

COGS138: Neural Data Science

Lecture 2

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UCSD Dept. of Cognitive Science, Spring 2023

http://casimpkinsjr.radiantdolphinpress.com/pages/cogs138_sp23

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(Based on a course created by Prof. Bradley Voytek)

Plan for today

- Announcements
- Review - Last time
- Programming, python and Jupyter notebooks
- Jupyter notebook review, EDA with jupyter
- Asking the right questions - perspectives on your data
- More on general questions of what is data science, how does it relate to Neuroscience

Announcements

- On sickness and attendance
 - If you are not well, please do not come to lecture, attend when fully recovered.
 - The course is set up so you will be not missing anything, though in person learning is the best, it's better not to spread anything
 - If you have any issues we are here to help, answer questions and meet over zoom
- Course website is up, not much there yet, just an overview
 - Look for assignments page link with the first assignment and links to readings, etc by tomorrow
- SONA is **extra credit** - 2h for at least 2%, depending on total extra credit it might be higher, and you can do 1 for 1% etc, so any you do will give credit

Last time

- Course intro, intro to Neural Data Science
 - What is data science, and how does it intersect with neuroscience?
- Data hub discussion, review
 - File structures, basic operations, installation on your own machine of the toolsets
- Syllabus overview, class orientation

Course links

Website	http://casimpkinsjr.radiantdolphinspress.com/pages/cogs138_sp23	Main face of the course and everything will be linked from here. Lectures, Readings, Handouts, Files, links
GitHub	https://github.com/drsimpkins-teaching	files/data, additional materials & final projects
datahub	https://datahub.ucsd.edu	assignment submission
Piazza	https://piazza.com/ucsd/spring2023/cogs138_sp23_a00/home (course code on canvas home page)	questions, discussion, and regrade requests
Canvas	https://canvas.ucsd.edu/courses/44897	grades, lecture videos
Anonymous Feedback	Will be able to submit via google form	if I ever offend you, use an example you are uncomfortable with, or to provide general feedback. Please remain constructive and polite

What is a program?

- Generally a **program** is a **set of instructions** the programmer defines for a device or entity (usually a computer but not always) to follow
- Regarding computers-> programmer writes a set of instructions (“program”) that tells the computer to perform a set of operations
- When the program is executed, the instructions are carried out
- Does a program have to run on a digital machine? What is a computer? “Multiple realizability”

Why write a program, what does it have to do with neuroscience?

- What do you think? Course discussion...
- Many reasons you may want to write a program
- This can be anything, i.e.:
 - Processing data - behavioral, neural, environmental, etc.
 - Making a robot walk
 - Computer/phone/tablet app for some function

Why python?

- It's free
- Tremendous library support
- Easy interpreted language, quick for prototyping
- Highly optimized computational libraries
- Cross platform/portability
- Strong user community for answering questions/knowledgebase

When python?

- Web app development
- Data science
- Scripting
- Database programming
- Quick prototyping

Why Jupyter Notebooks

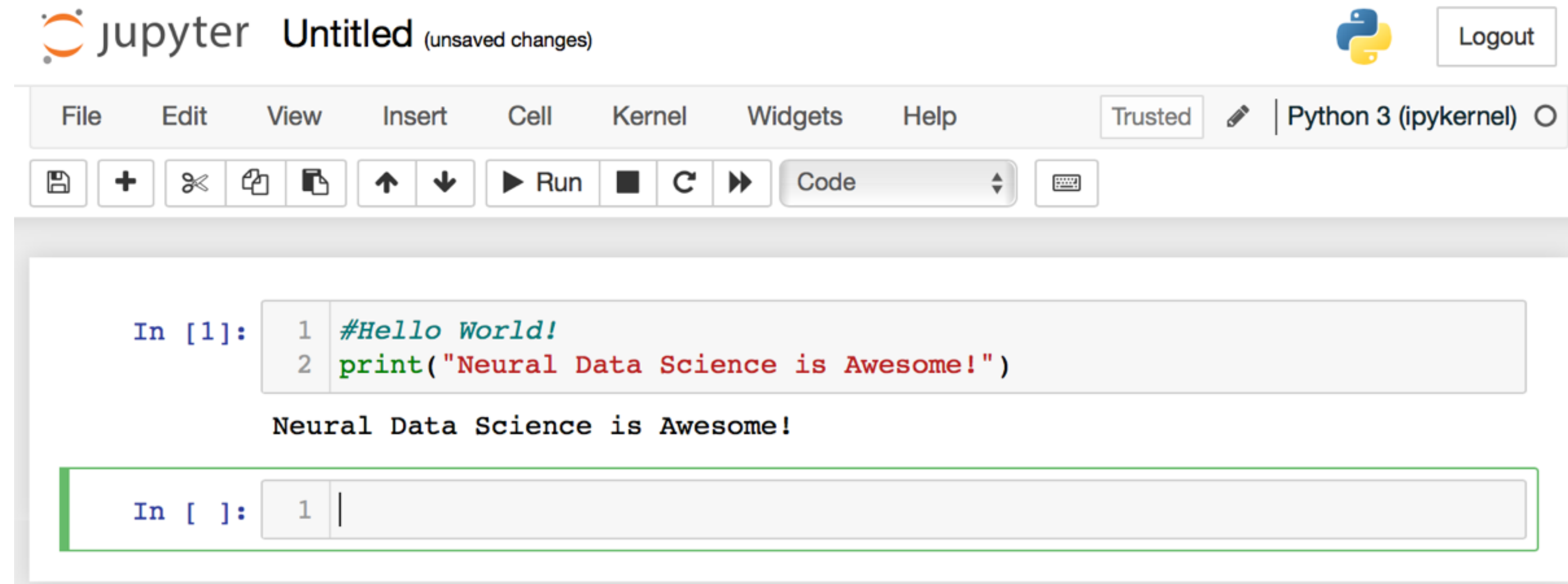
- Mixed media is excellent for data exploration and communication
- Don't have to write a separate program from your notes, results, etc
- Easy to experiment in nonlinear and compartmentalized ways
- We'll discuss the downsides later, but it's not for all cases
 - It can be slow,
 - Version control can be difficult
 - Sometimes debugging is easier other times more difficult

JN use cases

- Prototyping
- Data ingestion
- Exploratory data analysis
- Feature engineering
- Model comparison
- Final model

Jupyter notebooks review

- <https://jupyter.org/>
- Installing [anaconda](#)
- <https://github.com/COGS108/Tutorials>
- <https://github.com/NeuralDataScience/Tutorials>
- Correcting common issues
- Up to students to correct and resubmit so grading can be timely



How do you write a program in Jupyter notebooks and python?

- datahub.ucsd.edu
- or your machine with anaconda
- To the notebook! (the ones we will review are listed below and available in the lectures directory of the github and linked from the website and will be on canvas as well)
 - 00-Introduction.ipynb
 - 01-Python.ipynb
 - 02-JupyterNotebooks.ipynb
 - 01_01_python-checkpoint.ipynb