COGS 303

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UBC

Oct 27, 2023

1. Assignments
   - Problem Set
   - Literature Review
2. Replication and why it matters
3. Sources of the Problem
   - Systemic problems
   - Questionable Research Practices

Problem Set Question 1

The key here is to see that Larry's claim $P(D|V) = P(D|\neg V)$ reduces to the simpler claim that $P(V) = P(\neg V)$:

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- So, his claim amounts to the claim that the denominators are equivalent
- So, his inference would only be good if he knew that to be the case (doubtful)

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- Whatever B is, you will continue to be dogmatic about A

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- If the prize is behind door 2, which you haven't chosen, then the host has to reveal door 3, so $P(h|2) = 1$
- The upshot: if you switch, you're twice as likely to win the prize

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- Most common error on this one is to miss that we know her fair betting ratio is 0.5

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- $P(P|\neg S) = 0.005$
- So,

$$P(S|P) = \frac{0.99 \cdot 0.00005}{(0.99 \cdot 0.00005) + (0.005 \cdot 0.99995)}$$

$$= \frac{0.0000495}{0.0000495 + 0.00499975} \approx 0.0098$$

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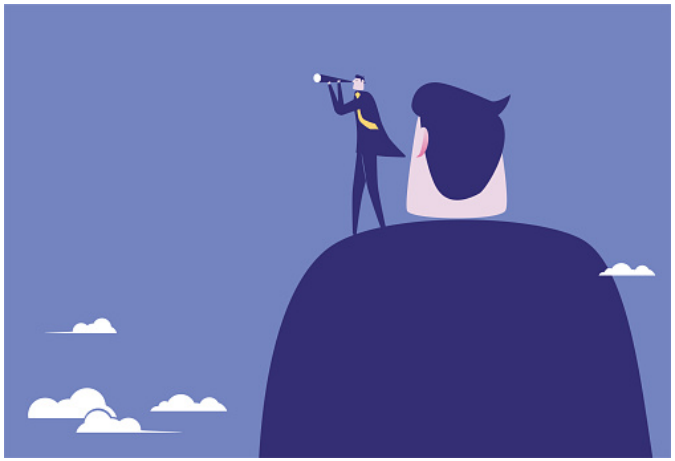
- 

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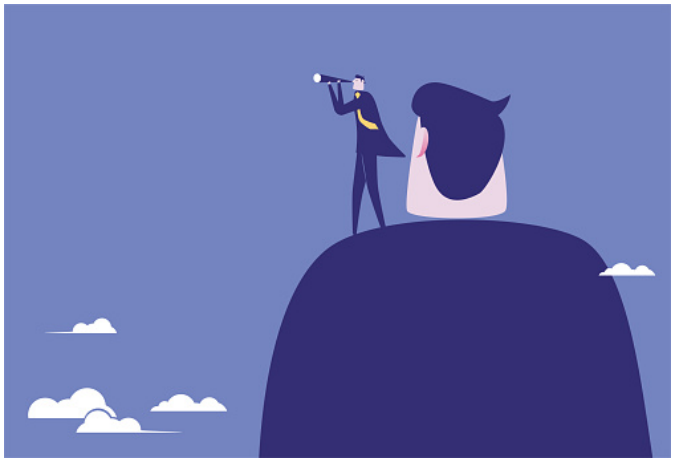
- 
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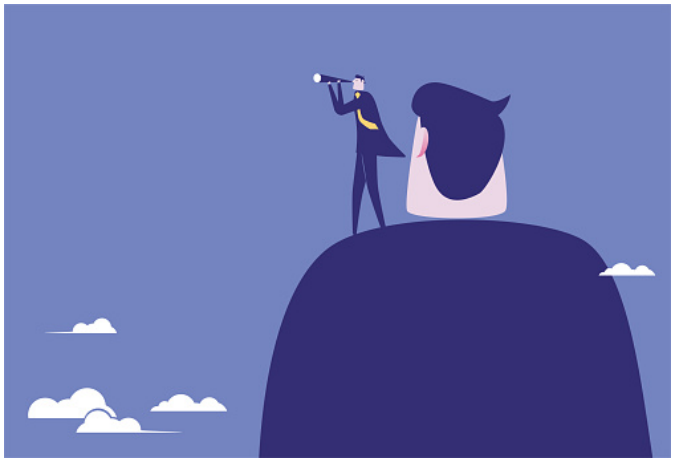
- 
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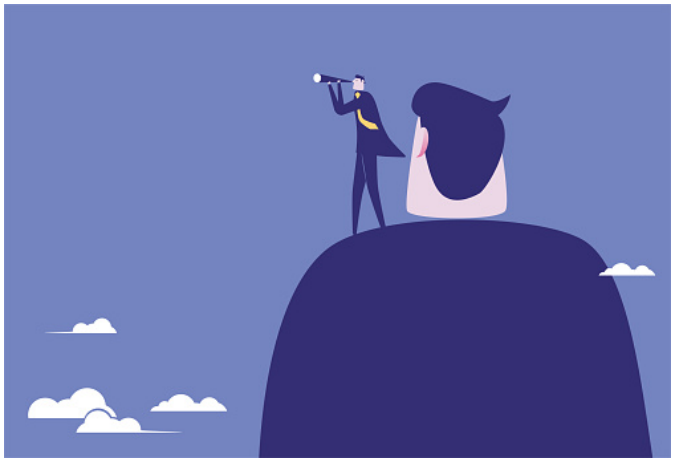
- 
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- The lit review assignment is an exercise to help you develop this skill

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- In your final paper, you will be presenting your view on the subject, in interaction with the other views that are out there

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- Just think of your lit review as the "context" section, and your final paper as a combination of the "context" and "comment" sections

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- Citations: pick a style and stick with it (apa preferred, but not required)

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  - Pay attention to the length requirements: you will lose marks if your work is too long/too short

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  - Direct–Closely following the original experiment
  - Indirect–Varying the methodology to test whether the effect can be generalized (eg. deliberately sampling from a different population than the original study)

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  - This is especially true with respect to indirect replications

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- Suppose, we are initially very confident that the result is true:

$$\frac{P(T|F)}{P(\neg T|F)} = 50 \cdot \frac{P(F|T)}{P(F|\neg T)}$$

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- And suppose we are twice as confident that the replication would fail if the original result is false than if it were true:

$$\frac{P(T|F)}{P(\neg T|F)} = 50 \cdot 0.5$$

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- Then, our posterior odds:

$$\frac{P(T|F)}{P(\neg T|F)} = 25$$

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- So, in principle, successive failures to replicate can result in our having more confidence that the original study is false than that it is true (What would the posterior odds be if we reiterated this process 6 times?)

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  - But it should bolster our confidence in the result, to a degree
- "Humans desire certainty, and science infrequently provides it. As much as we might wish it to be otherwise, a single study almost never provides definitive resolution for or against an effect and its explanation" (OSC p.4716-7)

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- Weakness: this is a pass/fail standard, and doesn't measure how far from the original findings the replication attempts were

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- This suggests that the original findings were in the right direction, but amplified

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- This would seem to indicate that significance tests are highly regarded as a "gold standard" for research (maybe too highly regarded...we'll look at that next week)

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- One problem with this method of testing is the potential for publication bias to have suppressed data that would be relevant for a complete meta-analysis

Summing up

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- Context of discovery vs context of justification!

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- We will be looking at this issue more closely next week

Questionable Research Practices

HARKing

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- Recall the example of the discovery of Neptune

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- So what's the problem with HARKing?

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- Contemporary Bayesians typically side with Mill and Keynes

Recall an Example from Week 1:

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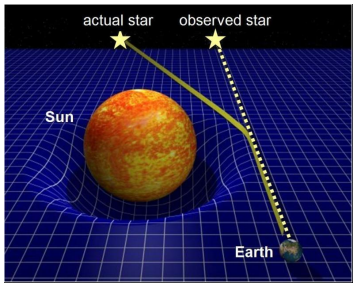

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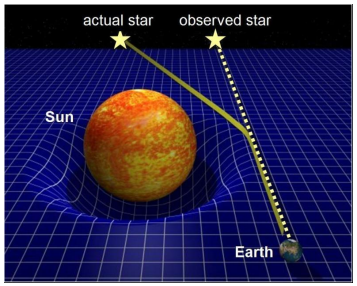

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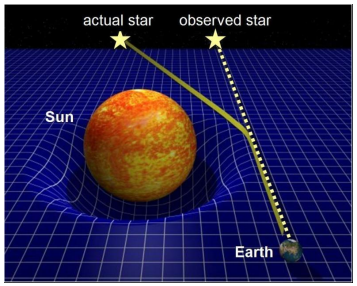

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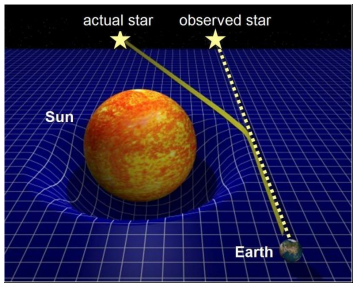

- General relativity **predicts** that gravity bends light
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- Does this not count in favour of the theory?

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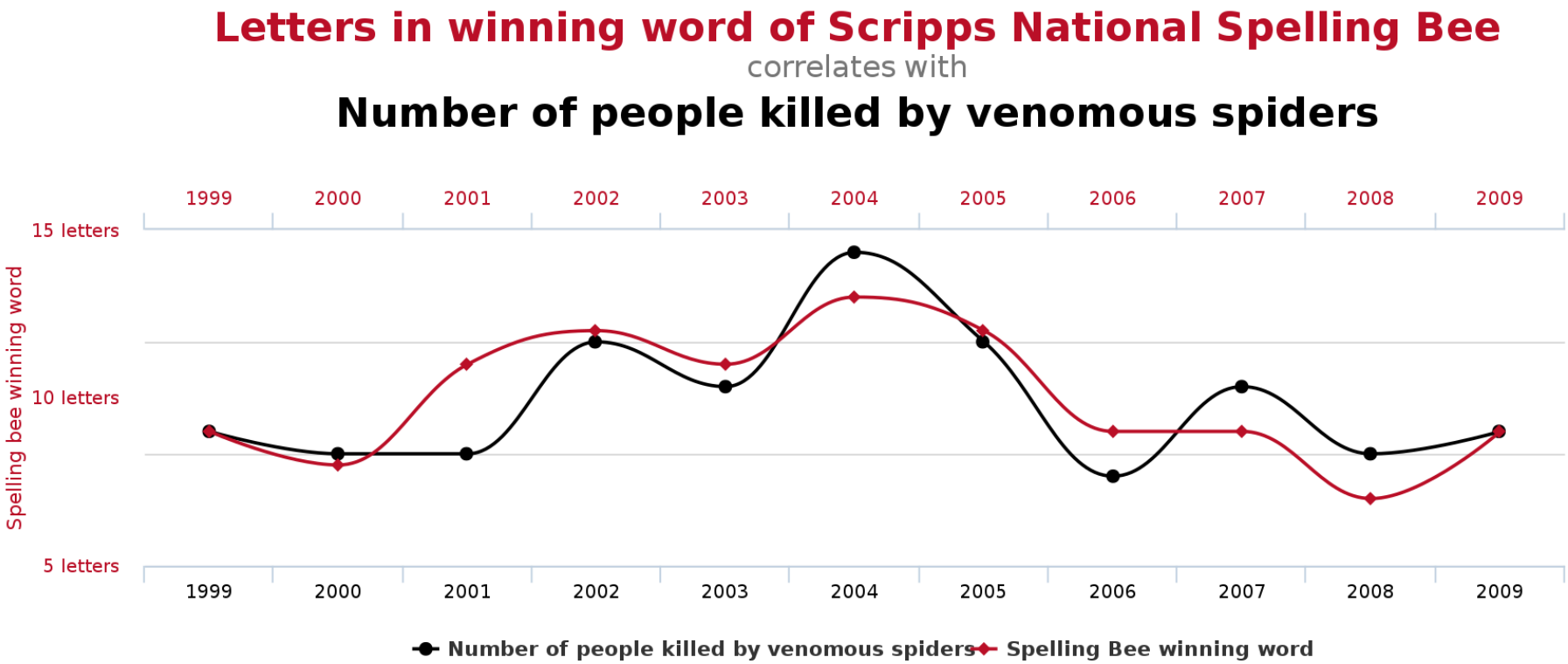
- Kerr: HARKing belongs to the context of discovery more than the context of justification
- Why? Since the studies were not designed to test the HARKed hypothesis, the correlations noted could just be spurious



Source: "Spurious Correlations" by Tyler Vigen

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- They are proposing an explanation for why the theory's prediction failed
- As Kerr notes, they are often the first explanation that occurs to the researcher
- What are the chances that the first explanation that occurs to the researcher is correct?

The upshot

HARKing is bad practice:

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- Maybe not because prediction is better than accommodation
- But because it presents a hypothesis as having been tested when it hasn't
- The experiment that suggested the HARKed hypothesis was not designed to test it (for example, you might need to choose your sample by a different method to test the HARKed hypothesis than you would for the original hypothesis).

Reading for next time:

- Travers et al. "Null Hypothesis Significance Testing and p Values"
- Howson & Urbach "Bayesian Reasoning in Science"
- Romero & Sprenger "Scientific self-correction: the Bayesian way" (it's ok to skim this one)