

ES 2: Critical thinking with Python

aka, Introduction to Computing for Engineers

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P-value

What is the probability this result could have occurred by chance?

Coin flipping

Suppose you have a coin that always comes up heads.

How many times would you have to flip it to feel confident saying it is biased?

Give some math to explain your answer.

Flipping coins for science

A common metric in science is $p < 0.05$

1 / 20 chance of happening by chance

How many coin flips would you need to do?

Suppose we have lots of coins!

I didn't bring in any coins, so let's do this in Python (surprise!)

`np.random.random(N)` gives numbers between 0 and 1

Compare with 0.5 to get equal probability heads/tails

Simulate 6 flips, and check if they are all heads or all tails.

Simulate M runs of N flips, and check if they are all heads or all tails.

An example of intentional p-hacking

For discussion:

1) What are your takeaways from the article?

2) Suppose you're giving a presentation to a group of high school students, about science literacy. What would you tell them?

Is most published research wrong? (Veritasium)

<https://www.youtube.com/watch?v=42QuXLucH3Q>

Science



Steak-umm 

@steak_umm



log off bro



Neil deGrasse Tyson  @neiltyson · 1d

The good thing about Science is that it's true,
whether or not you believe in it.

9:40 PM · 12 Apr 21 · [Twitter Web App](#)



Kevin Flynn @KevinFI79824320 · 15m



Replying to [@steak_umm](#)

you must have changed social media personnel



Steak-umm @steak_umm · 11m



nope. science itself isn't "true" it's a constantly refining process used to uncover truths based in material reality and that process is still full of mistakes. neil just posts ridiculous sound bites like this for clout and he has no respect for epistemology



Is that a lot?

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