**R2: Neural data science: accelerating the experiment-analysis-theory cycle in large-scale neuroscience**

**Quiz Type:** Graded Quiz

**Shuffle Answers:** Yes

**Time Limit:** No Time Limit

**Multiple Attempts:** Yes

**Score to Keep:** Latest

**Attempts:** 3

**View Responses:** Always

**Show Correct Answers:**

From {1 MINUTE AFTER DUE} at 12:02am to {ONE WEEK AFTER} at 12:01am

**One Question at a Time:** No

**Require Respondus LockDown Browser:** No

**Required to View Quiz Results:** No

**Webcam Required:** No

Complete the following reading(s) and do your best to think critically while doing so:

*Neural data science: accelerating the experiment-analysis-theory cycle in large-scale neuroscience*, by Paninski & Cunningham, *Current Opinion in Neurobiology* 2018. (Direct PDF download here.)

https://www.sciencedirect.com/science/article/pii/S0959438817302428

https://github.com/NeuralDataScience/Readings/blob/main/Paninski%20and%20Cunningham%20-%202018%20-%20Neural%20data%20science%20accelerating%20the%20experiment-a.pdf

After you've completed the reading, complete the reading quiz. These quizzes will help hold you accountable for reading the assigned papers and articles. Then, the discussions in section are meant to really help to ensure you're able to discuss these papers and their nuances with classmates, professors, and any data scientists you work with in your future careers.

**Question 1 (1 pt)**

Similar to the Ezer and Whitaker article we read, Paninski and Cunningham argue that data science is useful across the whole scientific life cycle: from experimental design and analysis, to theory building and back again. Despite this critical role of data science in neuroscience, they close their argument noting that there is a dearth of trained neural data scientists. Why is this a problem, in their view?

***Correct***

The need for trained data scientists far outpaces the supply, creating a scientific progress bottleneck.

***Incorrects***

Interdisciplinary training is necessary, but there is a bottleneck created by a lack of data.

The sociological trend toward more open data sharing limits the options for non data scientists.

Datasets are getting larger, therefore the bottleneck is at the level of needing more data engineers, not just data scientists.

**Question 2 (1 pt)**

Calcium imaging is a very powerful method that allows imaging the activity of many neurons, less invasively, with high cell-type specificity. The raw data from this method consists of many images of activity taken across many time points. Though powerful and popular, interpreting calcium imaging results warrants some caution, partly due to the fact that it's difficult to assess the performance of algorithms used to analyze these data. According to the authors, what is one potential solution for overcoming the challenge of assessing algorithm performance?

***Correct***

Creation of gold standard calcium imaging datasets for comparing methods

***Incorrects***

Deep learning

Incorporating other data types into calcium imaging analyses

Training more data scientists with machine learning expertise

**Question 3 (1 pt)**

In the *encoding / decoding*paradigm, encoding looks at how spiking is affected by stimuli, whereas decoding \_\_\_\_\_\_\_\_\_\_\_\_\_.

***Correct***

classifies or reconstructs stimuli from spiking

***Incorrects***

focuses entirely on using artificial neural networks for spike analysis

maps spiking to network states

maps a stimulus feature to a lower dimensional space

**Question 4 (1 pt)**

In contrast to the encoding / decoding approach, *factor models* assume that the brain's high dimensional response to a stimulus (where each dimension the activity of a single neuron or channel of data) can be reduced to few(er) latent factors. This is because it is assumed that the activity of a neural population is:

***Correct***

noisy and redundant

***Incorrects***

computationally efficient

non-linear and uncorrelated

irreducibly complex

**Question 5 (1 pt) (multiple answers)**

Which of the below are presented as reasons to be skeptical of the neural data science approach? (Select all that apply.)

***Corrects***

Our statistical methods are unable to give us a functional (mechanistic) understanding of how a system works

More sophisticated analysis approaches might not be teaching us anything new beyond what simpler approaches taught us

Our understanding (or capacity for understanding) may not grow with increasing data size

***Incorrects***

Our imaging methods do not have sufficient temporal resolution

Artificial neural networks are unable to recapitulate biology network function