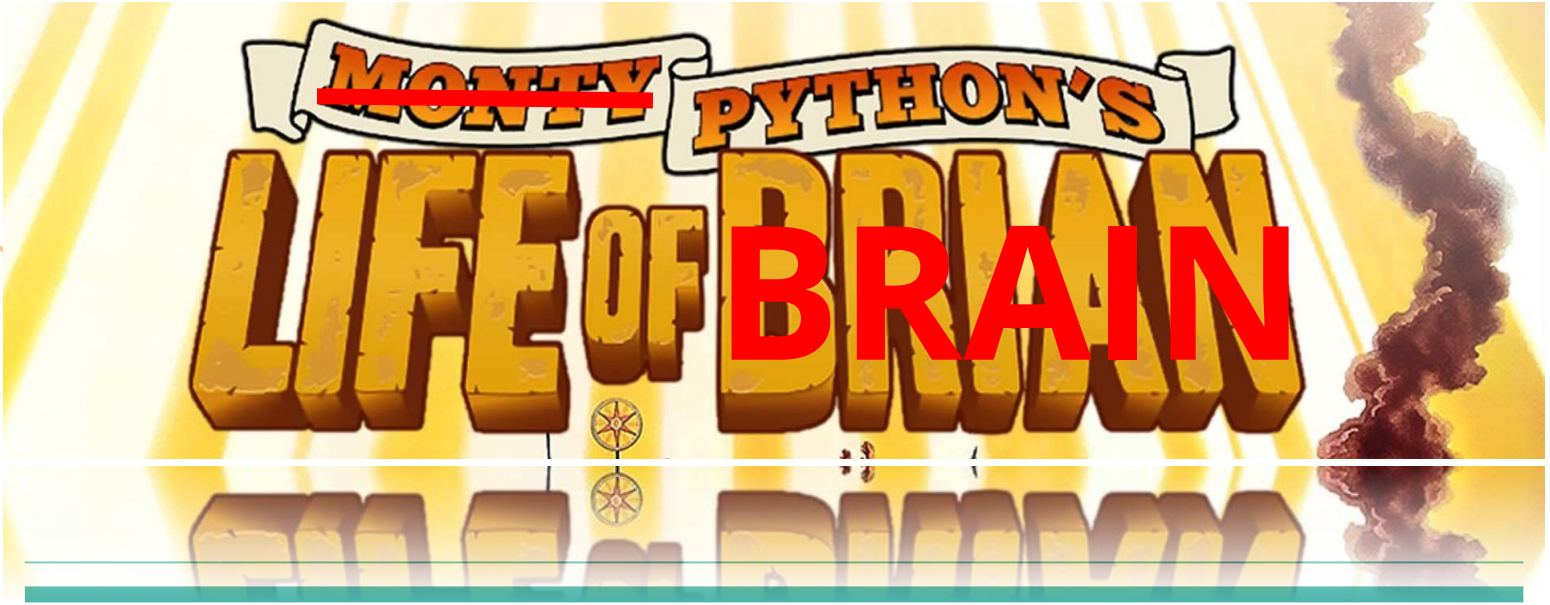


Dominik Krzemiński

@dokatox

In this talk

#EEG

#MEG

#brains

#fruit flies

#simulations

#python

#modelling

About me

Dominik Krzemiński

(Ⱪ - she - minsky)

- Neuroscientists
- Data scientists
- Open source enthusiasts...
- ... and contributor
- Open science advocate

UNIVERSITY OF CAMBRIDGE

SAMSUNG

Appsilon

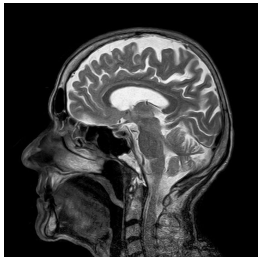
dokato.github.io

@dokatox

DEXdata

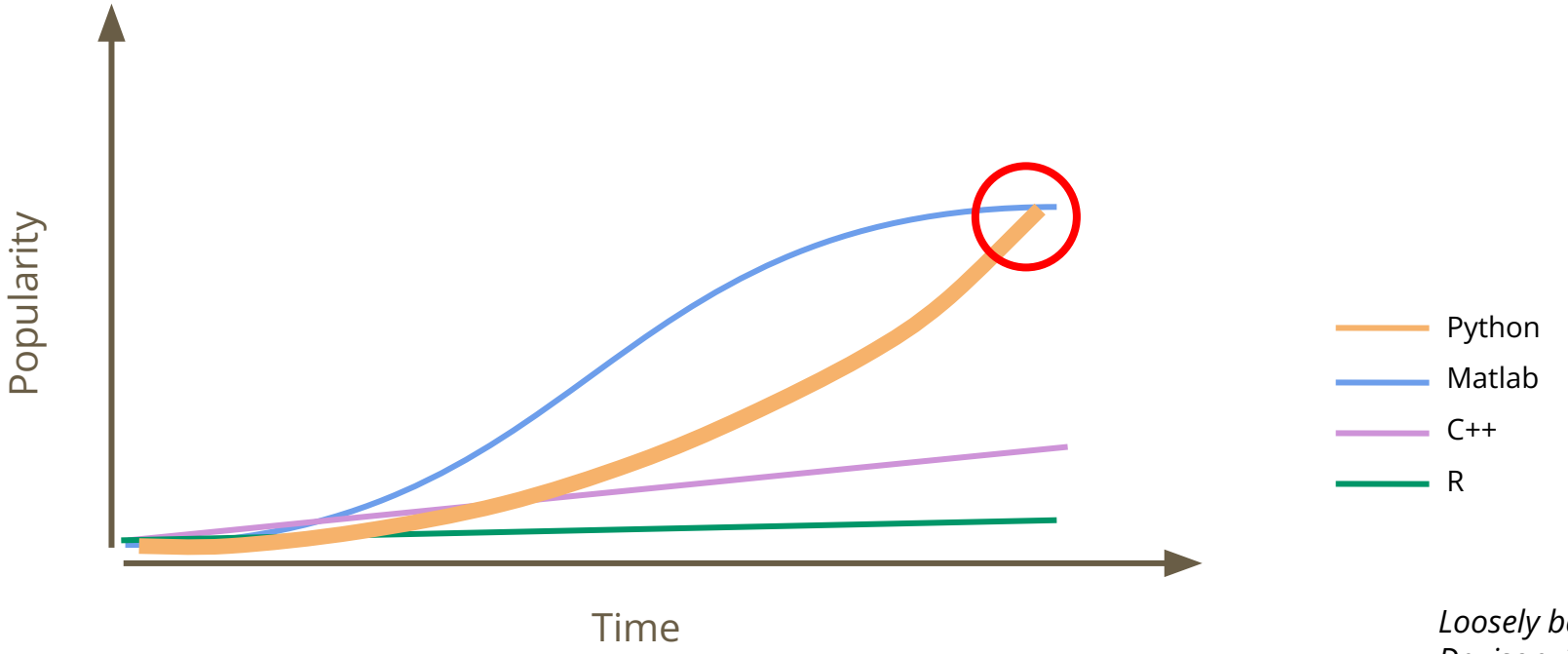
Why Python useful in brain research?

- Large volumes of data
- Computer simulation



- Gentle entry curve
  - A lot of neuroscientists are not trained software engineers
- Matlab
- Code sharing

Why Python useful in neuroscience?



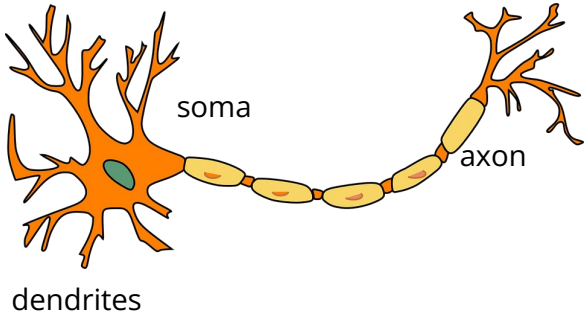
Loosely based on:
Davison, 2009
and twitter

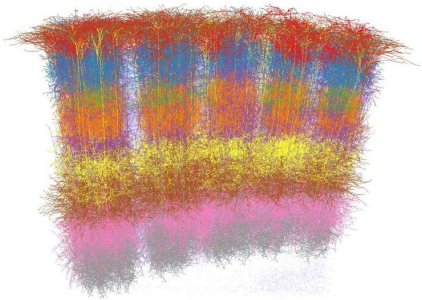
Why Python useful in neuroscience?

Ah. Thwow him to the floow.

Scales of brain investigation

Soma : 10–25 um in diameter
Length: < 1mm





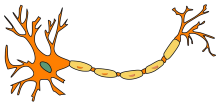
50 um diameter and 1500 um depth = 3000000 um^3 = 3e-6 cm^3
~200 neurons

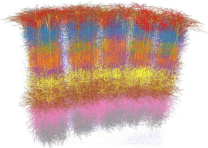
1400 cm^3
Weight: 1.5 kg

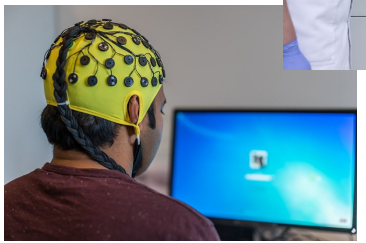
16 billion neurons!

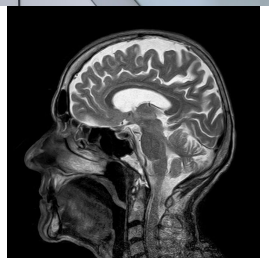
Sources: pixabay, image stock

Tools for brain investigation









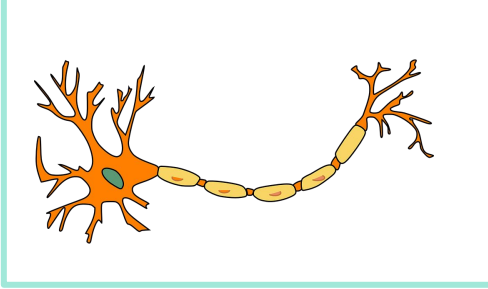
Sources: pixabay, image stock

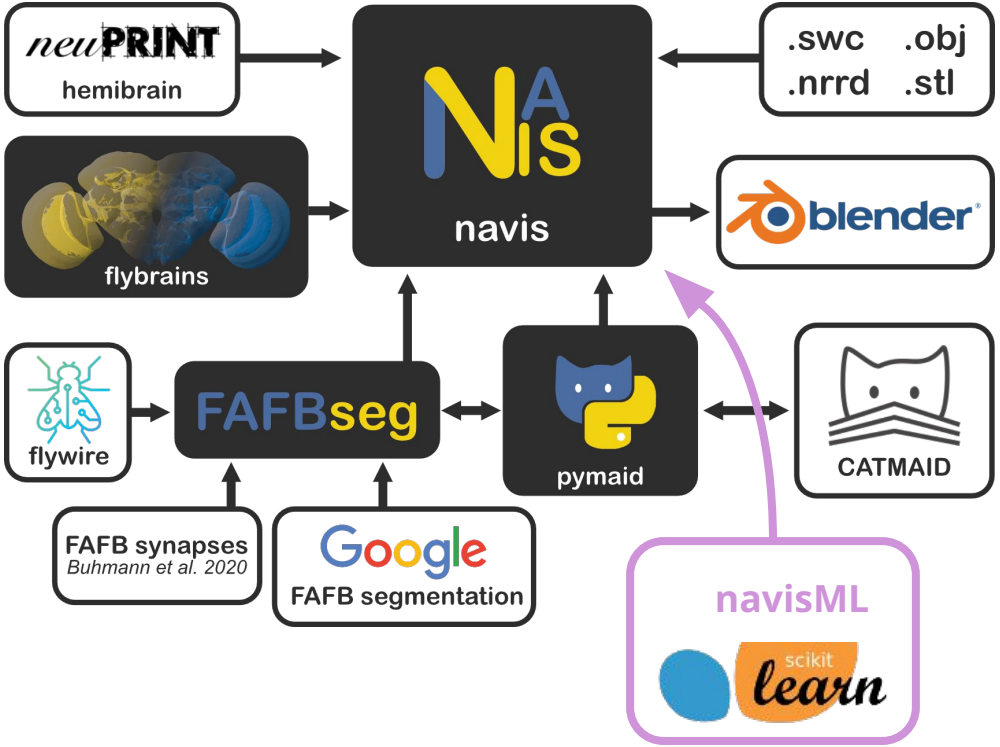
Python + Neurons = 💖

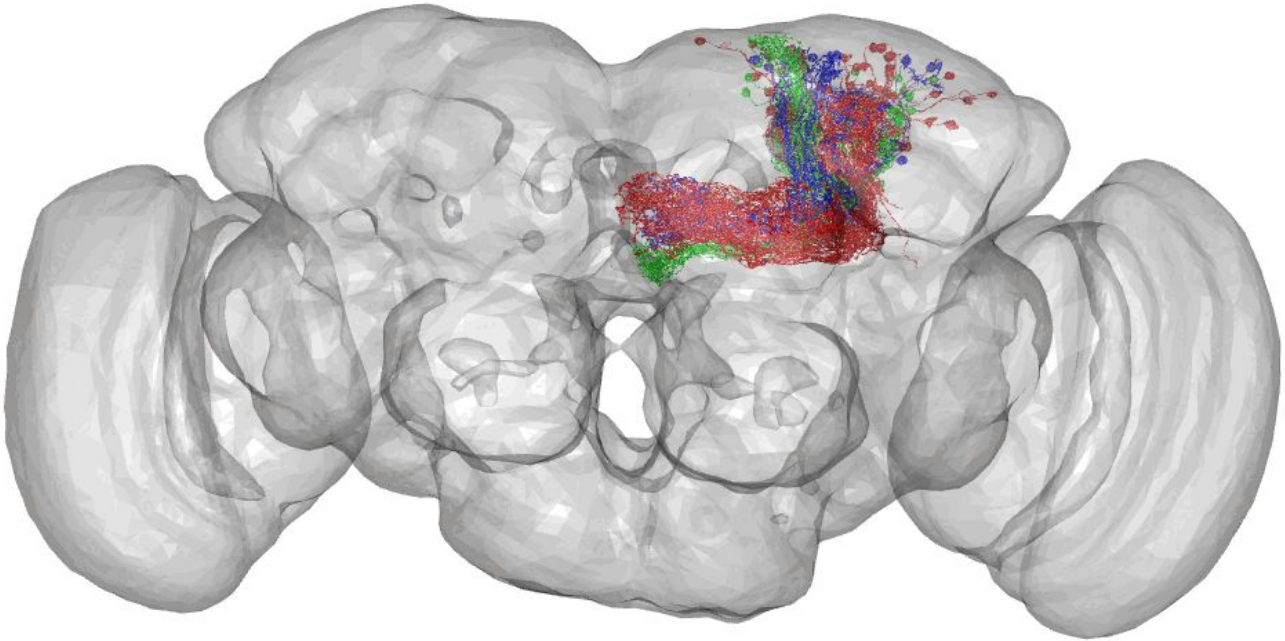
https://github.com/dokato/life-of-brain

navis

- library for **Neuron Analysis** and **Visualization**
- Works in Ipython **notebooks**
- High **performance** computation
- analyze **morphology** and **connectivity** of individual neurons



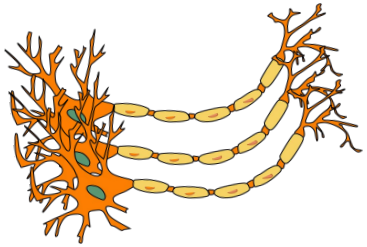


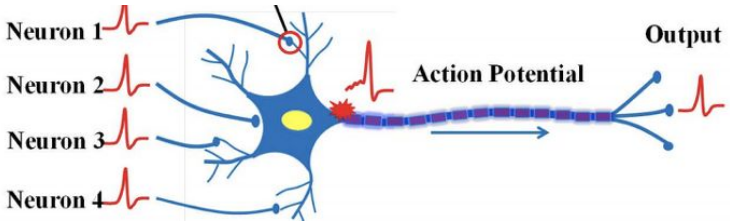


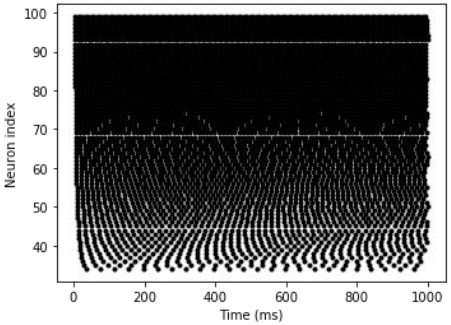
Kenyon cells, *Drosophila*

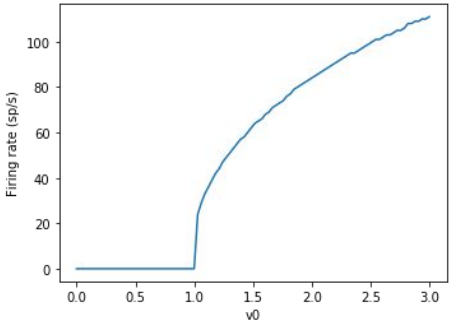
Brian2

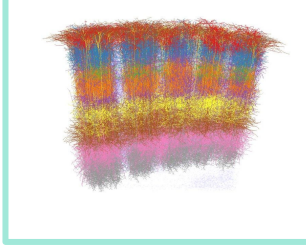
- A **simulator** for **spiking neural networks**
- Designed to **save time** of **processors**, but also **scientists**
- easy to learn and use







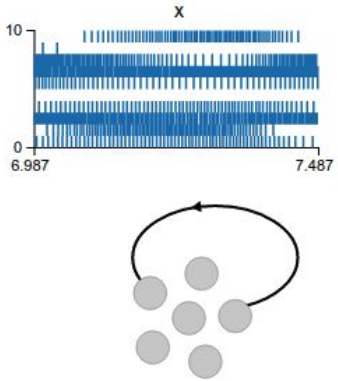




Nengo

- Python package for building, testing, and deploying biologically plausible neural networks
- Spiking neuron models
- Comes with Nengo GUI
- Easily exploit the latest hardware, i.e. NPU

Nengo

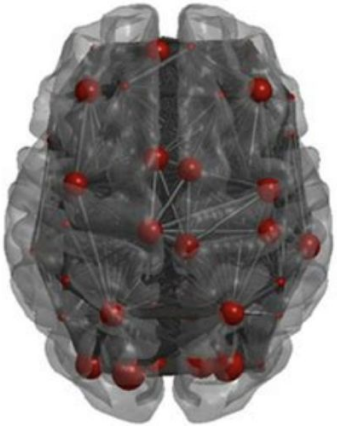


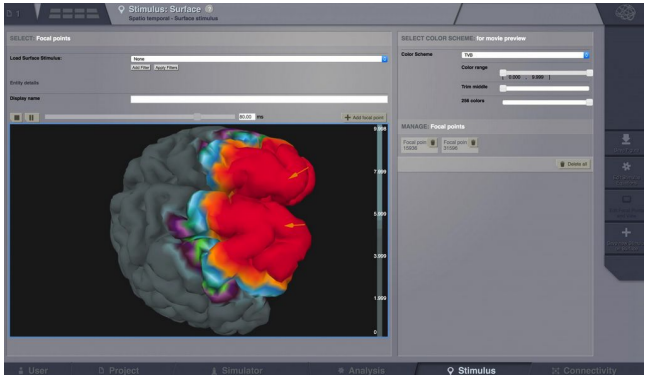
The virtual brain

- Platform for large-scale brain simulations
- Brain regions treated as a node of the graph where the local dynamical models are run

www.thevirtualbrain.org

THEVIRTUALBRAIN.





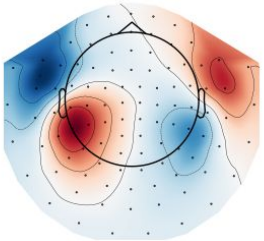
MNE-python

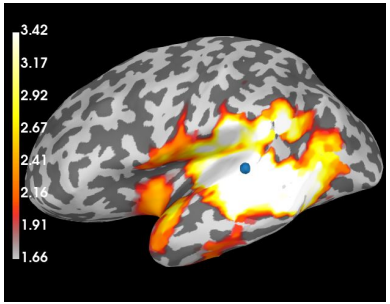
Package for exploring, visualizing, and analyzing human neurophysiological data such as MEG, EEG, sEEG, ECoG, and more.

- Source estimation
- Connectivity
- Statistics

MNE

MEG + EEG ANALYSIS & VISUALIZATION





Other packages

- ★ Nibabel
- ★ PsychoPy
- ★ Neurolib
- ★ Connectivipy

Many more...

What's so special about the cheesemakers?

"Well, obviously it's not meant to be taken literally. It refers to any manufacturer of dairy products."

Summary

Python becomes more and more popular programming language in the **brain research** field.

- Analysis and modelling on almost any scale of brain
- Increased reproducibility and readability of a scientific software
- Democratization of science

https://github.com/dokato/life-of-brain

Thank you!

Grazie mille!

dokato.github.io

dkk33@cam.ac.uk


/@dokatox

Always look at the bright side of brain...

(or something like this)