Formatted Async 3 Code

Introduction

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In this code we're going to work though an extended example that demonstrates how randomization inference works. We hope that at the end of this section you are able to:

1. Understand the sharp null hypothesis
2. Apply randomization inference to produce a sharp null distribution of the focal test-statistic, the ATE
3. Produce and evaluate probabilistic statements of belief about the plausibility of the sharp-null hypothesis

Three Inferential Paradigms

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1. Frequentist Inference
2. Bayesian Inference
3. Fisherian Inference

Frequentist Inference

- Theoretically unappealing
  - $P(Data \mid Null\ Hypothesis) \neq P(Hypothesis \mid Data)$
  - Requires assumptions that are frequently implausible
- Analytically challenging

$$\int_{-\infty}^{x} \frac{e^{\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}}{\sigma\sqrt{2\pi}}, is\ hard.$$

- Computationally solved
  - Look in the back of any book; or,
  - `pnorm`, `pt`, `pf`, `pchisq`

Bayesian Inference

- Theoretically appealing
  - $P(Hypothesis \mid Data) \propto P(Data \mid Hypothesis) * P(Hypothesis)$
  - Though requires potentially controversial statement of prior beliefs about $P(Hypothesis)$
- Analytically challenging
  - Correctly specifying priors so they are both (a) plausible; and (b) conjugate with Likelihood statement requires skill
- Computationally challenging
  - Sampling likelihood space requires informed, principled samplers (e.g. Metropolis, Gibbs) that require cycles

Fisherian Inference

- Theoretically unappealing
  - $P(Data \mid Sharp\ Null\ Hypothesis) \neq P(Hypothesis \mid Data)$
- Analytically simple
- Computationally Straightforward