Lab in Cognition & Perception

PSYCH-UA.46

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Brenden Lake

Assistant Professor, Psychology and Data Science

office hours: Thursdays, 4:30-5:30pm, 6 Washington Place, Room 58 9. (Also zoom by request in this slot)

https://cims.nyu.edu/~brenden
https://lake-lab.github.io/

Marianne Azar

NYU Ph.D. Student in Cognition and Perception

office hours: Wed. 11am-12. Conference room, 6th floor (neurolinguistics lab), NYU Department of Linguistics, 10 Washington Place.

https://wp.nyu.edu/morphlab/marianne-azar/

What is this class about?

Shorter version

Experimental approaches to understanding the structure of human thought.

What is this class about?

Longer version

An introductory course on the use of various behavioral measures (accuracy, reaction time, etc...) to understand the structure of the human mind. Our goal is to use experiments to test alternative theories of cognitive function and to better understand the motivation and structure of human behavior. We will learn a basic set of skills for using computers to run experiments, collect data, analyze it, and communicate the outcome to others.

Topics

- What makes a good research question?
- What makes a good experiment?
- How do we use statistics to analyze an experiment?
- Standard computer programming and statistical tools for data analysis
  - tools for analyzing/manipulating data
  - describing data
  - visualizing data
  - hypothesis testing
  - fitting statistical models
- Research ethics
- Putting it all together to do research!

Topics

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- What makes a good experiment?
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- **Standard computer programming and statistical tools for data analysis**
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Why the focus on programming, and analyzing data through programming?

- Increasingly essential component of doing research in psychology
- Increasingly essential component of working in a data-rich world!
- High probability these skills will serve you well, regardless of what you decide to do after you degree
- I believe everyone, if you work hard, can learn to program

Example: Tech companies have the biggest troves of behavioral data, which require sophisticated analysis


LOGISTICS

Course website

https://cims.nyu.edu/~brenden/courses/labincp/intro.html

Lab in C&P (Fall 2023)

Search this book...

OVERVIEW

Syllabus

Schedule

RESOURCES

JupyterLab

EdStem

GitHub

TEXTBOOK

1. What is Cognitive Science and how do we study it?

2. Why do we have to learn statistics?

3. Introduction to Jupyter

4. Intro to Python for Psychology Undergrads

5. A brief introduction to research design

6. The Format and Structure of Digital Data

LAB IN COGNITION AND PERCEPTION

PSYCH-UA.46 - Fall 2023

Instructor: Brenden M. Lake

This course provides good hands-on experience with the tools, practices, and computer programming techniques used in psychological research. Students learn how to collect, analyze, and report psychological data concerning a variety aspects of human cognition and perception. By the end of the course students will have an first hand understanding of how to run psychological experiments, collect and analyze data, and write research reports. Students will also get substantial practice with computer programming in Python.

In addition to methods, the course will expose students to key concepts in cognition and perception including intelligence, learning, memory, attention, visual perception, mental imagery and imagination, and cognitive neuroscience. Data analyzed include choice data, reaction time, eye-movement data, and functional magnetic resonance imaging (fMRI). The course culminates in an intensive final project involving the design and analysis of a novel experiment.

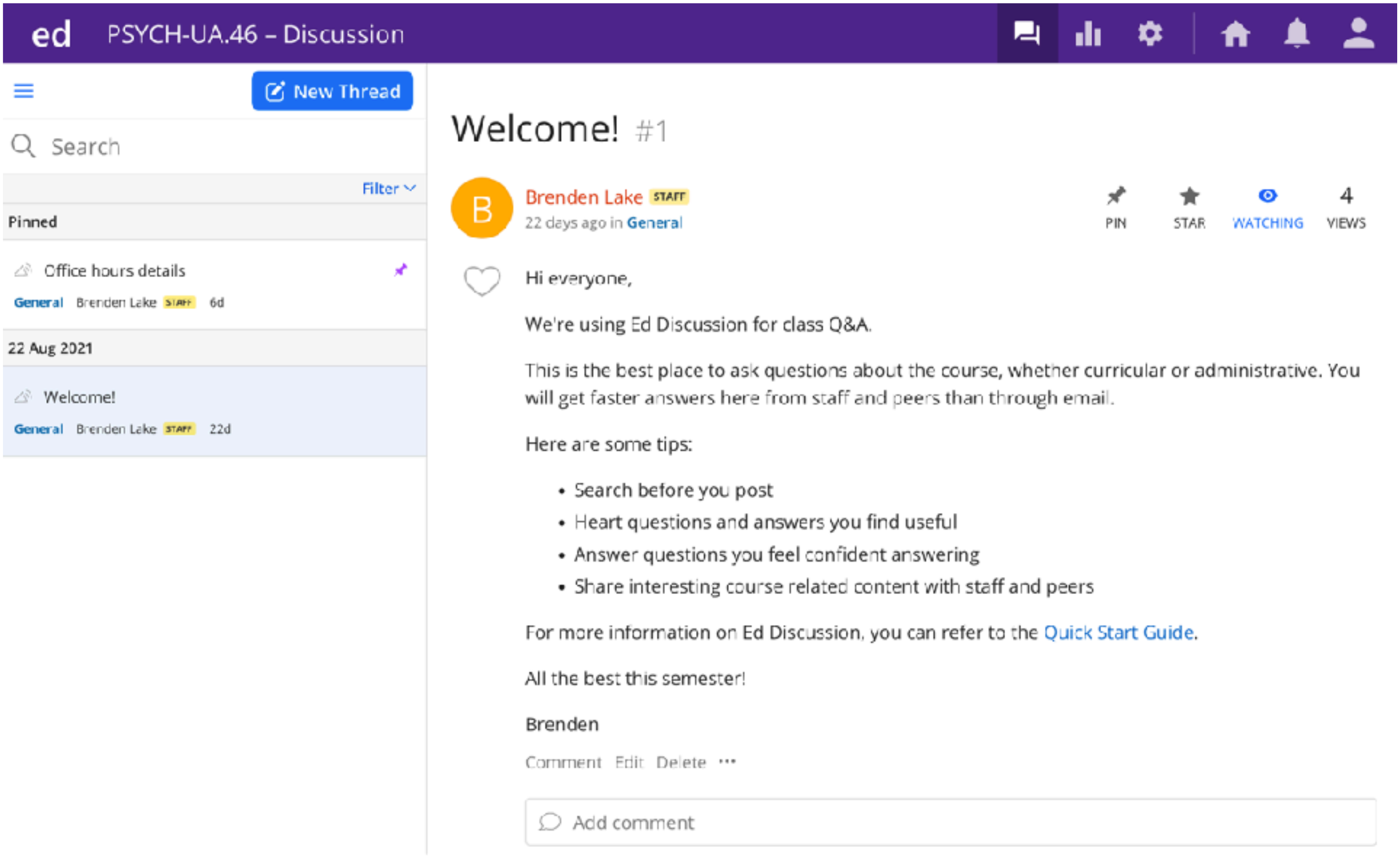
This course is useful for undergraduate students interested in getting actively involved in research at NYU or another university. In addition, this course provides a strong background for graduate work in psychological science, particularly cognitive science, cognitive neuroscience, and perception. Even if you plan to not continue to do scientific research, the course should arm you with some of the necessary skills to be an effective worker in a world awash with data.

Goals

- Learn the basics of using Python to explore and analyze data
- Learn how scientific research is conducted in psychology
- Learn how to communicate the results of psychological research to scientific community
- Introduce key concepts used throughout the study of cognition and perception
- Put knowledge from past coursework in statistics into practice.

PSYC
Goals
Ackn

Course discussion and announcements: EdStem



The class website is the text book

1. What is Cognitive Science and how do we study it?

Note

This chapter authored by Todd M. Gureckis and Hillary Raab is released under the license for the book.

1.1. Introduction

In this course, you will learn some of the basics of conducting psychological research into human perception and cognition (generally falling under the broader topic of "cognitive science"). This requires integrated knowledge of several topics: psychological theory, principles of experimental design, methods for statistical analysis of data, and reporting/summarizing results. You will learn the basics of all these across the upcoming semester.

However, before we begin it is useful to ask what is **cognitive science**? Is it different than psychology? What about cognitive neuroscience?

1.2. Psychology

Getting in touch

EdStem should be your main point of contact. Use EdStem if you think there's even a small chance someone has the same question. This will also get you the fastest answer.

If you need to send an individual message,

Email address for instructors and TAs:
instructors-labcp-fall2023@googlegroups.com

How will we spend our class time?

An interactive mix of

- Short lectures
- Student presentations
- Group work
- Practical exercises
- Discussions! Please participate

Lecture schedule

ime!

Date	Agenda	Assignments
Mon Sep 04 Warning	**No class, Labor Day** - No class	
Wed Sep 06	Organizational meeting, meet and greet fellow classmates (slides)	Read Chapter 1: What is Cognitive Science and how do we study it? before next class.
Mon Sep 11	Lecture on 'What is cognitive science?' (slides) In class activity: here.	Read Chapter 2: Why do we have to learn statistics? before next class.
Wed Sep 13	Lecture on basic research design (part 1) (slides)	Read Chapter 3: Introduction to Jupyter before next class, and *watch accompanying video.*
Mon Sep 18	Review/discussion of JupyterHub. Walk through demo.	Read Chapter 4: Introduction to Python for Psychology Undergraduates before next class, and *watch accompanying video.* **Homework 1, due Mon Sep 25.**
Wed Sep 20	Review/discussion of basic Python programming. In class activity: here (solution).	Read Chapter 5: A brief introduction to research design before next class. **Homework 1, due Mon Sep 25.**
Mon Sep 25	Lecture on basic research design (part 2) (slides) Join group to work on homework or start on ICA.	Choose and read paper for next class ICA
Wed Sep 27	In class activity: here.	
Mon Oct 02	Python practice with in class acitivity here (answers), begin Homework 2 in class.	**Homework 2, due Tue Oct 10.** If you need additional FOR-LOOP help please read through this notebook.
Wed Oct 04	In class acitivity here (answers). Continue Homework 2 in class.	**Homework 2, due Tue Oct 10.** Begin reading Chapter 6: Format and structure of digital data up to section 6.10 before next class.

Pre-requisites

PSYCH-UA 10 (Statistical reasoning for the behavioral sciences)

PSYCH-UA 11 (Advanced psychological statistics)

One of the following:
PSYCH-UA 22 (Perception),
PSYCH-UA 25 (Cognitive Neuroscience),
PSYCH-UA 29 (COGNITION)

(Informally, you should have a desire to learn technical tools/ programming used in research design and analysis)

Computer programming in Python for research

- A substantial aspect of the class is learning to use Python for research and data analysis

- We will be teaching these skills in the class. However, if you find that you need extra assistance, the Bobst library Data Services (https://library.nyu.edu/departments/data-services/) provide consultants who are familiar with these packages

Python and Jupyter notebooks

Problem 1 (5 points)

Implement the function `hello` and make sure the test cells runs without any errors. You will need to delete the line with `raise NotImplementedError`, write your own solution, and then re-run the cell before running the test cell. Each time you change code in a cell, you will need to re-run that cell before running any other cells that depend on it!

```
def hello(name):
    """Returns a message containing "Hello, <name>!",
    where <name> is passed in as an argument.

    Parameters
    ----------
    name : string
        The name of the person to say hello to

    Returns
    -------
    the message containing "Hello, <name>!"

    """
    raise NotImplementedError
```

To test your function, you'll want to create a new cell to call it with a test input. To create a new cell, click on **Insert→Insert Cell Below** in the menubar above. Then, in your new cell, add the following code (or whatever code you want, really):

Pre-configured cloud environment

Students registered are encouraged to use the cloud Jupyter environment with all required packages pre-installed (see class website).

Before next class, try to launch link to Jupyterhub

Working groups

Before next class, students will be pseudo-randomly assigned to a working group of 3 that they keep throughout the semester

Email us (today!) if you have a buddy in the class that you would like to be grouped with. We will try to accommodate but can't guarantee (instructors-labcp-fall2023@googlegroups.com).

Grading

Class Participation (10% of grade)

Attendance and participation is important given the hands on nature of the course. Two “free”/”no excuse” absences are automatically granted. You do not need to tell me the reason but connect with other students or the TA to find out what you missed. Otherwise, please get in touch in advance if you expect to miss class.

Grading

Quizzes (10% of grade)

Short quizzes on the assigned reading and videos will be assigned at the start of each class.

Presentation (10% of grade)

Students will be assigned to a working group that they will keep throughout the entire semester (~3 people). You will use this group for in-class work and labs. Additionally, each group will be in charge of presenting a summary of the reading/chapter assigned for one of the classes. Presentations involve a few slides describing the overall content of the class, and a list of questions that your group had about the reading that we can discuss as a group.

Grading

Homework (15% of grade)

We will have semi-regular homeworks. These should not be too long or onerous and should let you develop your skill and practice material covered in class. Often you will complete these assignments by filling out a webform or by completing some exercises on the class Jupyterhub instance and submitting your completed notebooks.

Labs (45% of grade)

The main part of the course will consist of three multi-part labs. These labs will expose key concepts in the psychology of cognition and perception and will consist of multiple exercises and reports. Most of this work will take place in the Jupyterhub.

Attendance

Attendance is necessary, with exceptions made for health and other issues you may be having. The course is cumulative and so that the information you learn on one day will be important for the following day's learning. Thus, it is not something you can catch up easily with notes from a friend. If you have to be away for a class please let the instructor or TA know in advance. Also, students should aim to arrive at class on time as much as possible. Frequent tardiness will cause you to miss the quizzes.

Collaboration and honor code

We take the collaboration policy and academic integrity **very seriously**. Violations of the policy will result in zero points and possible disciplinary referral.

All work that students turn in must be their own work. For group assignments, all work must have been done by the students on the team and must include an acknowledgements section detailing the contribution of each team member. Any outside sources (articles, books, people) must be appropriately cited in written assignments. Turning in someone else's work as your own is unacceptable and will result in a failing grade. Most importantly, such behavior is academically dishonest and lazy. Submit only your own ideas and words.

What you will come away with…

1. New or improved technical skills for collecting, analyzing, manipulating, and understanding data
2. Hands-on experience that will serve you well whether you pursue research, graduate work, or careers in industry (especially that deal with data in some way)
3. Classic examples of experiments, why they were designed the way they were, and
4. How to ask good research questions, and design experiments for testing those questions

Questions?

Introductions

1) Your name
2) Department / degree program
3) What are your interests related to psychology? What do you hope to learn in this class?

For next time....

ime!

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Online background survey

Sign up on EdStem, view post, and complete the online background survey now!

https://forms.gle/ZkMasmWhPkhoCo3s9