

FRST302: Forest Genetics

Interlude I

What is a p-value?

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The probability of a particular observation under the null hypothesis

Flipping Coins

Assume you're flipping a **fair** coin

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A: $Pr(5 \text{ tails out of } 5 \text{ flips}) = 0.5^5$

Flipping Coins

Q: If you flipped the coin 5 times, what is the probability that you got exactly two tails?

Write them all down if you get really bored!!

Flipping Coins

Q: If you flipped the coin 5 times, what is the probability that you got exactly two tails?

A: HHTTT, HTHTT, HTTHT, HTTTH, THHTT, THTHT, THTTH, TTHHT, TTHTH, TTTHH

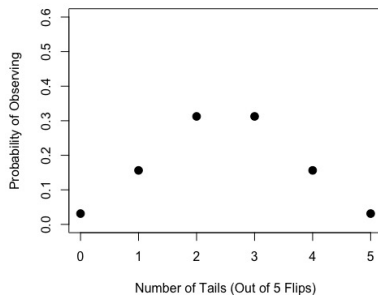
10 possible ways to get it

*From 5 coin flips there are 32 possible outcomes**

A: $Pr(2 \text{ heads out of 5 flips}) = 10/32 = 0.3125$

Flipping Coins

Here's the *probability distribution* of flipping a fair coin 5 times



This is called the *binomial* distribution

Approximately 3% of the time we would expect 0 tails in a set of 5 coin flips



Jam Toast

Is a dropped piece of toast equally likely to land jam side down, or jam side up?

Let's pretend that that we had 500 identical pieces of jam toast and we dropped them from the top of the FSC

What could we conclude about jam toast if in our experiment, it landed jam side down 100 times out of 500?

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Q: What is the null hypothesis

A: That it's equally likely that dropped toast lands jam side or bread side up $Pr(Jam) = 0.5$

Under this null hypothesis,

$$\Pr(100 \text{ jam-up toasts out of } 500 \text{ drops}) = \binom{500}{100} 0.5^{100} \times (1 - 0.5)^{500-100} = 6.24 \times 10^{-44}$$

This probability **is** the *p*-value - *the probability of observing 100 jam-up toasts out of 500 toast drops assuming that both outcomes are equally likely*

Don't worry about the maths, that's just there to show you that there's a way to calculate it

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That we got such an unexpected result could lead us to reject the null hypothesis that

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