<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Day/Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Boyle</td>
<td><a href="mailto:mboyle@ucsd.edu">mboyle@ucsd.edu</a></td>
<td>Monday, 2-3:50pm</td>
<td>CSB 130</td>
</tr>
<tr>
<td>Zoe</td>
<td><a href="mailto:tzcheng@ucsd.edu">tzcheng@ucsd.edu</a></td>
<td>Monday, 12-12:50pm</td>
<td>CSB 223</td>
</tr>
<tr>
<td>Lauren</td>
<td><a href="mailto:lcurley@ucsd.edu">lcurley@ucsd.edu</a></td>
<td>Monday, 3-3:50pm</td>
<td>CSB 225</td>
</tr>
<tr>
<td>Subathra</td>
<td><a href="mailto:suraj@ucsd.edu">suraj@ucsd.edu</a></td>
<td>Tuesday, 2-2:50pm</td>
<td>CSB 114</td>
</tr>
<tr>
<td>Elizabeth</td>
<td><a href="mailto:e1cisner@ucsd.edu">e1cisner@ucsd.edu</a></td>
<td>Wednesday, 10-10:50am</td>
<td>Rogers Market</td>
</tr>
<tr>
<td>Lexi</td>
<td><a href="mailto:adalenco@ucsd.edu">adalenco@ucsd.edu</a></td>
<td>Thursday, 8-8:50am</td>
<td>CSB 114</td>
</tr>
<tr>
<td>Kenny</td>
<td><a href="mailto:kyc048@ucsd.edu">kyc048@ucsd.edu</a></td>
<td>Thursday, 11-11:50am</td>
<td>Perks Coffee Shop</td>
</tr>
<tr>
<td>Sandhya</td>
<td><a href="mailto:sasriram@ucsd.edu">sasriram@ucsd.edu</a></td>
<td>Thursday, 2-2:50am</td>
<td>CSB 114</td>
</tr>
<tr>
<td>Arthur</td>
<td><a href="mailto:asemenuk@ucsd.edu">asemenuk@ucsd.edu</a></td>
<td>Friday, 9-9:50am</td>
<td>CSB 215</td>
</tr>
</tbody>
</table>
A note about the quizzes:

Issues:
Extra marks around bubbles
No bubbling
Bubbling too light
No name
Please do not do this!!
C. Shorter words are quicker and easier to say
D. Both B and C

4. Which of the following languages does not have any known profanity equivalent?
   A. Italian
   B. Turkish
   C. French
   D. Japanese

5. True or False: Insulin is a hormone relevant only to blood sugar - it has nothing to do with brain.
   A. True

This person did not bubble in the quiz!

Score for quiz will be: 0
This quiz is bubbled in TOO LIGHT!
The accuracy of grading this quiz is LOW!
<table>
<thead>
<tr>
<th>COURSE NUMBER</th>
<th>WINTER 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>COGS 1</td>
<td>Dr. Mary ET Boyle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quiz A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 8 – Oct 12, 2018</td>
</tr>
</tbody>
</table>

Section you are taking this quiz:

- Please Bubble only one!
- [1] Monday @ 3 Zoe
- [2] Monday @ 4 Lauren
- [3] Monday @ 5 Alexis
- [4] Monday @ 6 Kenny
- [5] Friday @ 9 Sandhya
- [6] Friday @ 10 Alexis

No name = ACADEMIC INTEGRITY VIOLATION!
No name = 0 quiz score
Don’t forget: EC Pre-reading quizzes start this week!

1st one will open on TritonEd this Wednesday (October 17) at 4pm. The quiz will close on Thursday (October 18) at 9am.

Content: Mandarin Makes You More Musical? and Parents, Listen Next Time Your Baby Babbles (readings associated with Dr. Creel’s Thursday lecture)
Last Week’s Topics

- **Lecture 4** | Sleep and Alzheimer’s Disease, *Dr. Boyle*
- **Lecture 5** | Introduction to Data Science, *Dr. Voytek*
Lecture 4 | Review Questions

1. What is the anatomy of neurons and the role of each structure in neuronal communication?
2. What is neuron metabolite? How does it get cleaned out?
3. What are APP and beta amyloid?
4. What is the Amyloid Cascade Hypothesis? The development of which disease does it explain?
5. What stages of sleep do scientists identify? When do they occur?
6. What are the characteristics and functions of REM sleep?
7. What are the characteristics and functions of deep sleep?
8. What is the glymphatic system? When is the glymphatic system most effective?
9. What is the purpose of the arousal system in the brain? What happens is if it is destroyed?
10. What does VLPO do? How does caffeine affect it? What makes one sleepy?
11. What are the neurotransmitters involved in sleep regulation?
Lecture 4

Sleep and Alzheimer’s Disease, Dr. Boyle
1. What is the anatomy of neurons and the role of each structure in neuronal communication?
2. What is neuron metabolite? How does it get cleaned out?

• Metabolite is the intermediate and product of metabolism
• Beta amyloid is a natural byproduct of neurons being active
• The glymphatic system clears neuron metabolites
3. What are APP and beta amyloid?

**APP - amyloid precursor protein**

**Beta amyloid (a.k.a. amyloid beta & Aβ) - fragment of APP**
4. What is the Amyloid Cascade Hypothesis? The development of which disease does it explain?

- Length of Aβ - between 40 and 42 amino acids
- 42 is more toxic - more likely to form plaques

According to ACS, plaque accumulation is an important factor in Alzheimer’s Disease.
4. What is the Amyloid Cascade Hypothesis? The development of which disease does it explain?
4. What is the Amyloid Cascade Hypothesis? The development of which disease does it explain?
5. What stages of sleep do scientists identify? When do they occur?

**SLEEP STAGES**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Duration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>5-15 minutes</td>
<td>Very light sleep, sense of falling is common NREM</td>
</tr>
<tr>
<td>Stage 2</td>
<td>5-15 minutes</td>
<td>Light sleep, body temperature drops, heart rate slows NREM</td>
</tr>
<tr>
<td>Stages 3 &amp; 4</td>
<td>5-15 minutes each</td>
<td>Slow wave sleep (SWS), stage 4: Delta waves, body repairs itself NREM</td>
</tr>
<tr>
<td>REM</td>
<td>10 minutes, first cycle (up to 1 hour in subsequent cycles)</td>
<td>Dreaming occurs, brain activity similar to waking level, rapid eye movement (REM), sleep cycle restarts after REM</td>
</tr>
</tbody>
</table>

Sleep deprivation will increase REM, decrease deep sleep!
5. What stages of sleep do scientists identify? When do they occur?

Sleep deprivation will increase REM, decrease deep sleep!
5. What stages of sleep do scientists identify? When do they occur?

Different EEG signal patterns for different stages of sleep:

- **Awake**
- **Stage 1**
- **Stage 2**
  - K-complex
  - Spindles
- **Stage 3**
- **Stage 4**
  - REM
  - Delta waves
5. What stages of sleep do scientists identify? When do they occur?
6. What are the characteristics and functions of REM sleep?

- Dreams
- Memory consolidation and learning
- EEG signal similar to awake state
- Cholinergic system active (like in awake states)
- Norepinephrine arousal system not active
7. What are the characteristics and functions of deep sleep?

- Hardest to wake up from
- Delta waves
- Most repairs in the body (e.g. glymphatic system activity)
- Amount and quality decreased in older adults
- Amount is reduced when sleep-deprived (b/c REM sleep is privileged) and going to bed later - this leads to many health problems
8. What is the glymphatic system? When is the glymphatic system most effective?

Brain removes toxic metabolic waste (including beta amyloid) using the cerebrospinal fluid in the glymphatic system.
8. What is the glymphatic system? When is the glymphatic system most effective?
9. What is the purpose of the arousal system in the brain? What happens if it is destroyed?

1st arousal system:

- Acetylcholine
- Thalamus - gate to alertness; activated by ACh neurons in brainstem
- Fire fastest during awake states and REM sleep
9. What is the purpose of the arousal system in the brain? What happens if it is destroyed?

2nd arousal system:

- Norepinephrine (a.k.a. noradrenaline)
- Most active during awake states
- Lesions => profound sleepiness or even coma
- Inhibits VLPO when active
10. What does VLPO do? How does caffeine affect it? What makes one sleepy?

- VLPO promotes sleep and is active during it;
- Inhibits the arousal system
- VLPO lesions lead to insomnia
- Use of energy by the brain during wakefulness leads to production of adenosine
- Adenosine binds to VLPO making you sleepy; caffeine interferes with this process
- During sleep adenosine levels decrease
11. What are the neurotransmitters involved in sleep regulation?

- Adenosine
  - Binds to VLPO => sleepiness; Wakefulness = ++, sleep = --
- Norepinephrine
  - REM-suppressive; Used in 2nd arousal system
- Acetylcholine
  - Activates various brain regions; REM-generating; Used in 1st arousal system
- Orexin
  - Excitatory to arousal system; loss causes narcolepsy
25. What are the neurotransmitters involved in sleep regulation?

- Supra/Superchiasmatic Nucleus
- Upper brainstem neurotransmitters:
  - Norepinephrine (REM-suppressive)
  - Serotonin (REM-suppressive)
  - Acetylcholine (activates various brain regions; REM-generating)
  - Glutamate (REM-generating)
- Hypothalamus
  - Orexin (excitatory to arousal system; loss causes narcolepsy)
- Ventrolateral Preoptic Area (VLPO)
  - SCN -> Subparaventricular Nuc -> dmHypohalamus -> VLPO + Hypothalamus
  - Galanin and GABA (damage leads to irreversible insomnia; REM-suppressive)
25. What are the neurotransmitters involved in sleep regulation?

- Homeostatic Mechanisms:
  - While awake:
    - ATP -> Adenosine
    - Adenosine reduces neural activity
    - Initially found mostly in basal forebrain and then everywhere
  - During sleep:
    - ATP stores built back up

* This is one of the mechanisms by which coffee works
Lecture 5
Introduction to Data Science, Dr. Voytek
Lecture 5 | Review Questions

1. What is cognitive science, according to Dr. Voytek?
2. What are some examples of cognitive/intelligent behaviors?
3. Do other animals display cognitive behavior? Provide some examples of animals and the cognitive behavior they display.
5. What was the point of the filtered/unfiltered audio example from lecture?
1/2. What is Cognitive Science, according to Dr. Voytek & What are some examples of cognition?

Cognitive Science is the study of intelligences both natural and artificial.

**Communication:** information transfer

**Computation:** information processing

**Memory:** information storage for later recall

**Inference/reasoning:** using a subset of known information to derive new information

**Planning/decision-making:** using information to guide behavior, both long-term and short-term

**Note:** all of these hallmarks of cognition have to do with manipulating and making use of data, or information.
3. Do other animals display cognitive behavior? Provide some examples of animals and the cognitive behavior they display.

- **Tool use**
- **Planning**
- **Rudimentary communication**

**Prediction**

**Classification**

**Knowledge Discovery**

*Doing useful shit!*
5. What was the point of the filtered/unfiltered audio example from lecture?

Signals and Noise:

Filtered sentence $\rightarrow$ Clear sentence $\rightarrow$ Filtered sentence

We are able to hear the filtered sentence clearly in the second sentence because our brain uses memory to modify how we hear the actual signal.
Linking Cognitive Science, Data Science, & Neuroscience

Recording Brain Activity

<table>
<thead>
<tr>
<th>fMRI</th>
<th>EEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Measures oxygen changes in blood in brain</td>
<td>- Measures electrical activity in brain</td>
</tr>
<tr>
<td>- Can tell <strong>where</strong> activity happens, but not <strong>when</strong></td>
<td>- Can tell <strong>when</strong>, but not <strong>where</strong> signals come from</td>
</tr>
</tbody>
</table>

Large-Scale Data Mining

We can use large data sets from the brain to model/explain human cognition
Quiz time!

- No talking, signing, or communicating of any kind.
- Put *everything* away except a pen or pencil (make sure it’s a black pen and press hard with a pencil)
- When you get your quiz:
  1. Write your name in the “Name” box
  2. Write and bubble in your PID
  3. Sign the Academic Integrity Agreement
  4. Bubble in *this* section (regardless of which you’re assigned to)
- Please have your student ID out when you turn in your quiz!
Write and circle in your PID

Write down your name here

UC SAN DIEGO – DEPARTMENT OF COGNITIVE SCIENCE

STUDENT PID NUMBER

A/U

[0] ○ ○ ○ ○ ○ ○ ○ ○ ○
[1] ○ ○ ○ ○ ○ ○ ○ ○ ○
[2] ○ ○ ○ ○ ○ ○ ○ ○ ○
[3] ○ ○ ○ ○ ○ ○ ○ ○ ○
[4] ○ ○ ○ ○ ○ ○ ○ ○ ○
[5] ○ ○ ○ ○ ○ ○ ○ ○ ○
[6] ○ ○ ○ ○ ○ ○ ○ ○ ○
[7] ○ ○ ○ ○ ○ ○ ○ ○ ○
[8] ○ ○ ○ ○ ○ ○ ○ ○ ○
[9] ○ ○ ○ ○ ○ ○ ○ ○ ○

Last NAME, First NAME

COURSE NUMBER

COGS 1
WINTER 2018
Dr. Mary ET Boyle
Quiz I
Oct 8 – Oct 12, 2018

Quiz VERSION

A B C D E F G H

Section you are taking this quiz:

Please Bubble only one!

[1] ○ Monday @ 3 Zoe
[2] ○ Monday @ 4 Lauren
[3] ○ Monday @ 5 Alexis
[4] ○ Monday @ 6 Kenny
[5] ○ Friday @ 9 Sandhya
[6] ○ Friday @ 10 Arturs
[7] ○ Friday @ 11 Subathra
[8] ○ Friday @ 12 Elizabeth

Quiz will not be graded without Academic Integrity Signature.

COGS 1: QUIZ I -Choose the best answer. Please bubble in your answers to the right →

ACADEMIC INTEGRITY

By taking this quiz, you agree that you will follow ALL UCSD ACADEMIC INTEGRITY policies. It is YOUR responsibility to know and understand all of the policies. Failure to follow all UCSD Academic Integrity policies could result in expulsion from UCSD.

Signature

Date

Your signature above certifies that you will follow and that you know that you will suffer the consequence for ANY academic integrity violation.

YOUR ANSWERS GO HERE

[A] [B] [C] [D] [E]

1 ○ ○ ○ ○ ○ ○
2 ○ ○ ○ ○ ○ ○
3 ○ ○ ○ ○ ○ ○
4 ○ ○ ○ ○ ○ ○
5 ○ ○ ○ ○ ○ ○
6 ○ ○ ○ ○ ○ ○
7 ○ ○ ○ ○ ○ ○
8 ○ ○ ○ ○ ○ ○
9 ○ ○ ○ ○ ○ ○
## COGS 1: FALL 2018

### Section B

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Day</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor Boyle</td>
<td><a href="mailto:mboyle@ucsd.edu">mboyle@ucsd.edu</a></td>
<td>Monday</td>
<td>2-3:50pm</td>
<td>CSB 130</td>
</tr>
<tr>
<td>Zoe</td>
<td><a href="mailto:tzcheng@ucsd.edu">tzcheng@ucsd.edu</a></td>
<td>Monday</td>
<td>12-12:50pm</td>
<td>CSB 223</td>
</tr>
<tr>
<td>Lauren</td>
<td><a href="mailto:lcurley@ucsd.edu">lcurley@ucsd.edu</a></td>
<td>Monday</td>
<td>3-3:50pm</td>
<td>CSB 225</td>
</tr>
<tr>
<td>Subathra</td>
<td><a href="mailto:suraj@ucsd.edu">suraj@ucsd.edu</a></td>
<td>Tuesday</td>
<td>2-2:50pm</td>
<td>CSB 114</td>
</tr>
<tr>
<td>Elizabeth</td>
<td><a href="mailto:e1cisner@ucsd.edu">e1cisner@ucsd.edu</a></td>
<td>Wednesday</td>
<td>10-10:50am</td>
<td>Rogers Market</td>
</tr>
<tr>
<td>Lexi</td>
<td><a href="mailto:adalenco@ucsd.edu">adalenco@ucsd.edu</a></td>
<td>Thursday</td>
<td>8-8:50am</td>
<td>CSB 114</td>
</tr>
<tr>
<td>Kenny</td>
<td><a href="mailto:kyc048@ucsd.edu">kyc048@ucsd.edu</a></td>
<td>Thursday</td>
<td>11-11:50am</td>
<td>Perks Coffee Shop</td>
</tr>
<tr>
<td>Sandhya</td>
<td><a href="mailto:sasriram@ucsd.edu">sasriram@ucsd.edu</a></td>
<td>Thursday</td>
<td>2-2:50am</td>
<td>CSB 114</td>
</tr>
<tr>
<td>Arthur</td>
<td><a href="mailto:asemenuk@ucsd.edu">asemenuk@ucsd.edu</a></td>
<td>Friday</td>
<td>9-9:50am</td>
<td>CSB 215</td>
</tr>
</tbody>
</table>