Agenda for Today

- Give a short overview of course for those still considering if they will enroll
- Go over tentative syllabus
- Fill out pre-course survey
- Why study human cognition and what is it?
- Assign readings
First

Who are you (i.e., me)?
Todd Gureckis

Office: Meyer 280

Hours: Immediately after class

Email: todd.gureckis@nyu.edu

How to Email Me

Subject: [lhc] I have a question

[lhc]
Teaching Assistant

John McDonnell
Office: Meyer 280 Suite
Hours: tbd
Email: john.mcdonnell@nyu.edu
Writing Instructor

Luke Fiske

Hours: by appointment
Email: luke.fiske@nyu.edu

How to Email Luke

Subject: [lhc] I have a question
Second

Pragmatics
Pragmatics

- Course webpage (not using blackboard)
- http://smash.psych.nyu.edu/courses/fall09/lhc/
- All lectures, hand outs, announcement, etc... will be made in here. Check back often!!
Grading

- 10% Attendance and participation, in-class assignments
- 15% assignments based on reading, in-class quizzes, etc..
- 50% lab reports (12.5% each)
- 25% final project
Grading

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More on Readings

- We will read a variety of different kinds of papers during the semester.
- Some will be articles related to the labs, other will be general issues in experimental approaches to human cognition, and some will be about data analysis and communicating scientific results.
- Typically will assign reading on a wednesday, we will have an in-class discussion to clarify/dig deeper.
- You are responsible for reading, there may be quizzes.
Grading

- 10% Attendance and participation, in-class assignments
- 15% assignments based on reading, in-class quizzes, etc..
- 50% lab reports (12.5% each)
- 25% final project
More on Labs

- We will collect data on ourselves in the class
- Analyze it
- Write up the results in an APA formatted paper (4-8 pages plus figures/graphs)
- Graded on accuracy of statistical analysis, interpretation, and quality/clarity of writing
Grading

- 10% Attendance and participation, in-class assignments
- 15% assignments based on reading, in-class quizzes, etc..
- 50% lab reports (12.5% each)
- 25% final project
More on Final Project

- Can work in teams of 2-3 people
- Design your own experiment (based on those we run in the labs, or one of your own design)
- You will have to get people from class to run in your experiment
- We will help you develop the system to test people using Python (later lectures)
- Each student will turn in a final APA paper based on their experiment and the group (or individual) will make a presentation to the class based on their results

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Books and Software

- Books: None!
- Software: Free!
- Software will be a combination of a custom experiment-running system written in Python (a general purpose computer programming language) and R (a open-source statistical analysis tool)
Statistical Consulting

- Consultation for R - available via Bobst library on 6th floor (620, 621) or via email: data.service@nyu.edu
  phone: (212)998-3434
- http://www.library.nyu.edu/forms/research/classes.html
Ethics and Academic Misconduct

- Plagiarism or cheating is lazy and unethical.
- There will be consequences to students who cheat, including copying labs from previous semesters or copying from online/library sources.
- Falsification of any data is also unacceptable. You are not graded on the significance of the result, but on the quality of the hypothesis and your analysis.
Why should I take this course?

- You are interested in cognitive science, experimental psychology, computer science, marketing, business, sociology, and/or economics
- You have to
- You are generally interested in science and how scientists develop and test theories about the way the world works
- You like hands-on courses where you get to learn and explore it on your own
Why should I drop this course?

- You have trouble waking up before 2:00pm
- You have other things you are going to want to do at 2:00pm instead of attending class
- You hate computers and are unwilling to even try to touch one
- You hate working in groups on even a single project
What is this course about?
The Short Version

Experimental approaches to understand the structure of human thought
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 interacting with computers to run experiments, collect data, analyze it, and communicate the outcome to others.
What is human cognition?

The study of how the mind (or mind/brain) works.
What is human cognition?

Examples:

How do people learn effective behavior through interaction with their environment?

How does human memory work? In what ways is human memory like computer memory? In what was is it not?

What is the format or “representation” of information that the mind uses?

Can we develop theories that allow us to predict and explain human behavior? Can information we derive from these investigations enable us to build better artificial intelligence systems to solve problems?
Scientific Inference: A tale of two magnets
Observations

Theories

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Observations

- Natural Behavior
- Just ask people questions
- Test/quizzes (more controlled performance measures)
- Reaction Time
- Physiological measures (EKG, Galvanic skin response, heart rate)
- Brain Measures (fMRI, EEG, MEG)
- Lesion studies/surgical interventions
Theories of information processing inspired by modern computers

Mind-as-a-computational device

Build computational theories of the way we think the mind works, test the implication of those theories in new experiments, refine theories when needed.
Who are you (i.e., you)?
Fifth

What is “cognitive science”?
Cognitive Science

“Cognition, as defined by Ulrich Neisser, involves all processes by which sensory input are transformed, reduced, elaborated, stored, recovered, and used.”


“Science is the art of acquiring knowledge in such a manner that coherent structures of understanding can be erected on the basis of a critical evaluation of evidence”

Ragnar Granit, *The Purposive Brain* (p 21)
Sixth

The structure of scientific pursuit
Environment

Stimuli that are perceived by the body and nervous system

Behavior
Environment

Stimuli that are perceived by the body and nervous system

Cognitive Mechanism (representations, processes)

Behavior
Stimuli that are perceived by the body and nervous system

Cognitive Mechanism (representations, processes)

Behavior

Environment

Theory
Environment

Stimuli that are perceived by the body and nervous system

Cognitive Mechanism (representations, processes)

Theory predicts

Behavior
Environment

Stimuli that are perceived by the body and nervous system

Cognitive Mechanism (representations, processes)

Behavior

Theory
describes
predicts
Stimuli that are perceived by the body and nervous system → Cognitive Mechanism (representations, processes) → Behavior

Model: 

\[ P(\alpha_i) = \frac{x_i}{\sum_j x_j} \]
Stimuli that are perceived by the body and nervous system implement Cognitive Mechanism (representations, processes) generates bracket

\[ P(a_i) = \frac{x_i}{\sum_j x_j} \]
Fig. 1. Parallels between the problems faced by search engines and human memory. Internet search and retrieval from memory both involve finding the items relevant to a query from within a large network of interconnected pieces of information. In the case of Internet search (a), the items to be retrieved are Web pages connected by hyperlinks. When items are retrieved from a semantic network (b), the items are words or concepts connected by associative links.

Stimuli that are perceived by the body and nervous system

Cognitive Mechanism (representations, processes)

Environment

Behavior

Model

\[ P(\alpha_i) = \frac{x_i}{\sum_j x_j} \]

implements

generates
Stimuli that are perceived by the body and nervous system

Cognitive Mechanism (representations, processes)

Environment

Behavior

Experiment

Model

\[ P(\alpha_i) = \frac{x_i}{\sum_j x_j} \]

implements

generates

observes

refines/tests

manipulates
Terminology of Science

- **Law** - quantitative regularity among variables
- **Effect** - qualitative regularity among variables
- **Theory** - explanation of a phenomena
- **Hypothesis** - prediction of a phenomena or tentative theory
- **Model** - Analogy that supports a theory
PV = nRT

where, P = pressure, V = volume, n=moles of gas, R = universal gas constant, T = absolute temperature of the system
The Ideal Gas Law

\[ PV = nRT \]

where, \( P = \) pressure, \( V = \) volume, 
\( n = \) moles of gas, \( R = \) universal gas constant, \( T = \) absolute temperature of the system
The Baldwin Effect

Learned behaviors -> Instinct

Individuals who learn a behavior survive, learning faster = better, eventually the behavior will become instinctualized.

ex: lactose tolerance: cultures raise milk producing animals, develop digestive tolerance to digest lactose, leading to more domestication of cattle, etc..
http://www.exploratorium.edu/complexity/java/lorenz.html
How About Theories? Maybe two kinds
Cognitive Theories

Cognitive Science (as a young field) doesn’t have many “Theories” (with a capital T), but includes many “theories” (with a lower case)

These “theories” usually take the form of cognitive models which lay out the theory in detail
Sixth

Readings for next week posted online tonight