES	4.6	5.1	2.6	2.6	5	17	4.4	5.2	5.3	5.9	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.3	3.3	1.7	4.2	9.5	20	5.6	9.7	18	48	(1+1)-CMA-ES [2]
DASA	15	24	40	73	150	540	220	940	2900	<i>21e-5/1e6</i>	DASA [19]
DEPSO	21	1500	<i>12e+1/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	540	6800	<i>91e+0/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	25	33	11	4.5	4.7	4.8	1	1	1	1	iAMaLGaM IDEA [4]
NELDER (Han)	4.8	5.9	9.8	20	71	160	41	<i>13e-2/1e4</i>	.	.	NELDER (Han) [16]
NEWUOA	1	1	1	2	3	13	7.3	15	28	<i>88e-5/1e4</i>	NEWUOA [31]
(1+1)-ES	2.9	3.3	4.7	4.5	18	36	11	37	100	1400	(1+1)-ES [1]
Monte Carlo	<i>21e+2/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	4.4	4.6	2.1	2.8	6.3	8.2	2.6	2.8	2.8	2.9	IPOP-SEP-CMA-ES [29]

Table 134: 40-D, running time excess ERT/ERT_{best} on f_{14} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

$\Delta_{ftarget}$ ERT_{best}/D	14 Sum of different powers										$\Delta_{ftarget}$ ERT_{best}/D
	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	
ALPS	1	2.4	38	59	80	140	510	<i>27e-5/1e5</i>	.	.	ALPS [17]
AMaLGaM IDEA	1.1	2.2	44	46	53	50	30	22	20	2.1	AMaLGaM IDEA [4]
BayEDAcG	1	3.3	74	89	180	<i>63e-3/2e3</i>	.	.	.	.	BayEDAcG [10]
BFGS	1	2.4	1.7	1.6	1.8	1.7	1.2	1	1	<i>29e-7/2e4</i>	BFGS [30]
BIPOP-CMA-ES	1	1.1	2.7	2.5	3.1	3.9	4.4	5.4	6.6	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	2.3	2.1	1.7	2	2.2	2.2	3.2	5.3	1	(1+1)-CMA-ES [2]
DASA	1	4.8	8.7	8.6	13	22	71	500	4600	<i>58e-7/1e6</i>	DASA [19]
DEPSO	1.1	1.7	11	28	300	<i>11e-2/2e3</i>	.	.	.	.	DEPSO [12]
simple GA	1	3.3	280	390	1.1e4	<i>17e-2/1e5</i>	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	1	13	15	19	19	12	9.2	8.6	1	iAMaLGaM IDEA [4]
NELDER (Han)	1	2.9	2.5	2.8	3	3.4	3.4	11	<i>40e-6/1e4</i>	.	NELDER (Han) [16]
NEWUOA	1.2	2	1	1	1	1	1	2	8.6	24	NEWUOA [31]
(1+1)-ES	1.2	2	1.9	1.6	1.8	2.2	5.2	37	400	<i>81e-8/1e6</i>	(1+1)-ES [1]
Monte Carlo	1.1	1.9	<i>29e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1.1	2.4	2.3	2.9	3.7	6.8	8.8	10	1.5	IPOP-SEP-CMA-ES [29]

Table 135: 40-D, running time excess ERT/ERT_{best} on f_{15} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

15 Rastrigin											
Δ_{ftarget}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ_{ftarget}
ERT_{best}/D	4.79	190	4700	19700	26200	26600	27000	27300	27700	28400	ERT_{best}/D
ALPS	12	1100	<i>10e+1/1e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	13	9.6	1.9	1.5	1.6	1.6	1.6	1.6	1.6	1.7	AMaLGaM IDEA [4]
BayEDAcG	23	<i>24e+1/2e3</i>	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	28	<i>53e+1/9e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1.2	1	1.4	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	5.1	<i>34e+1/1e4</i>	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	640	<i>39e+1/1e6</i>	.	.	.	.	.	.	.	.	DASA [19]
DEPSO	3.7	<i>35e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	100	2200	<i>11e+1/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	3.9	2.9	9.8	14	11	11	11	11	10	10	iAMaLGaM IDEA [4]
NELDER (Han)	1.6	<i>33e+1/1e4</i>	.	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	7.4	<i>37e+1/7e3</i>	.	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	450	<i>42e+1/1e6</i>	.	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	3.6e4	<i>91e+1/1e6</i>	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1.3	1	3.6	<i>40e-1/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 136: 40-D, running time excess ERT/ERT_{best} on f_{16} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

16 Weierstrass											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	0.025	131	1800	8040	17800	35200	49300	49700	50500	ERT_{best}/D
ALPS	1	1.1	11	<i>38e-1/1e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1.1	17	3.4	3.6	4.8	3.4	3.1	3.1	3.8	AMaLGaM IDEA [4]
BayEDAcG	1	1.3	<i>31e+0/2e3</i>	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	3.7	<i>41e+0/2e4</i>	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1	1.1	1	1	1.3	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1.1	550	<i>12e+0/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1.2	1.1e5	<i>13e+0/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	1.2	<i>35e+0/2e3</i>	.	.	.	.	.	.	.	DEPSO [12]
simple GA	1	1.1	260	<i>79e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	1.1	3.1	4.3	24	27	17	23	27	27	iAMaLGaM IDEA [4]
NELDER (Han)	1	1.1	95	<i>10e+0/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	1.2	17	<i>78e-1/1e4</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1	<i>15e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	1	1.1	<i>22e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1.1	1.8	1.5	1	1	1.4	3	<i>30e-3/1e4</i>	.	IPOP-SEP-CMA-ES [29]

Table 137: 40-D, running time excess ERT/ERT_{best} on f_{17} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

17 Schaffer F7, condition 10											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	0.025	9.98	106	354	874	1300	2220	3330	6640	ERT_{best}/D
ALPS	1	1.1	7	3800	<i>12e-1/1e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1.3	13	9.3	4.9	3	2.6	1.9	1.6	4.5	AMaLGaM IDEA [4]
BayEDAcG	1	1.1	22	14	<i>47e-2/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	5.6	410	<i>68e-1/3e4</i>	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1	1	1	1	1	1	1	1	1	1.4	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	67	<i>68e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	4.2	9.4e4	<i>98e-1/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	1.2	4	31	<i>97e-2/2e3</i>	.	.	.	.	.	DEPSO [12]
simple GA	1	1.3	63	230	<i>89e-2/1e5</i>	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	1.4	5.2	2.6	1.5	1	54	110	100	62	iAMaLGaM IDEA [4]
NELDER (Han)	1	1.7	310	<i>77e-1/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	1.9	38	<i>54e-1/1e5</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	7.4	5.6e4	<i>80e-1/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	1	1.1	2.2e4	<i>91e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1.2	1	2.1	2.4	1.6	1.6	1.3	1.3	1	IPOP-SEP-CMA-ES [29]

Table 138: 40-D, running time excess ERT/ERT_{best} on f_{18} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

18 Schaffer F7, condition 1000											
Δ ftarget	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δ ftarget
ERT_{best}/D	0.025	0.403	36.1	425	1180	3180	4690	6420	16800	23700	ERT_{best}/D
ALPS	1	1	38	<i>39e-1/1e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLgAM IDEA	1	1.1	18	3.3	1.9	1	2.2	3	2.6	5	AMaLgAM IDEA [4]
BayEDAcG	1	1.1	23	35	<i>16e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	3.7	620	<i>28e+0/3e4</i>	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1.1	2.9	1.1	1.1	1.4	1.1	1.1	1.2	1.2	1.1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	3.1	<i>25e+0/1e4</i>	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	13	<i>41e+0/1e6</i>	.	.	.	.	.	.	.	DASA [19]
DEPSO	1.1	1.5	25	<i>57e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
simple GA	1.1	1.3	100	<i>46e-1/1e5</i>	.	.	.	.	.	.	simple GA [22]
iAMaLgAM IDEA	1.1	1.1	4.6	1	1	9	52	54	44	43	iAMaLgAM IDEA [4]
NELDER (Han)	1.1	12	<i>29e+0/1e4</i>	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1.1	4.2	<i>20e+0/1e5</i>	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	100	<i>35e+0/1e6</i>	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	1	1	<i>32e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	2.2	1	1.3	1.7	1.1	1	1	1	1	IPOP-SEP-CMA-ES [29]

Table 139: 40-D, running time excess ERT/ERT_{best} on f_{19} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	19 Griewank-Rosenbrock F8F2										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	0.025	8.79	1410	34800	4.21e5	6.38e5	1.13e6	1.13e6	1.14e6	ERT_{best}/D
ALPS	1	1.2	6.5	620	<i>16e-1/1e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1	11	2.4	1	2.6	7.4	4.2	4.2	4.2	AMaLGaM IDEA [4]
BayEDAcG	1	1.1	18	<i>57e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	<i>19e+0/2e4</i>	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1	1	1.1	1	1.2	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	16	<i>38e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	1.6e6	<i>16e+0/1e6</i>	.	.	.	.	.	.	DASA [19]
DEPSO	1	1.1	3.9	<i>67e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
simple GA	1	1.1	130	1e3	<i>24e-1/1e5</i>	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	1.1	7	11	46	<i>10e-2/1e6</i>	.	.	.	.	iAMaLGaM IDEA [4]
NELDER (Han)	1	1	12	<i>40e-1/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	1.2	1	<i>28e-1/1e5</i>	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1.4	7.7e5	<i>16e+0/1e6</i>	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	1	1.1	<i>14e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1	1.1	4.6	<i>84e-2/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 140: 40-D, running time excess ERT/ERT_{best} on f_{20} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

20 Schwefel $x*\sin(x)$											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	3.12	4.33	5.54	3280	4.03e6	nan	nan	nan	nan	nan	ERT_{best}/D
ALPS	45	44	40	<i>13e-1/1e5</i>	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	74	62	52	1400	<i>11e-1/1e6</i>	.	.	.	.	.	AMaLGaM IDEA [4]
BayEDAcG	85	75	64	<i>34e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1.6	1.5	1.5	33	<i>11e-1/3e4</i>	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	5.4	4.6	4.1	22	1	<i>17e-2/6e5</i>	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	3.6	3.1	2.7	<i>14e-1/1e4</i>	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	18	16	14	1	<i>57e-2/1e6</i>	.	.	.	.	.	DASA [19]
DEPSO	20	21	22	<i>30e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
simple GA	630	570	510	2.9	<i>65e-2/1e5</i>	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	31	28	23	<i>15e-1/1e6</i>	.	.	.	.	.	.	iAMaLGaM IDEA [4]
NELDER (Han)	4.8	4.6	4.1	<i>14e-1/1e4</i>	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	1	1	310	<i>11e-1/3e4</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	3.4	3	2.6	1400	<i>12e-1/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	<i>28e+3/1e6</i>	.	.	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	4.6	4	3.5	<i>16e-1/1e4</i>	.	.	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 141: 40-D, running time excess ERT/ERT_{best} on f_{21} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

21 Gallagher 101 peaks											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	0.025	26.1	529	2520	2530	2530	2540	2550	2560	ERT_{best}/D
ALPS	1	1	20	6.5	2.7	3	3.3	3.7	4.2	5.9	ALPS [17]
AMaLgAM IDEA	1	1	21	1800	1700	1700	1700	1700	1700	1700	AMaLgAM IDEA [4]
BayEDAcG	1	1	37	8	<i>13e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	2.9	2.3	2.1	2.1	2.1	2.1	2.1	9.3	BFGS [30]
BIPOP-CMA-ES	1	1	2.7	49	110	110	110	110	110	110	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	4.1	1.8	1.7	1.7	1.7	1.7	1.6	1.6	(1+1)-CMA-ES [2]
DASA	1	1	46	44	27	27	27	27	27	27	DASA [19]
DEPSO	1	1	18	16	12	<i>33e-1/2e3</i>	.	.	.	.	DEPSO [12]
simple GA	1	1	120	770	560	<i>25e-1/1e5</i>	.	.	.	.	simple GA [22]
iAMaLgAM IDEA	1	1	38	660	850	850	850	840	840	840	iAMaLgAM IDEA [4]
NELDER (Han)	1	1	13	14	5.6	5.5	5.5	5.5	5.5	5.5	NELDER (Han) [16]
NEWUOA	1	1	1	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	1	3.6	5.2	2.8	2.8	2.8	2.8	2.8	2.8	(1+1)-ES [1]
Monte Carlo	1	1	<i>69e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1	3.4	19	16	16	16	16	16	16	IPOP-SEP-CMA-ES [29]

Table 142: 40-D, running time excess ERT/ERT_{best} on f_{22} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	22 Gallagher 21 peaks										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	0.025	116	886	16200	16200	16300	16300	16300	16400	ERT_{best}/D
ALPS	1	1	8.5	12	35	110	<i>69e-2/1e5</i>	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1	2200	760	<i>69e-2/1e6</i>	.	.	.	.	.	AMaLGaM IDEA [4]
BayEDAcG	1	1	18	10	<i>73e-1/2e3</i>	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	1	1.5	<i>69e-2/8e3</i>	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1	1	6.4	60	<i>69e-2/1e5</i>	.	.	.	.	.	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	2.7	1.8	2	2	2	2	2	2	(1+1)-CMA-ES [2]
DASA	1	1	32	31	45	45	45	45	45	45	DASA [19]
DEPSO	1	1	7.3	10	<i>26e-1/2e3</i>	.	.	.	.	.	DEPSO [12]
simple GA	1	1	87	180	<i>20e-1/1e5</i>	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	1	370	760	<i>69e-2/1e6</i>	.	.	.	.	.	iAMaLGaM IDEA [4]
NELDER (Han)	1	1	4.7	3.8	9	9	9	8.9	8.9	8.9	NELDER (Han) [16]
NEWUOA	1	1	2.7	1	1	1	1	1	1	1	NEWUOA [31]
(1+1)-ES	1	1	3.3	2.7	6.6	6.6	6.6	6.6	6.6	6.6	(1+1)-ES [1]
Monte Carlo	1	1	<i>71e+0/1e6</i>	.	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1	13	6	<i>69e-2/1e4</i>	.	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 143: 40-D, running time excess ERT/ERT_{best} on f_{23} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

23 Katsuuras											
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT_{best}/D	0.025	0.025	0.237	298	1890	16500	32000	79000	81100	84000	ERT_{best}/D
ALPS	1	1	1	150	<i>80e-2/1e5</i>	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	1	1	1.1	12	2.5	1	1	1	1	1	AMaLGaM IDEA [4]
BayEDAcG	1	1	1.1	<i>37e-1/2e3</i>	.	.	.	.	.	.	BayEDAcG [10]
BFGS	1	1	58	260	<i>30e-1/5e3</i>	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	1	1	5.6	4.8	1	1.6	2	1.4	1.4	1.4	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	1	1	12	12	<i>82e-2/1e4</i>	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	1	1	1.5	76	<i>68e-2/6e5</i>	.	.	.	.	.	DASA [19]
DEPSO	1	1	1.2	<i>44e-1/2e3</i>	.	.	.	.	.	.	DEPSO [12]
simple GA	1	1	1.1	440	<i>79e-2/1e5</i>	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	1	1	1.1	2.3	1.1	3.1	12	8.1	8	7.7	iAMaLGaM IDEA [4]
NELDER (Han)	1	1	1.3	1	<i>29e-2/1e4</i>	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	1	7.1	1.8	<i>46e-2/8e3</i>	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1	1	24	280	<i>73e-2/1e6</i>	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	1	1	1.4	<i>22e-1/1e6</i>	.	.	.	.	.	.	Monte Carlo [3]
IPOP-SEP-CMA-ES	1	1	6.2	4.9	6.3	<i>89e-3/1e4</i>	.	.	.	.	IPOP-SEP-CMA-ES [29]

Table 144: 40-D, running time excess ERT/ERT_{best} on f_{24} , in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

	24 Lunacek bi-Rastrigin										
Δf_{target}	1e+03	1e+02	1e+01	1e+00	1e-01	1e-02	1e-03	1e-04	1e-05	1e-07	Δf_{target}
ERT _{best} /D	2.06	967	1.46e5	2.45e6	7.5e6	7.51e6	7.51e6	7.51e6	7.51e6	7.51e6	ERT _{best} /D
ALPS	5.8	82	<i>91e+0/1e5</i>	.	.	.	.	.	.	.	ALPS [17]
AMaLGaM IDEA	13	4.2	17	<i>42e+0/1e6</i>	.	.	.	.	.	.	AMaLGaM IDEA [4]
BayEDAcG	15	<i>28e+1/2e3</i>	.	.	.	.	.	.	.	.	BayEDAcG [10]
BFGS	560	<i>89e+1/8e3</i>	.	.	.	.	.	.	.	.	BFGS [30]
BIPOP-CMA-ES	2.3	12	4.6	1	1	1	1	1	1	1	BIPOP-CMA-ES [15]
(1+1)-CMA-ES	2.3	<i>34e+1/1e4</i>	.	.	.	.	.	.	.	.	(1+1)-CMA-ES [2]
DASA	3200	<i>55e+1/1e6</i>	.	.	.	.	.	.	.	.	DASA [19]
DEPSO	6.6	<i>37e+1/2e3</i>	.	.	.	.	.	.	.	.	DEPSO [12]
simple GA	110	1500	<i>14e+1/1e5</i>	.	.	.	.	.	.	.	simple GA [22]
iAMaLGaM IDEA	6.6	1	8.5	<i>10e+0/1e6</i>	.	.	.	.	.	.	iAMaLGaM IDEA [4]
NELDER (Han)	28	<i>64e+1/1e4</i>	.	.	.	.	.	.	.	.	NELDER (Han) [16]
NEWUOA	1	<i>25e+1/9e3</i>	.	.	.	.	.	.	.	.	NEWUOA [31]
(1+1)-ES	1700	<i>49e+1/1e6</i>	.	.	.	.	.	.	.	.	(1+1)-ES [1]
Monte Carlo	650	<i>82e+1/1e6</i>	Monte Carlo [3]
IPOP-SEP-CMA-ES	2.3	1.5	1	<i>46e+0/1e4</i>	IPOP-SEP-CMA-ES [29]

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