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Autonomous exploration, active learning and human guidance with open-source Poppy humanoid robot platform and Explauto library

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► To cite this version:

Sébastien Forestier, Yoan Mollard, Damien Caselli, Pierre-Yves Oudeyer. Autonomous exploration, active learning and human guidance with open-source Poppy humanoid robot platform and Explauto library. The Thirtieth Annual Conference on Neural Information Processing Systems (NIPS 2016), Dec 2016, Barcelona, Spain. hal-01404399v1

HAL Id: hal-01404399

<https://inria.hal.science/hal-01404399v1>

Submitted on 29 Nov 2016 (v1), last revised 28 Aug 2018 (v2)

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Autonomous exploration, active learning and human guidance with open-source Poppy humanoid robot platform and Explauto library



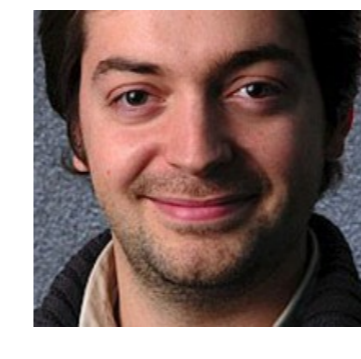
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The Demonstration

The Torso robot learns how to move its arm to control the ball, light and sounds!
Interact to help him:

- On the **Tablet**, click an element to focus on (sound, light, ball pose...)
- Push the **Demo Button** and then **demonstrate** a motion:
 - ◆ **Move Torso's left arm** to show him how to control the joystick
 - ◆ **Move the left joystick** to show him how to teleoperate the Ergo robot



An open platform *Poppy robots + Explauto library*, to:

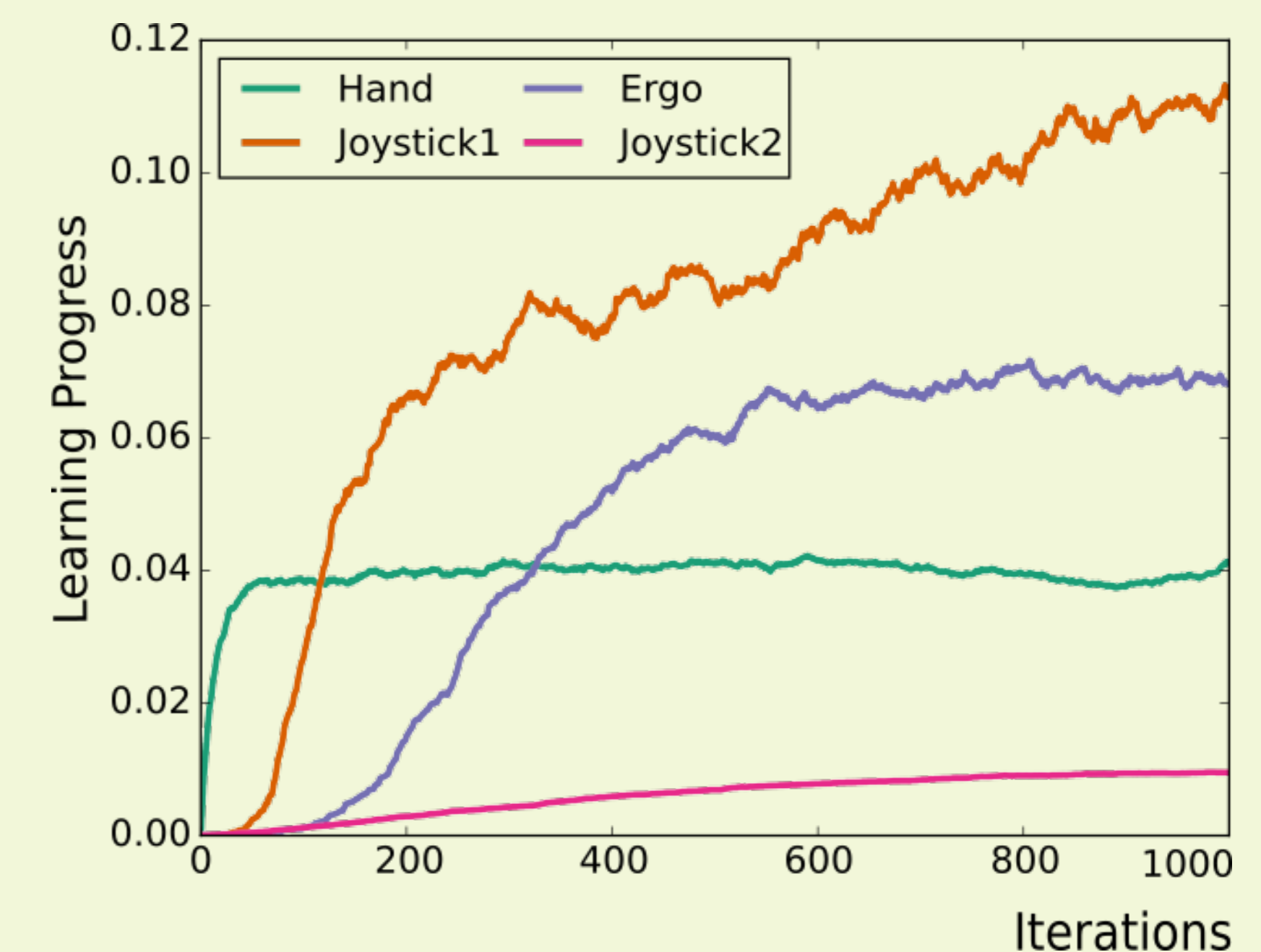
- Allow **non-roboticists** researchers to conduct **learning experiments** with robots
- Benchmark algorithms for active multi-tasks policy learning with robots

github.com/sebastien-forestier/NIPS2016

Intrinsically Motivated Multi-Task Reinforcement Learning

Intrinsically motivated RL allows:

- To learn **parameterized policies**
- To solve families of **parameterized problems**
- Problems structured in spaces that can be organized in a **hierarchy of reusable skills**



github.com/sebastien-forestier/ExplorationAlgorithms

Forestier, S. and Oudeyer, P.-Y. (2016). *Modular active curiosity-driven discovery of tool use*. In 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea.

Poppy: an experimental platform for science

“Make *scientific outputs* openly **accessible**, **reproducible** and **cumulative**”

Poppy robots are accessible in terms of **cost** and **complexity**, allowing researchers to share hardware and experimental details

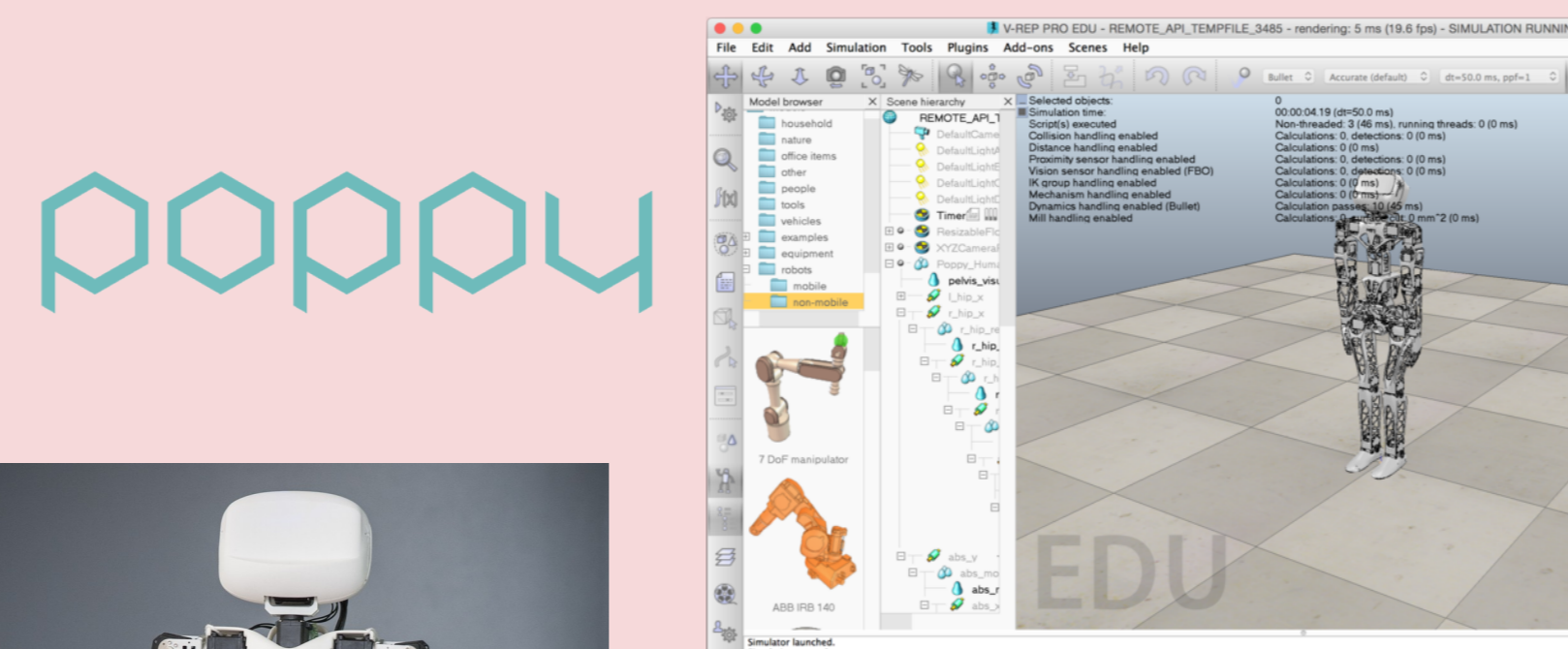
Fast design, building and experimentation of alternative morphologies: **3D printing** and **rapid prototyping** techniques now make it possible!

poppy-project.org

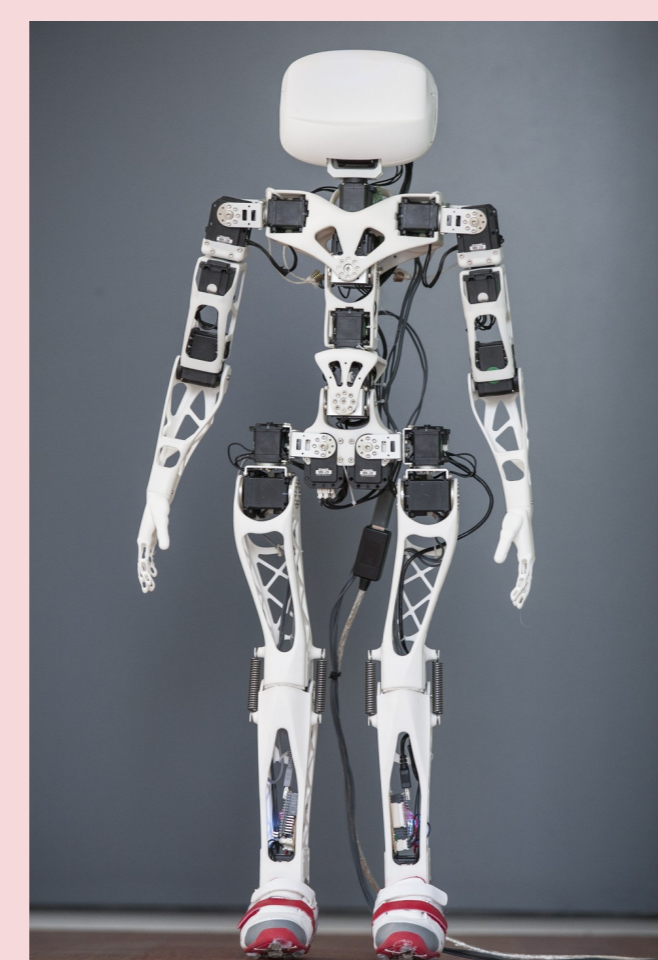


Make your Ergo Jr jump in 3 lines of code

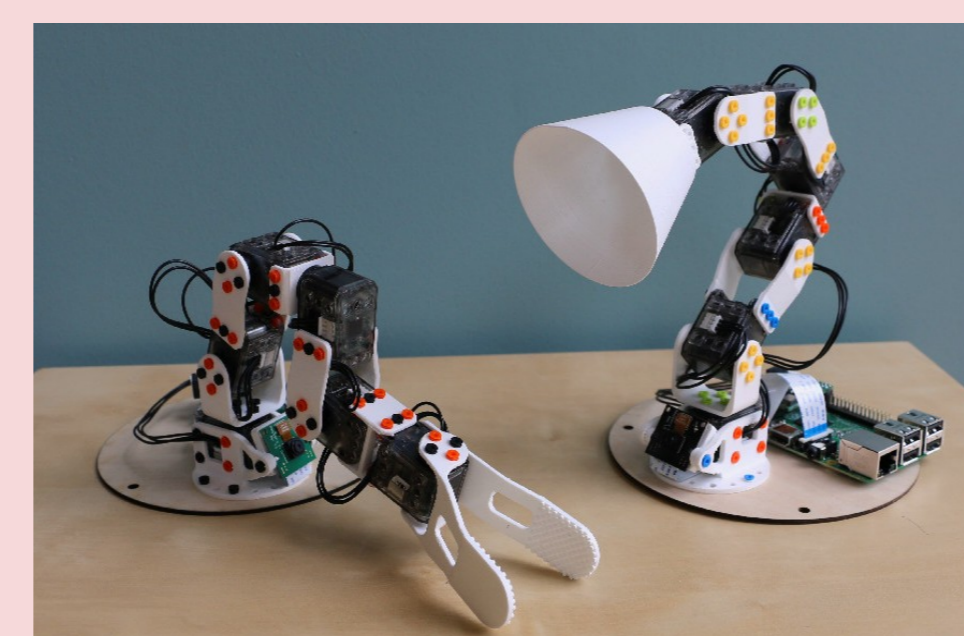
```
In [ ]: from poppy.creatures import PoppyErgoJr
jr = PoppyErgoJr()
In [ ]: jr.jump.start()
```



Robot simulator



Poppy Humanoid



Poppy Ergo Junior

Explauto: a library to study learning in robotics agents

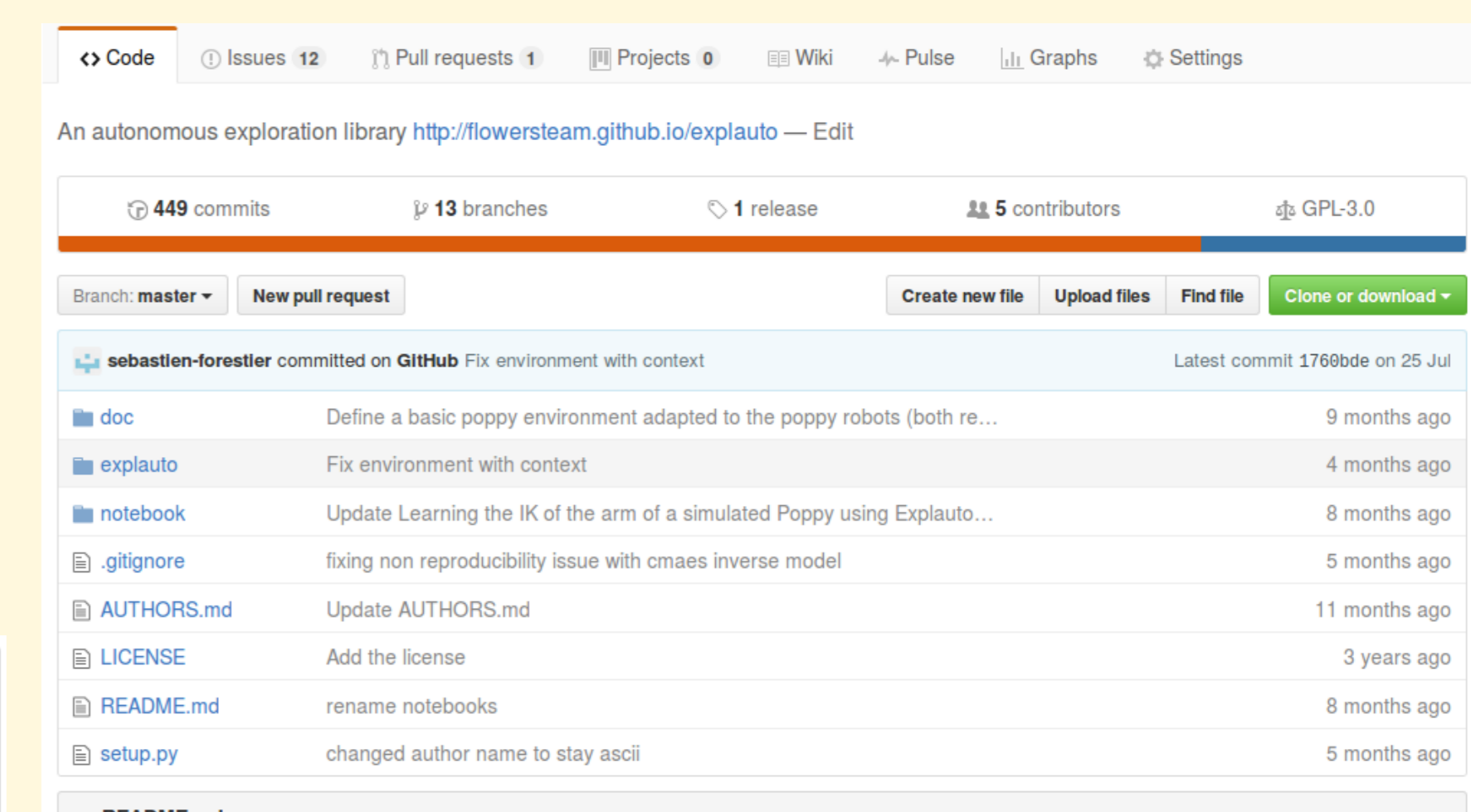
Explauto provides a high-level Python API for an easy definition of:

- Real and simulated **robotics setups**
- **Incremental learning** of parametrized policies
- **Active selection** of parametrized RL problems

```
from explauto.experiment import Experiment, make_settings

s = make_settings(environment='simple_arm',
                  babbling_mode='motor',
                  interest_model='random',
                  sensorimotor_model='nearest_neighbor')

expe = Experiment.from_settings(s)
```



Explauto: A library to study, model and simulate curiosity-driven learning and exploration in virtual and robotic agents

github.com/flowersteam/explauto