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Introduction to the special session "10 years of reproducibility in biomedical research: how can we achieve generalizability and fairness?"

Camille Maumet

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Special session – April 19, 2023



10 years of reproducibility in biomedical research how can we achieve generalizability and fairness?

Camille Maumet

Inria, Univ Rennes, Inserm, CNRS, IRISA, France



On our way **to fix irreproducibility**

On our way **to fix irreproducibility**

Irreproducible with...

Same Data

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Irreproducible with...

Same Data

Lack of experimental
details

Proposed solutions
Sharing code,
Programming best
practices, etc.

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✨ **Open question** ✨

How to ensure computational reproducibility with increasingly big sample sizes?



Talk 1 by **Adina Wagner**

On our way **to fix irreproducibility**

Irreproducible with...

Different Data

On our way to fix irreproducibility

Irreproducible with...

Different Data

False positive finding

Low statistical power

SCIENCE A Waste of 1,000 Research Papers

Decades of early research on the genetics of depression were built on nonexistent foundations. How did that happen?

ED YONG MAY 17, 2019

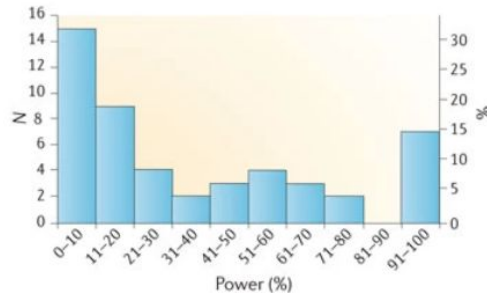


SEAN NEL / SHUTTERSTOCK

In 1996, a group of European researchers found that a certain gene *SLC6A4*, might influence a person's risk of depression.

It was a blockbuster discovery at the time. The team found that a version of the gene was more common among 454 people who had disorders than in 570 who did not. In theory, anyone who had this gene variant could be at higher risk for depression, and that finding might help in diagnosing such disorders, assessing suicidal behavior

Power of neuroscience studies



[Button, Nat Rev Neurosci 2013]

The Atlantic Science, [“A waste of 1000 research papers”](#), Ed Yong. The New York Times, [“Many Facial-Recognition Systems Are Biased, Says U.S. Study”](#), By Natasha Singer & Cade Metz., 2019

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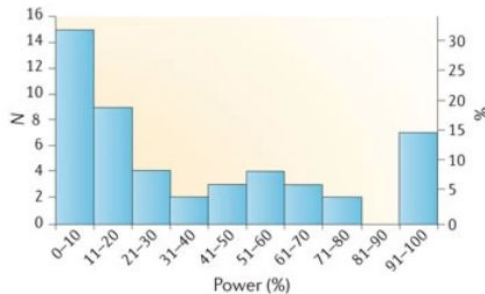
SEAN MEL / SHUTTERSTOCK

In 1996, a group of European researchers found that a certain gene, called *SLC6A4*, might influence a person's risk of depression.

It was a blockbuster discovery at the time. The team found that a less active version of the gene was more common among 454 people who had mood disorders than in 570 who did not. In theory, anyone who had this particular gene variant could be at higher risk for depression, and that finding, they said, might help in diagnosing such disorders, assessing suicidal behavior, or even

[Border, Am J Psy. 2019]

Power of neuroscience studies



[Button, Nat Rev Neurosci 2013]

The New York Times

Many Facial-Recognition Systems Are Biased, Says U.S. Study

Algorithms falsely identified African-American and Asian faces 10 to 100 times more than Caucasian faces, researchers for the National Institute of Standards and Technology found.



Morning at Grand Central Terminal. Technology for facial recognition is frequently biased, a new study confirmed. Timothy A. Clary/Agence France-Press — Getty Images

[Buolamwini, MIT 2017]

X-ray opacity detections



[Larrazabal, PNAS 2020]

The Atlantic Science, "[A waste of 1000 research papers](#)", Ed Yong. The New York Times, "[Many Facial-Recognition Systems Are Biased, Says U.S. Study](#)", By Natasha Singer & Cade Metz., 2019

On our way to fix irreproducibility

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Different Data

False positive finding

Low statistical power

Lack of generalisability

Unrepresentative sample



Proposed solution
Data Sharing

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Proposed solution
Data Sharing

✨ Open question ✨

How do scientific findings apply to subgroups of the population?



Talk 3 by
Melanie Ganz

✨ Open question ✨

How can inclusivity support fairness?

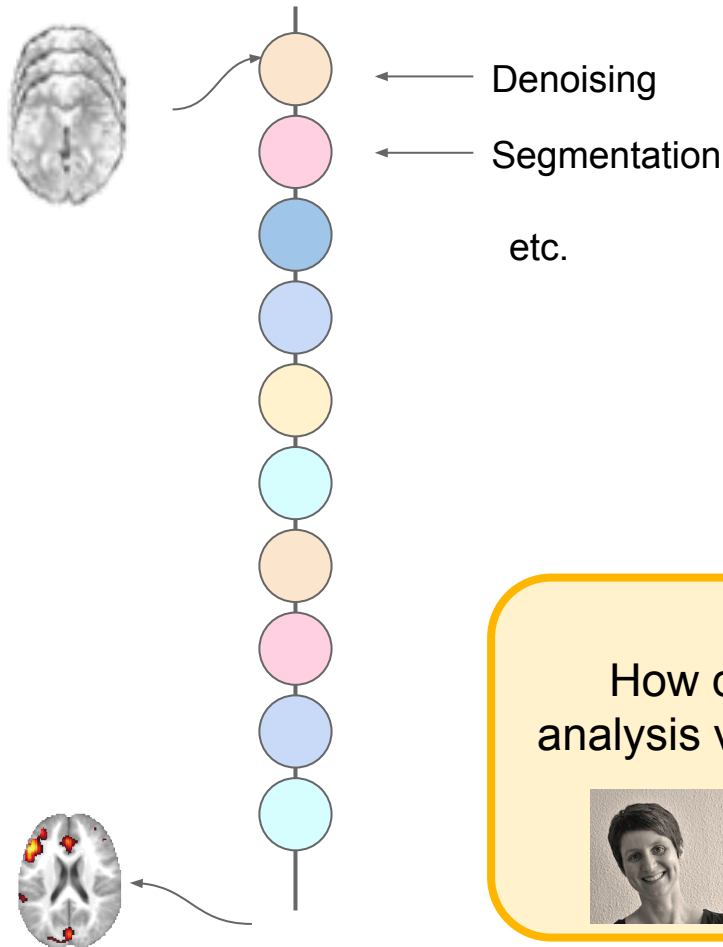


Talk 4 by
**Cassandra Gould
van Praag**

Fixing the reproducibility issue

Irreproducible with...

Different methods



✨ Open question ✨

How does a finding obtained with a given analysis vary when computed using another tool or algorithm?



Talk 2 by Camille Maumet

Talk 1 Towards **computational reproducibility** when working with **very large datasets**



Adina Wagner
Psychoinformatics Lab
INM-7
Juelich Research Center
Germany

Talk 2 Different analysis pipelines, different results... How to deal with **analytical variability?**



Camille Maumet
Empenn team
Inria, Univ Rennes,
CNRS, Inserm
France

Talk 3 **Fairness in biomedical imaging:** overview and a case study in neuroimaging



Melanie Ganz
Neurobiology Research
Unit at Rigshospitalet
Dpt. for Computer
Science
Uni. of Copenhagen,
Denmark

Talk 4 How does **inclusivity** support fairness in biomedical imaging?



Cassandra Gould Praag
Dpt. of Psychiatry
Uni. of Oxford
United Kingdom