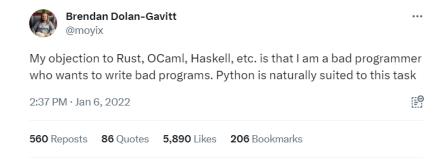
# Python for Research Computation: An Intermediate Workshop

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### 1 Introduction



This workshop is a five-part series on various aspects of Python I wish I had known at the beginning of graduate school. Some familiarity with programming is assumed; familiarity with Python (as well as modules such as NumPy, matplotlib) will be helpful but not strictly necessary.

### 2 Rationale

Python has somewhat of a bad reputation. It's slow. It's badly designed - who thought duck typing was a good idea? why does the Global Interpreter Lock exist? Many people internalize these criticisms and resign themselves to writing bad, slow Python code. This workshop is intended as a defense of Python for research computing - in my opinion, Python is just enough of a programming language to be extremely powerful, while avoiding a lot of baggage that scientists don't care about. Also, it can be fast. Seriously.

## 3 Learning Objectives

By taking this workshop, students will be able to:

- Code in a manner that reduces and simplifies the debugging of errors.
- Implement computational pipelines in a rigorous and reproducible manner.
- Recognize potentially slow code and implement faster alternatives.
- Produce highly customized figures in matplotlib and Seaborn.
- Manipulate non-numerical data with pandas.

### 4 Schedule

- 1. Th 9/11 Why Python? + Introduction to base Python
- 2. F 9/12 Defense: defensive programming, reproducibility, creating workflows with argparse and snakemake, using git for research.
- 3. M  $9/15^*$  Offense: Introduction to NumPy + how to write fast code.
- 4. T 9/16 Figure... Tuesday? plotting numerical data using matplotlib
- 5. F 9/19 Handling categorical data with pandas and plotting it with Seaborn

All lectures other than Monday will take place from 2:30-3:30 PM in GCIS W105. Monday's lecture is at 10:30 AM, also in GCIS W105.

## 5 Assignments

One Jupyter notebook's worth of homework per lecture. Optional. Each homework is intended to take 1-2 hours. I intend to provide feedback on all submitted homework.

### 6 Github

All lectures, homework, and miscellaneous files can be found on my github here: https://github.com/enifmada/research-python-workshop/tree/main