**R3: Variability in the analysis of a single neuroimaging dataset by many teams**

**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:

*Variability in the analysis of a single neuroimaging dataset by many teams*, by Botvinik-Nezee and *many*, *many co*authors. (Direct PDF download here.)

https://www.nature.com/articles/s41586-020-2314-9

https://github.com/NeuralDataScience/Readings/blob/main/Botvinik-Nezer%20-%20Variability%20in%20the%20analysis%20of%20a%20single%20neuroimagi.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)**

What is a "researcher degree of freedom"?

***Correct***

Choices that researchers make in their analyses that might influence the statistical results

***Incorrects***

A VC-funded, collaborative scientific data analysis platform

The number of researchers/analysts are involved in an analysis pipeline

The number of participants included in an analysis

**Question 2 (1 pt)**

What is a "prediction market" (at least, in the context of this experiment)?

***Correct***

A platform where people can bet on the outcomes of a statistical result, which serves as a proxy for confidence in an "established" finding.

***Incorrects***

A centralized database where people can bet on how likely any given researcher is to produce a significant result in an analysis.

A website the pools research predictions from different research groups, and then uses text-mining and NLP to mine for plausible hypotheses.

An algorithm for aggregating regression outcomes (predictions) to maximize statistical power.

**Question 3 (1 pt)**

Which of the below is a **not** a recommendation that the authors make for reducing the effect of analysis variability on statistical outcomes?

***Correct***

Consult with statisticians / data scientists on best practices in statistics / machine learning.

***Incorrects***

Publicly share analysis code and pipelines.

Publicly share data—raw and those produced at different processing stages.

Use registered reports to submit analysis pipelines to peer review before the data are analyzed (or even collected!)

**Question 4 (1 pt)**

Given the size and complexity of neuroimaging datasets and the concomitant flexibility in analysis choices, and the effect of that flexibility on how we interpret the significance of our results, what is the purpose of "multiverse" analyses?

***Correct***

Applying many different analysis approaches helps assess the sensitivity of the outcomes to individual analysis decisions.

***Incorrects***

Bringing in researchers with different backgrounds increases the chances that someone knows the correct analysis to perform.

The more analyses you run, the more likely you are you get the significant result you were looking for.

Larger datasets always require more complex analysis approaches that exist within a larger “multiverse” of methods.

**Question 5 (1 pt)**

What is the main message of this paper?

***Correct***

When given the exact same data and hypotheses to test, experts can come to different—even opposite!—conclusions depending on their analysis choices.

***Incorrects***

Crowdsourcing predictions regarding the validity of hypotheses outperforms detailed statistical analysis of neuroimaging data.

Without modern machine learning, analyses are more susceptible to spurious correlations.

When given the exact same data and hypotheses to test, even when analysis approaches differ, experts come to the same conclusions.