

PYTHON FOR NEUROSCIENTISTS

Spring/Summer 2021

Advisor:	Rudy Behnia
Instructors:	Jessica Kohn, Jacob Portes, Matthias (aka Gucky) Christenson, Elom Amematsro
Email:	mpc2171, jrk2177, jpp2139, eaa2164
Time:	Tue & Thu 12:00 pm – 1:30 pm EST

Course Dates: Tuesday May 4th through Tuesday June 8th.

Course Page: <https://neuropython.com/>

Slack Channel: columbianeuro-mkw1067.slack.com (zoom link will be shared over slack and Courseworks)

Objective: Learn how to use the most common Python packages for data science. Become confident in managing and analyzing your own data.

Prerequisites: Basic programming experience in R, python, or MATLAB is a plus, but not required.

Courseworks: Note that this course is listed in the Columbia Course Directory for Spring 2021 as “GR7050 Python for Handling Neuroscience Data.” Those not officially registered can gain access to Courseworks as a student “observer” by emailing the instructors.

Course Format: 11 classes lasting <1.5 hours each. We have redesigned the course to fit the “flipped classroom” format. Classes will begin with a short lecture (~ 30 min) followed by exercise-based, interactive breakout room sessions of ~ 4 people. There won’t be homework; those taking the course for credit are expected to attend the majority of classes and participate in group exercises. The first two lectures will be for people who have had no experience with Python whatsoever. Please feel free to join or skip classes depending on the material you are interested in!

Course Outline: (Tentative)

Class 1 - 3 Python Basics [Jessie, Jacob]

- Refresher of programming basics in Python, with a focus on `numpy` and `matplotlib` packages
- Data structures (intro to int, float, dict, tuple, etc.)
- Writing for loops, while loops, if statements, and functions
- Installing Python using `anaconda` and `pip`
- Introduction to programming environments: `jupyter` notebook, text editors, terminal, etc.

Class 4 - 5 Scientific Programming Basics [Jacob, Jessie]

- Using `scipy` and `sklearn`
- Series and dataframes with `pandas`

- Intro to Python “classes”

Class 6 - 7 Machine Learning Basics [Elom, Gucky]

- Predictive Modelling
- Dimensionality Reduction
- Clustering and Classification
- Data visualization and transformations

Class 8 - 9 Writing your own Classes in Python [Jacob, Gucky]

- Class attributes and methods
- Building a class from scratch
- Inheritance and building a subclass
- Class operators
- Using decorators in classes

Class 10 - 11 Data Pipelines [Gucky, Elom]

- Introduction to basic Git commands
- Introduction to DataJoint
- Ways to save your data
- Making your analysis pipeline reproducible
- Science data pipelines with DataJoint
- Building your own scientific data pipeline