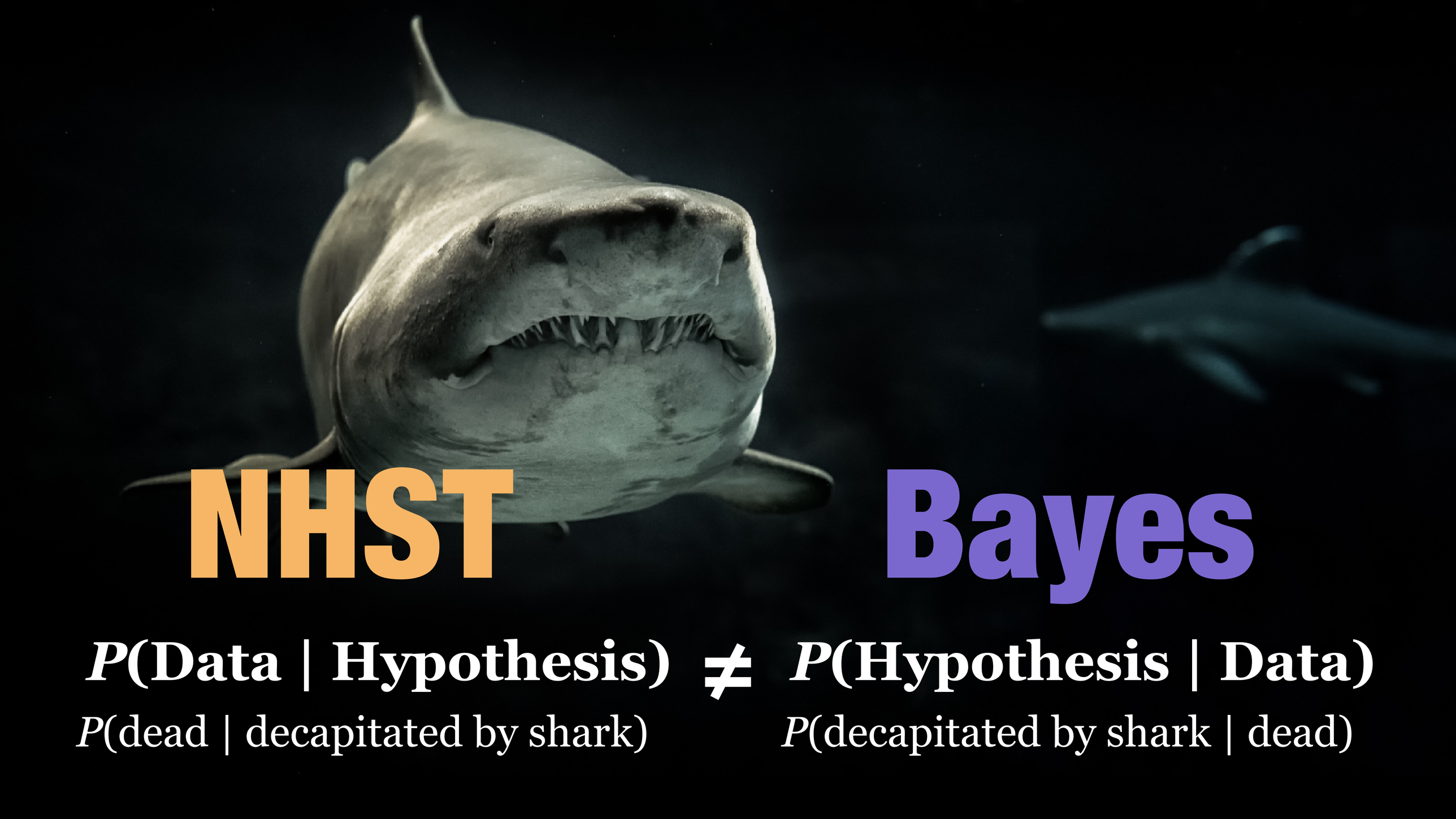

NHST vs Bayes


CRAFTSMAN
NICKEL PLATED


NHST
Bayes
P(Data | Hypothesis) ≠ P(Hypothesis | Data)
P(dead | decapitated by shark)
P(decapitated by shark | dead)

NHST ≠ Bayesian

NHST	Bayesian
P(Data | Theory)	*P*(Theory | Data)
no prior knowledge	incorporates prior knowledge
quantifies long-run probability of finding a false positive	quantifies uncertainty around possible parameter values
hard cut-off decisions	gradual assessment of evidence

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Bayesian

- 👍 very **flexible** in terms of model architecture
- 👍 not limited by optimization constraints (no “**convergence failures**”)
- 👍 not limited to categorical decision procedure

- 👎 computationally expensive
- 👎 one more layer of researcher degrees of freedom
- 👎 **more “thinking”** required

flexibility 👍

one and the same framework for everything you need

types of **error distributions**

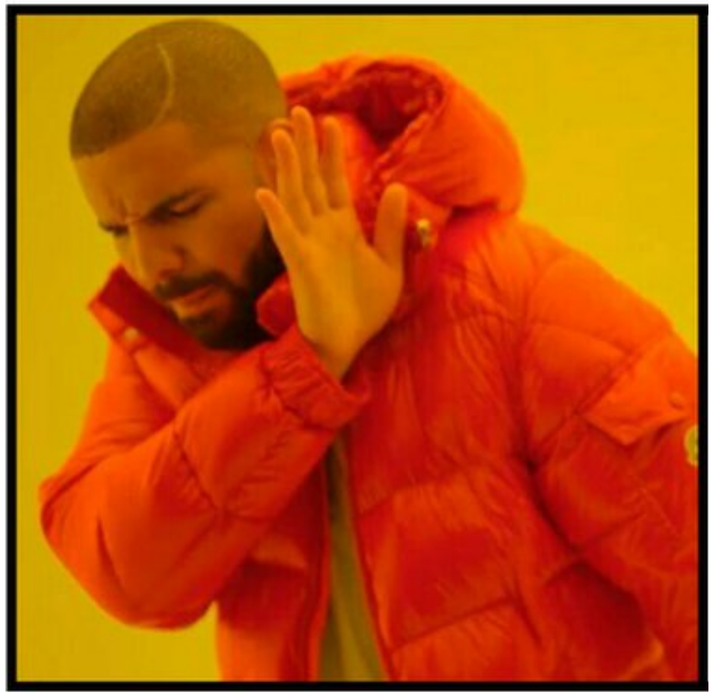
gaussian, binomial, ordinal, multinomial, etc.

types of **fitting procedures**

univariate, multivariate, mixture, etc.

levels of **covariance**

simple regression, multiple regression, mixed-effect regression, etc.



convergence issues?

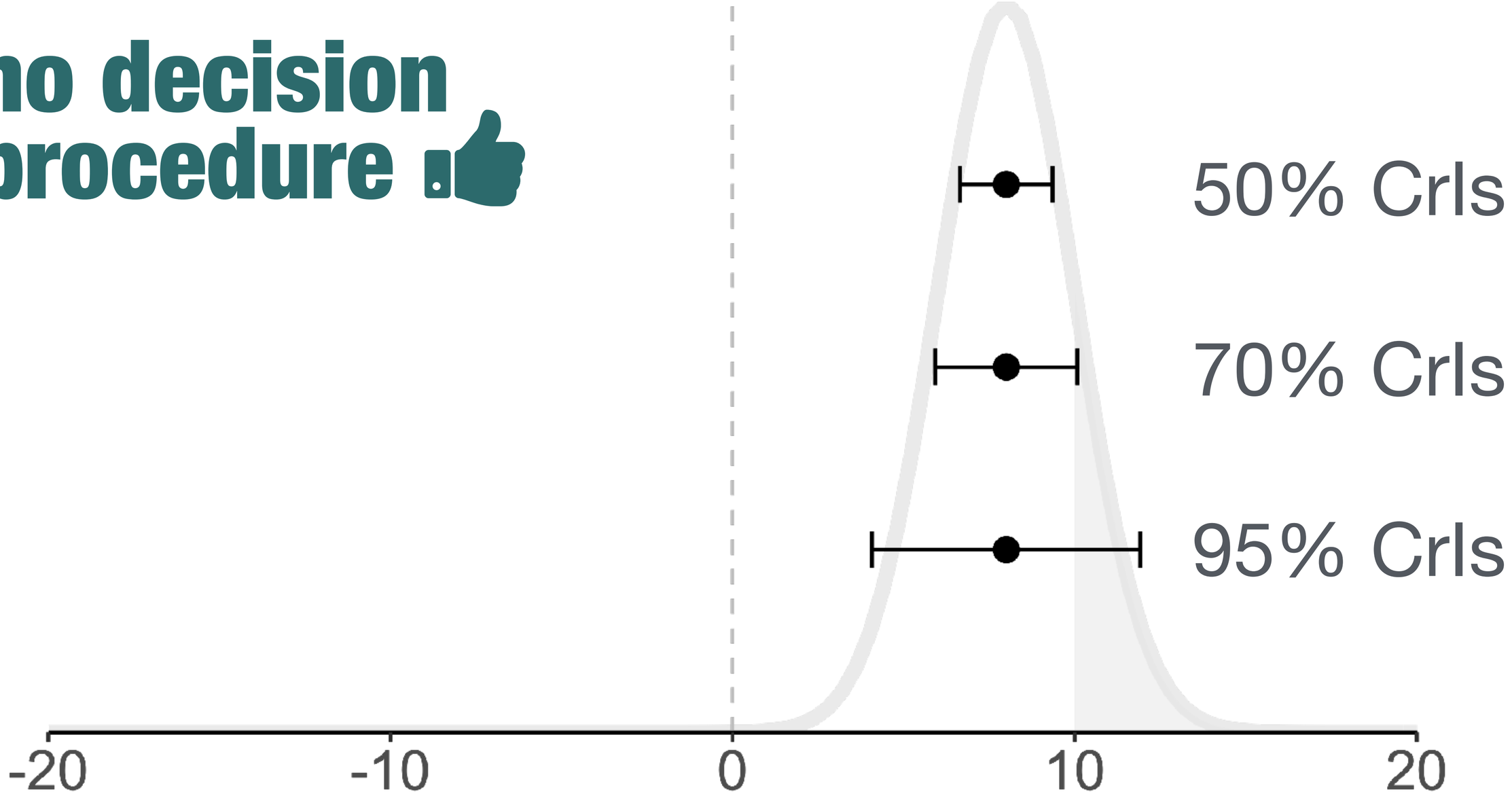
lmer()

```
Warning message:
In checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv,  :
  Model failed to converge with max|grad| = 0.0139723 (tol = 0.002, component 1)
```


DO I BRING MY UMBRELLA?


ARE MY RESULTS SIGNIFICANT?

no decision procedure



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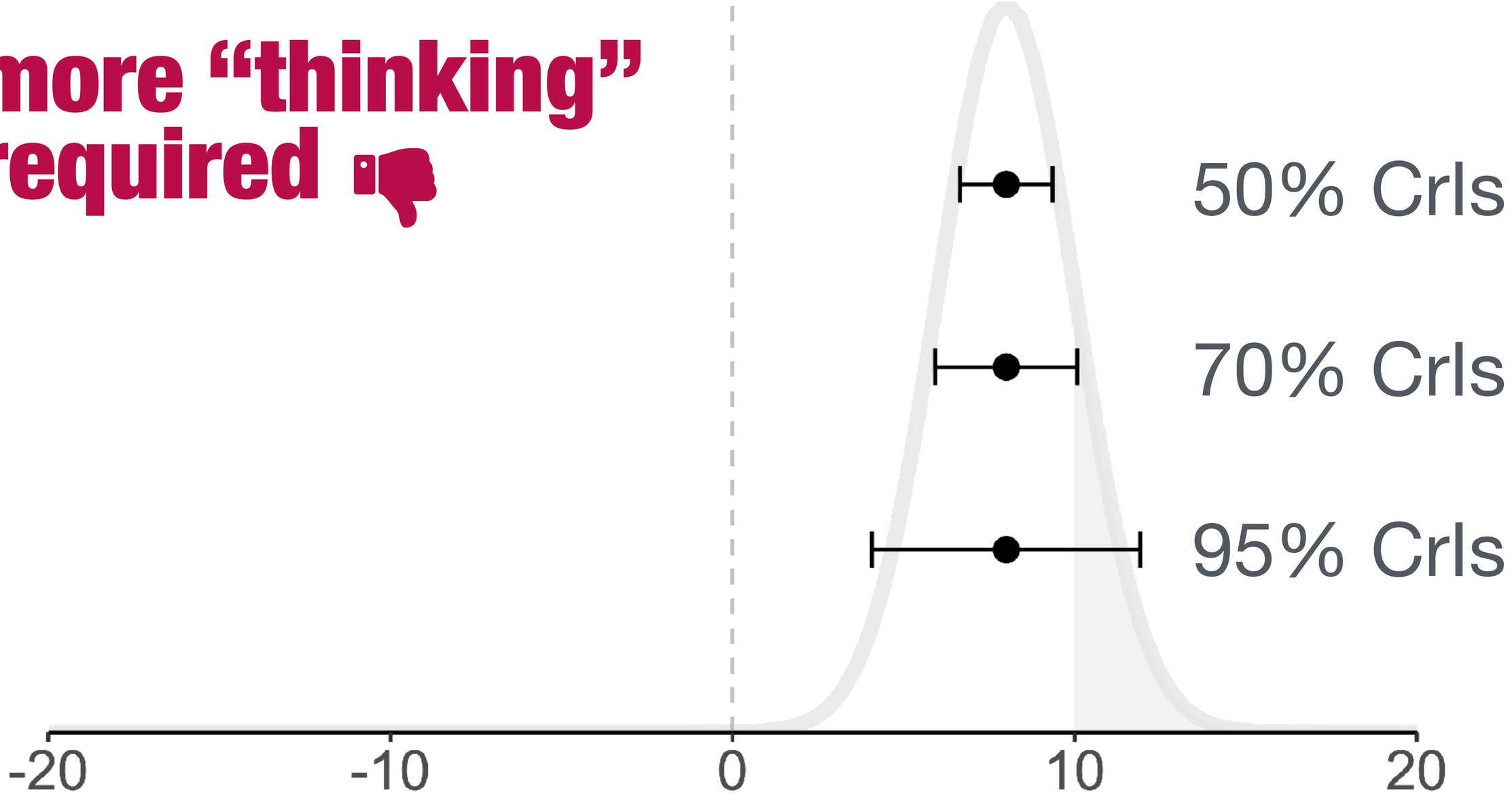


computationally expensive

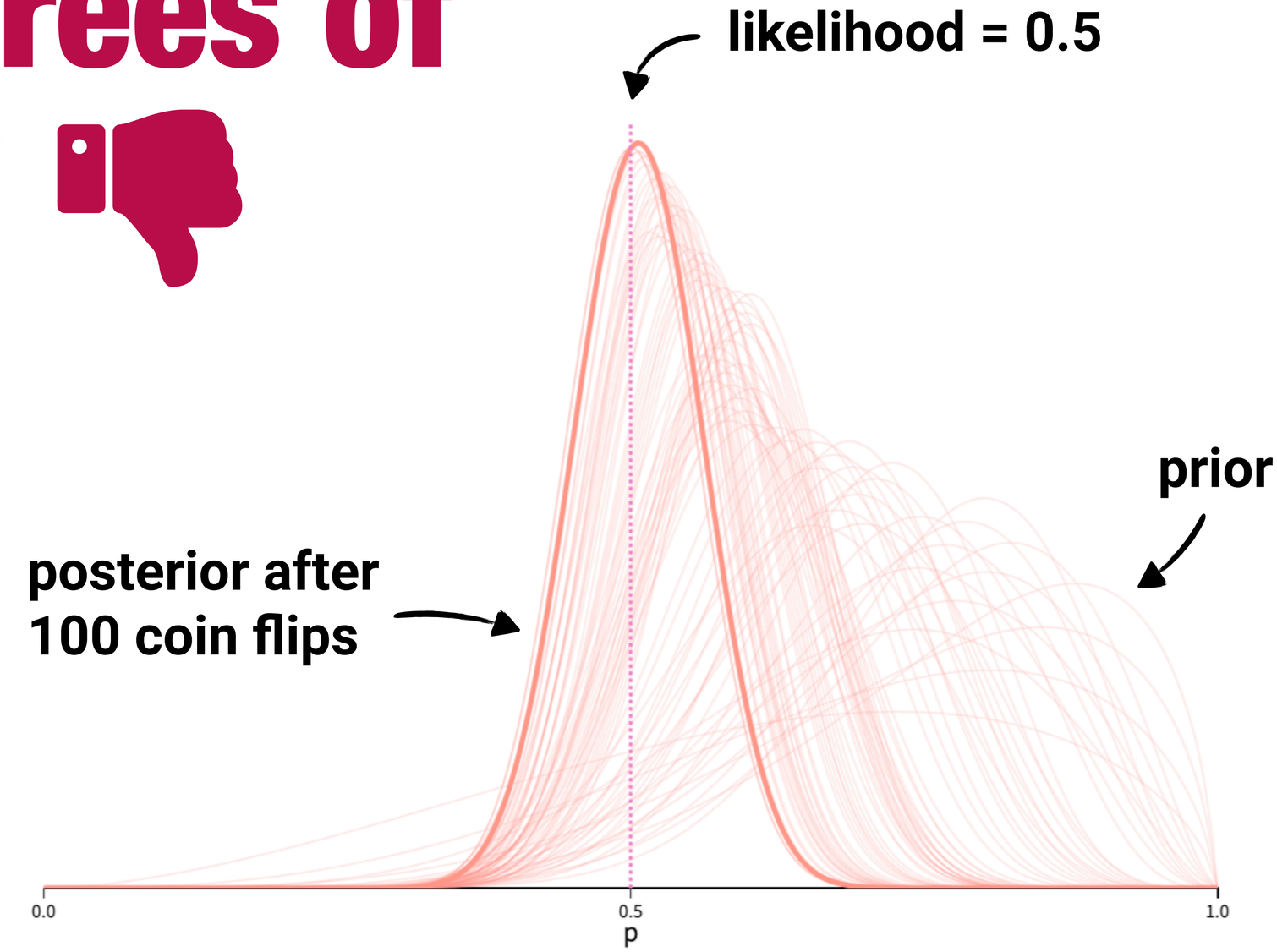
$$Pr(\text{Theory} \mid \text{Data}) = \frac{Pr(\text{Data} \mid \text{Theory}) \times Pr(\text{Theory})}{Pr(\text{Data})}$$

$$Pr(\text{Data}) = \int Pr(\text{Data}, \text{Theory})\, d_{\text{Theory}}$$

can be **intractable** to solve, but...

can be **approximated** with clever algorithms

more degrees of freedom? 👎



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ROADMAP

DAY 1

1st Bayesian Model
Run your first Bayesian Model

Bayes Theorem
What does it mean to think like a Bayesian?

Priors - Part 1
What are priors?

Priors - Part 2
How do I specify priors?

NHST vs. Bayes
Why are we doing this again?

DAY 2

Review
Day 1 in a nutshell

Inference
How do I answer my research question without a p-value?

More on priors
Why is it a good idea to specify priors?

Mixed Models
Run linear mixed effects models with brms

Sampling
What happens under the hood?

DAY 3

1:1 sessions

1:1 sessions

1:1 sessions