What is memory?

June 20, 2016
Announcements

• Welcome!
This time

- Course goals
- Intuitions about memory
- Theory: amnesia and multiple memory systems
- Applications: course overview
- Logistics
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Course goals

• Gain a **theoretical framework** to understand the multiple memory systems that impact our daily lives

• Understand how we investigate memory in the lab using the **scientific process**

• **Think critically** about how we can use these scientific findings for **applications in the real world**

We’ll learn about memory **behavior** in the **real world** and in the **lab**, by reading scientific **articles**, trying out **demonstrations** of experiments, and **brainstorming** about the role of learning and memory in our own lives
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Brainstorm!

(3 minutes)

In the last 24 hours, list as many times that you *used memory* as you can.

Why do we *need* memory?
Brainstorm!

Find a partner

Talk for 3 minutes

Be prepared to introduce your partner to the class:

   Name

   One reason why they are taking this class

   One time they used memory in the last 24 hours
What is memory & what is it for?
Memory is the influence of past experience on thought and behavior in the present.
Multiple forms of memory

• Recalling the episodes of your personal past (episodic memory)

• Knowing general information about the world (semantic memory)

• Learning new skills (skill memory)

• Facilitated processing of previously encountered items (priming)

• Learning relationships between stimuli, responses, and outcomes (conditioning)

• Maintaining information for a short period of time (working memory)
Multiple memory systems

Transient memory

- Sensory
- Working (short-term)

Long-term memory

- Declarative
  - Episodic
  - Semantic
- Non-declarative
  - Conditioning
  - Skill learning
  - Priming

What licenses us to partition memory in this way?
Brainstorm!

• Did you recall episodes from your personal past? (episodic memory)

• Did you use general information about the world? (semantic memory)

• Did you use any skills? (skill memory)

• Did you process or generate information faster based on previous experience with that information? (priming)

• Did you use knowledge about relationships to prepare for upcoming events or adjust your behavior? (conditioning)

• Did you hold information in mind for a short period of time? (working memory)
What is memory & what is it for?
Memory is the influence of past experience on thought and behavior in the present.

Memory enables us to predict the environment around us, and thus behave appropriately and adaptively.
“The strength of your memory dictates the size of your reality.”

– Chuck Klosterman
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Where do we keep our memories?

• ~1920-1950: Karl Lashley searched for the *engram* (the neural trace of an experience)

• Technique:
  
  • Teach something (rodents in a maze)
  
  • Remove (lesion) part of the brain
  
  • Is the memory still there? (can they still navigate the maze?)

• The *amount* of brain tissue destroyed determined the amount of forgetting (theory of *mass action*)

• The *location* did not matter (theory of *equipotentiality*)

• He never found the *engram*, and concluded that memories are distributed throughout the brain, and that all brain regions contribute to memory equally
“In experiments extending over the past 30 years I have been trying to find the locus of specific memory traces … This series of experiments has yielded a good bit of information about what and where the memory trace is not. It has discovered nothing directly of the real nature of the engram.”

– Karl Lashley, 1950
And in 1953 everything changed ...
Patient HM

- 1953: William Scoville removes the bilateral medial temporal lobes of Patient HM
- HM suffers “a very grave recent memory loss”
- Note: why was HM so special?
Patient EP

MEMORY LOSS: A CASE STUDY

https://www.youtube.com/watch?v=3XHfJiSmEy8
Medial temporal lobe amnesia

Anterograde amnesia: inability to form new long-term memories for experienced events and general knowledge encountered after injury

(Temporally graded) retrograde amnesia: disruption of memories for experienced events and general knowledge learned before injury

Global deficit: independent of assessment, material, or modality
What can Patient EP do?
What licenses us to partition memory in this way?
Medial temporal lobe amnesia

What licenses us to partition memory in this way?
Medial temporal lobe amnesia

What licenses us to partition memory in this way?
Medial temporal lobe amnesia

Transient memory
- Sensory
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Selective deficit in declarative memory
Was Karl Lashley wrong? To be continued ...
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Demonstration!
Demonstration!

CROWN
Demonstration!

QUEEN
Demonstration!

PALACE
Demonstration!

REIGN
Demonstration!

PRINCE
Demonstration!

LEADER
Demonstration!

ENGLAND
Demonstration!

CHESS
Demonstration!

MONARCH
Demonstration!

GEORGE
Demonstration!

ROYAL
Brain training and expertise

Your brain, just brighter.

Improve brain health and performance.

- Brain training produces real world benefits
- Enhance memory, attention and creativity
- Easy, web-based brain training program

Learn how we can help you.

Start Training
Brain training and expertise

Welcome! Let's build your Personalized Training Program

1. Memory
Select all aspects of your memory that you want to challenge

- Remembering patterns and locations
- Associating names with faces
- Keeping track of multiple pieces of information in your head
- Recalling sequences of objects and movements

Your responses shape your Lumosity program
We'll create simple daily workouts with exercises that reflect your choices. Informed by neuroscience research, Lumosity exercises are engineered to train a variety of core cognitive functions.

https://www.lumosity.com/app/v5/personalization/memory
Brain training gaining momentum as new app for athletes to be unveiled

19h - JOSE BAUTISTA, RICKIE FOWLER

Brain science for athletes is getting more attention, not only as scrutiny over concussion testing becomes greater with reports of long term damage to pros but also as brain training becomes more professionalized.

On Tuesday, a company called HeadTrainer is unveiling an app for Apple and android systems that is the first sports based app and offers to train the brain in the areas of focus and concentration, visual and spatial awareness, processing speed, memory and decision making.

Brain training and expertise

Lumosity to Pay $2 Million to Settle FTC Deceptive Advertising Charges for Its “Brain Training” Program

Company Claimed Program Would Sharpen Performance in Everyday Life and Protect Against Cognitive Decline

FOR RELEASE

January 5, 2016
Brain training and expertise

Ben Pridmore
Breaking the world record in speed cards
MemorySports.com
Emotion & memory
Technology, attention, and memory
Demonstration!

Which penny is correct?
Demonstration!

Which penny is correct?
RATS ad: Subliminal conspiracy?

A still from Mr Bush's controversial campaign ad

By BBC News Online's John Egan

George W Bush may have dismissed the controversy as "weird and bizarre", but there is no doubt that the Republican presidential candidate has been wrong-footed by one of his own campaign adverts.

The 30 second TV advertisement, which deals with who should pay for prescription drugs for the elderly, contains the word "rats".

Marketing and nondeclarative memory

https://www.youtube.com/watch?v=L6pgoqZpfUU
The Ad That Created A Habit!

by buildingpharmabrands

Film
A Dangerous Coating
That robs teeth of their whiteness

Away to remove it that quickly restores brilliance.
Film, it is agreed, also fosters serious tooth and
gum disorders. Please accept free 10-day supply.

THE POWER OF HABIT

WHY WE DO WHAT WE DO IN LIFE AND BUSINESS

Charles Duhigg
“When I was younger, I could remember anything, whether it had happened or not; but my faculties are decaying now and soon I shall be so I cannot remember any but the things that have never happened. It is sad to go to pieces like this, but we all have to do it.”

– Mark Twain
Education, learning, and memory
Demonstration!
Demonstration!

CHESS
Demonstration!

PRINCE
Demonstration!

QUEEN
Demonstration!

PINEAPPLE
Demonstration!

CROWN
Demonstration!

KING
**Demonstration!**

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<tr>
<th>Studied List</th>
<th>New Words</th>
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<td>CROWN</td>
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<td>QUEEN</td>
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Think of your mind as a bowl filled with clear water. Now imagine each memory as a teaspoon of milk stirred into the water. Every adult mind holds thousands of these murky memories.... Who among us would dare to disentangle the water from the milk?... Memories don't sit in once place, waiting patiently to be retrieved; they drift through the brain, more like clouds or vapor than something we can put our hands around....

- Elizabeth Loftus
Memory errors

Was Brian Williams a Victim of False Memory?

By TARA PARKER-POPE    FEBRUARY 9, 2015 5:33 PM    1144 Comments

Brian Williams, anchor of “NBC Nightly News,” with American troops at Camp Liberty in Baghdad, Iraq, in March 2007. He has temporarily stepped down from his newscast responsibilities. Photo by Jeff Riggins/NBC/NBCU Photo Bank via Getty Images

How reliable is human memory? Most of us believe that our memory is like a video camera, capturing an accurate record that can be reviewed at a later date.

http://well.blogs.nytimes.com/2015/02/09/was-brian-williams-a-victim-of-false-memory/?_r=0
It's Baltimore, 1999. Hae Min Lee, a popular high-school senior, disappears after school one day. Six weeks later detectives arrest her classmate and ex-boyfriend, Adnan Syed, for her murder. He says he's innocent - though he can't exactly remember what he was doing on that January afternoon. But someone can. A classmate at Woodlawn High School says she knows where Adnan was. The trouble is, she's nowhere to be found.
India’s Novel Use of Brain Scans in Courts Is Debated

By ANAND GIRIDHARADAS  SEPT. 14, 2008

MUMBAI, India — The new technology is, to its critics, Orwellian. Others view it as a silver bullet against terrorism that could render waterboarding and other harsh interrogation methods obsolete. Some scientists predict the end of lying as we know it.

Now, well before any consensus on the technology’s readiness, India has become the first country to convict someone of a crime relying on evidence from this controversial machine: a brain scanner that produces images of the human mind in action and is said to reveal signs that a suspect remembers details of the crime in question.
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• Intuitions about memory

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Course logistics

• **Course website**: www.stanford.edu/class/psych136s

• **Office hours**

• **Textbook**

• **Academic accommodations**

• **Guest lectures and spotlights**

• **Assignments**
  
  • Exams (25% midterm; 35% cumulative final)
  
  • Responses to scientific journal articles (20%)
  
  • Memory in action (10%)
  
  • Class participation & attendance (10%)
Course goals

• Gain a theoretical framework to understand the multiple memory systems that impact our daily lives!

• Understand how we investigate memory in the lab using the scientific process

• Think critically about how we can use these scientific findings for applications in the real world

We’ll learn about the brain and behavior in the real world and in the lab, by reading scientific articles, trying out demonstrations of experiments, and brainstorming about the role of learning and memory in our own lives
Exams

- **Midterm**: Wednesday, July 20th, in class
- **Final**: Friday, August 12, 12:15-3:15, location TBA

1. **Exams (25% midterm; 35% cumulative final)**. The midterm will be held in class on Wednesday, July 20th. The final will be held on Friday, August 12 from 12:15-3:15 PM. Although the final exam is cumulative, it will emphasize the second half of the course. If you have an unavoidable conflict with an exam, I must be notified of this two weeks prior to the exam date in order to arrange for an alternate exam.
2. **Responses to scientific journal articles (20%).** Throughout the course you will carefully read six journal articles and complete a reading response related to each one; these must be turned in by the start of class on the assigned date. *Each reading response will be graded on a scale of 0-5.* Late responses will lose one point per day that they are late, for a maximum of three lost points (e.g., a perfect response turned in at the end of the quarter would receive ⅔ possible points).

The readings will show you **how we investigate** memory in the lab using the **scientific process**. Responses and discussions will help you **think critically** about the scientific findings.
Responses to scientific journal articles

**Readings:** Instructions for accessing the readings are provided on the course website.


3. **Memory in action (10%)**. In preparation for each class you will be asked to complete a short *demonstration* of a task, to *brainstorm* some real-world examples of the course material, and/or to *document* examples of the course material in your day-to-day life. The specific assignment for each upcoming class will be shared in class during the preceding class and also posted on the course website. These “memory in action” assignments must be turned in by 8 PM the night before the relevant class so that I have time to review them before class starts. *Each assignment will be graded on a scale of 0-5.* Any *memory in action* assignments that are turned in between 8 PM the night before class and the start of class will receive at most half credit. Because this material will be used in class on the day it is due, I *cannot accept* memory in action assignments that are turned in after the start of class.

*Demos, brainstorm, and journals will expose you to some of the experimental methods used in the lab, and have you critically think about how multiple memory systems influence our everyday lives!*
4. **Class participation and attendance (10%).** Attending class is very important because most of the material will be presented only in class. As such, your attendance in class is required. I will take attendance each class via a *participant prompt* that is completed in class or an *exit ticket* that includes your name and a question or comment that you have about the material that day. While in class, I ask that you engage as active learners by asking questions, participating in class activities and discussions, and directing your attention *only* toward the course material (e.g., not toward your phone, your friends, etc). You may miss one class (not the midterm) without penalty.
Exam and assignment policies

**Collaboration policy.** You may discuss any assignments (other than exams) with your classmates, but you must write each of your assignments individually, in your own words.

**Late and absence policies:** Late and absence policies for each course requirement are described above. Serious health issues or other unexpected issues can be discussed with me but require an accompanying note from a doctor, a dean, or the Summer Session office. This policy is in place to ensure that you are getting the help that you need with any serious illness or issues that arise during the quarter.
**Honor code**: The Stanford Honor Code is in effect for all assignments. Please be sure that you are familiar with all of the policies explained in the honor code (http://honorcode.stanford.edu).

Briefly, following the Honor Code means that:

a. During exams you will answer all questions on your own without consulting any notes, books, outside sources, or your classmates; you also will not provide any help to any of your classmates during the exams.

b. Your written assignments will be written in your own words and you will properly cite any quotes or ideas from any other sources; you will not write any assignments for your classmates.

c. You will not modify any assignments after the submission deadline without informing me that you have done so.

If you are unsure about any of the honor code policies or whether you are at risk of violating the Honor Code, please come and see me **before** you turn in the work that you are unsure about.
Google Docs

- All assignments will be turned in using Google Docs
- Instructions are in syllabus
- You will need a gmail account (which is free)

- Note: all changes are tracked and timestamped — changing your submission after the deadline (without emailing me to tell me that you are accepting any associated late penalties) may be considered a violation of the honor code
Assignments and readings should be completed before the relevant class — we will use them in class!

Reminder of deadlines:

Memory in action: due by 8 PM the night before class
Reading response: due by the start of class
Homework

• Memory in action reading
  • Roediger, H.L., Ill, & Gallo, D.A. (2004). How to read a journal article in cognitive psychology. [link on website!]

• Tell us about yourself
  • Create your MiA Google Doc — name it YourName_MIA (e.g., LaRocque_MIA)
  • Complete the assignment Tell us about yourself!
    • Name (or preferred nickname), year in school, where you’re coming from
  • Share the document with psych136s@gmail.com by 8 PM on Tuesday, June 21
  • Please email me if you run into any trouble!

• Read the syllabus — come to class on Wednesday with any questions!
To create and share your MIA Google Doc

1. Open the Google Drive app.
2. Click on Drive.
3. Click on the New button.
4. Select Google Docs.
5. Share the document.
6. Rename the document.
7. Enter the recipient's email address.
8. Tell us about yourself (W 6/22)
   My name is Karen, I am the instructor of the course, and I am coming from Stanford.
9. Share the document with others.
10. Enter the recipient's email address.
11. Send the document.
Questions?