
Lab in Cognition & Perception

PSYCH-UA.46

Brenden Lake

Assistant Professor, Psychology and Data Science
Research Scientist, Facebook AI Research



office hours: Wednesdays
4:30-5:30pm, 6 Washington
Place, Room 858 (Also zoom by
request in this slot)

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

Peiling Jiang

NYU alum and current Research Assistant



office hours: Thursday, 1-2pm, Zoom (see EdStem for details)

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!

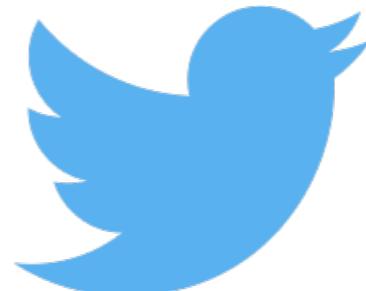
Topics

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- **Standard computer programming and statistical tools for data analysis**
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- Putting it all together to do research!

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 your degree

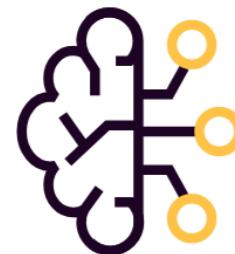
Example: Tech companies have the biggest troves of behavioral data, which require sophisticated analysis





Course website

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



Lab in C&P (Fall 2021)

Search this book...

OVERVIEW

[Syllabus](#)

[Schedule](#)

RESOURCES

[JupyterHub ↗](#)

[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



Contents

PSYCH-UA.46 - Fall 2021

Goals

Acknowledgements

LAB IN COGNITION AND PERCEPTION

PSYCH-UA.46 - Fall 2021

Instructor: Brenden M. Lake

This course provides 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

Course discussion and announcements: EdStem

ed PSYCH-UA.46 – Discussion

New Thread

Search

Pinned

Filter

Office hours details

General Brenden Lake STAFF 6d

22 Aug 2021

Welcome!

Welcome! #1

Brenden Lake STAFF 22 days ago in General

Hi everyone,

We're using Ed Discussion for class Q&A.

This is the best place to ask questions about the course, whether curricular or administrative. You will get faster answers here from staff and peers than through email.

Here are some tips:

- Search before you post
- Heart questions and answers you find useful
- Answer questions you feel confident answering
- Share interesting course related content with staff and peers

For more information on Ed Discussion, you can refer to the [Quick Start Guide](#).

All the best this semester!

Brenden

Comment Edit Delete ...

Add comment

The screenshot shows the EdStem platform interface. At the top, there's a purple header bar with the course name "PSYCH-UA.46 – Discussion". Below the header is a sidebar on the left containing navigation links like "New Thread", "Search", "Pinned", and a "Filter" dropdown. The main content area on the right displays a post by "Brenden Lake" (STAFF) titled "Welcome! #1". The post includes a message about using Ed Discussion for class Q&A, tips for users, and a link to the "Quick Start Guide". There are also icons for pinning, starring, watching, and viewing the post. On the far right of the interface, there are icons for a home page, notifications, and user profile.

The class website is the text book

JupyterHub ↗

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

7. Visualizing Data

8. Describing Data

9. Samples, populations and sampling

10. Hypothesis testing

11. Comparing one or two means

12. Measuring Behavior

13. Research Ethics

14. Linear regression



Contents

1.1. Introduction

1.2. Psychology

1.3. Cognition and Perception

1.4. So how does "Cognitive Science" fit in?

1.5. The Computational Theory of Mind

1.6. Is Cognitive Science is the hardest science?

1.7. Example Mysteries of Cognitive Science

1.8. Learn more

1.9. References

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-fall2021@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

Date	Agenda	Assignments
Mon Sep 06	No class, Labor Day - No class Warning	
Wed Sep 08	Organizational meeting, meet and greet fellow classmates	Read Chapter 1: What is Cognitive Science and how do we study it? before next class.
Mon Sep 13	Lecture on 'What is cognitive science?' In class activity: here .	Read Chapter 2: Why do we have to learn statistics? before next class.
Wed Sep 15	Lecture on basic research design (part 1) In class activity: here .	Read Chapter 3: Introduction to Jupyter before next class, and <i>watch accompanying video</i> .
Mon Sep 20	Review/discussion of JupyterHub. Walk through of interface. Begin working on homework 1 .	Read Chapter 4: Introduction to Python for Psychology Undergraduates before next class, and <i>watch accompanying video</i> . Homework 1, due Mon Sep 27.
Wed Sep 22	Review/discussion of basic Python programming. In class activity: here .	Read Chapter 5: A brief introduction to research design before next class. Homework 1, due Mon Sep 27.
Mon Sep 27	Lecture on basic research design (part 2) In class activity: here .	
Wed Sep 29	Python practice, begin Homework 2 in class.	Homework 2, due Tue Oct 12. If you need additional FOR-LOOP help please read through this notebook .
Mon Oct 04	Continue Homework 2 in class.	Homework 2, due Tue Oct 12. Begin reading Chapter 6: Format and structure of digital data up to section 6.10 before next class.
Wed Oct 06	Review/discussion of data organization and pandas	Homework 2 due Tue Oct 12. <i>Read rest of Chapter 6: Format and</i>

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 provide statistical consultants who are familiar with these packages (see website for details)

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).

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-fall2021@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....

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Online background survey

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

<https://forms.gle/9F2a6xZoituf8C4P8>