



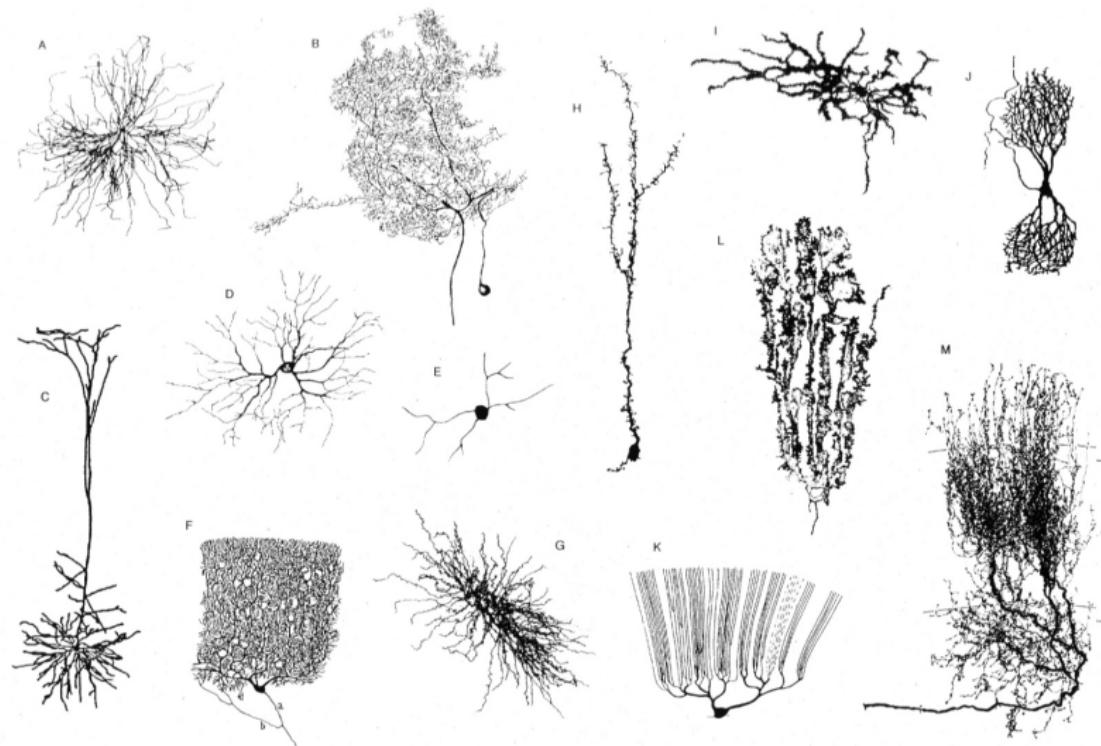
NeuroFedora

FOSS and Free/Open (neuro) Science

NeuroFedora contributors

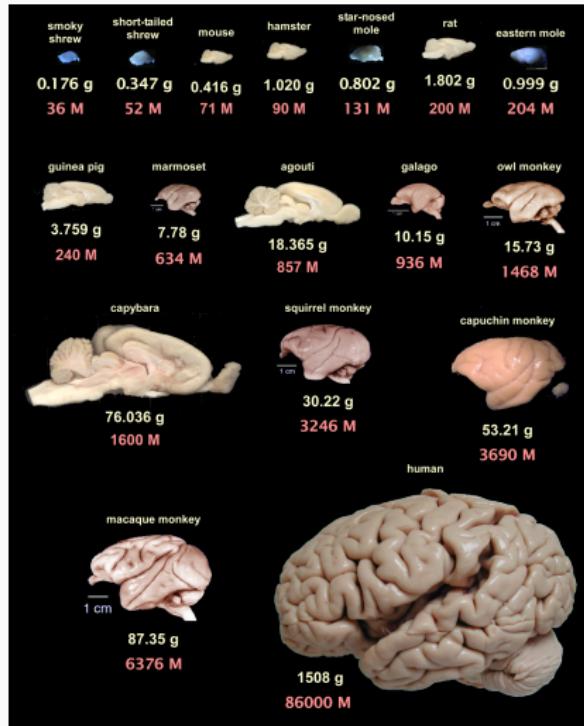
Problem statement: the brain

The brain: neurons



Dendrites, Oxford University Press, 2015; Modified from Mel, B.W. Neural Computation, 1994.

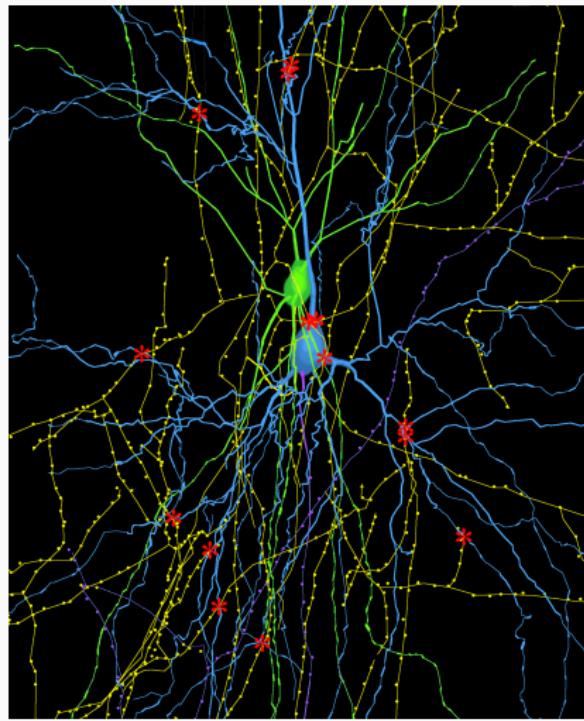
The brain: in numbers: neurons



- 86B neurons¹.

¹ Suzana Herculano-Houzel. "The human brain in numbers: a linearly scaled-up primate brain". In: *Frontiers in human neuroscience* 3 (2009), p. 31. DOI: [10.3389/neuro.09.031.2009](https://doi.org/10.3389/neuro.09.031.2009)

The brain: in numbers: synapses

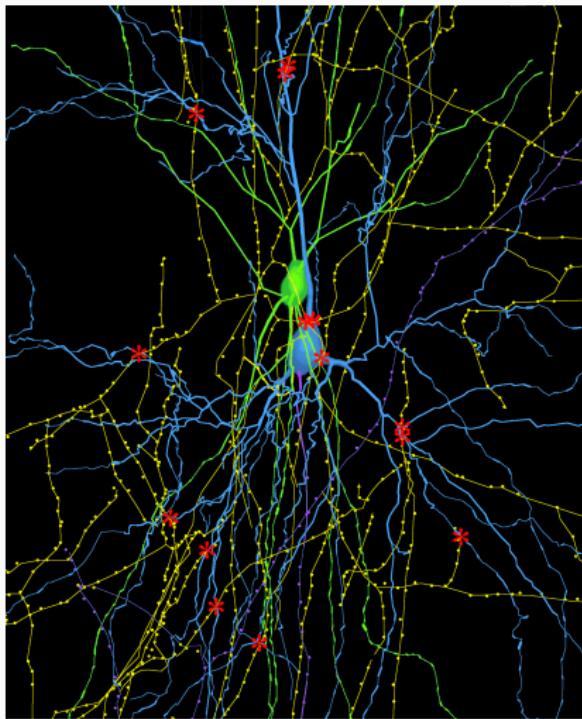


- Thousands of connections between neurons (synapses)².
- Synapses are also of different types, and serve different functions.

²Image from The Gao lab, College of Medicine, Drexel University.

³D. O. Hebb. *The organization of behavior: A neuropsychological theory*. 1949

The brain: in numbers: synapses



- Thousands of connections between neurons (synapses)².
- Synapses are also of different types, and serve different functions.
- Synapses underlie learning³.

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- how the brain functions (**physiology**),
- how it is structured (**anatomy**),
- about its chemicals (**pharmacology, biochemistry**),
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- how the brain functions (**physiology**),
- how it is structured (**anatomy**),
- about its chemicals (**pharmacology, biochemistry**),
- ...
- how it processes information (**computational**),
- about behaviours, and cognition (**behavioural, cognitive**),
- ...

with the aim of applying this knowledge to

- disease prevention and treatment,
- ...

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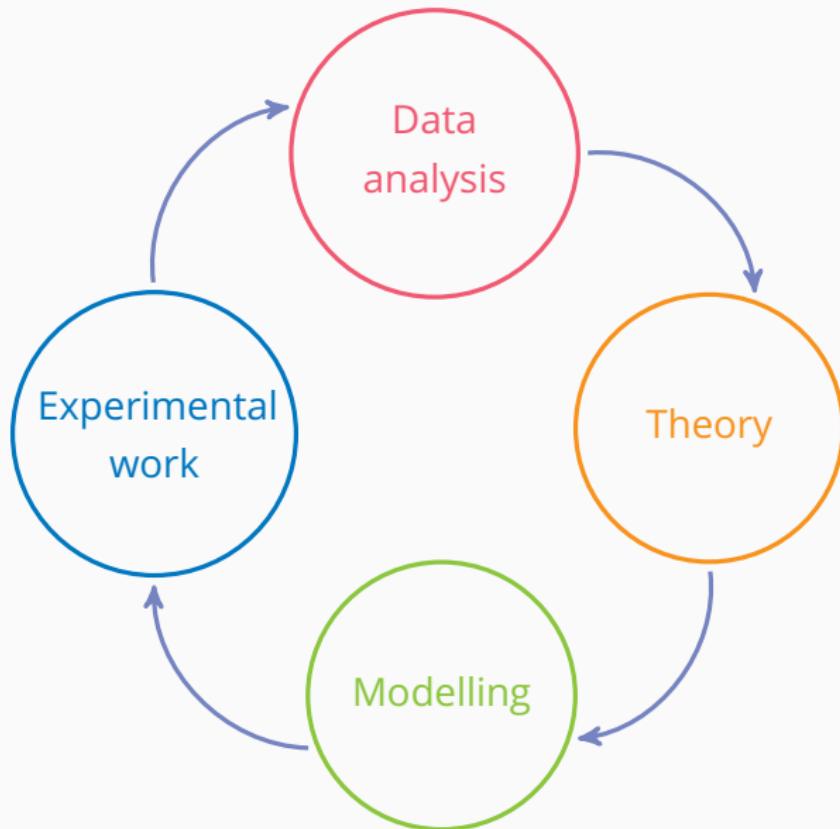
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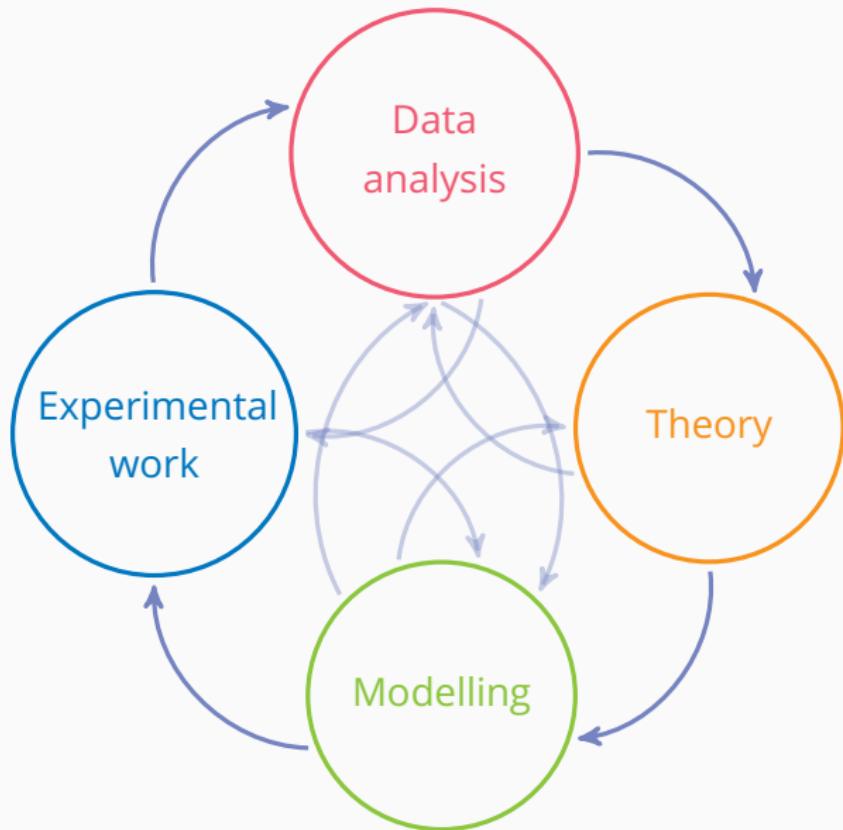
- disease prevention and treatment,
- ...
- brain inspired computing,
- ...
- philosophy and consciousness,

Research pipeline

General workflow



General workflow



Tools of the trade

- Experimental:
 - EEG, ECoG, intracellular and extracellular single and multi neuron recording,
 - CT, DOI, MRI, f-MRI, MEG, PET,

⁴To a non-specialist audience.

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- Dissemination of results⁴.

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FOSS and Free/Open Science share ideals

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Everyone should have the freedom to share, study, and modify software⁵.

⁵Free software foundation

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Free/Open Science implicitly includes FOSS.

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FOSS and Open Science are catching on:

- There are now active efforts to:
 - use FOSS⁶,
 - standardise open access publishing,
 - use open formats for data,

⁶Open source for neuroscience

Fedora and Open Science?

User/developer community

- various specialities: biologists, mathematicians, physicists, chemists, psychologists, ... ,

User/developer community

- various specialities: biologists, mathematicians, physicists, chemists, psychologists, . . . ,
- small proportion of trained software developers,

Anecdotal observations on software

- often single developer, small user-developer communities,
- limited code quality,
- limited use of established best practices,
- limited testing for correctness (!),
- limited maintenance,
- often limited lifespan,

- FOSS for