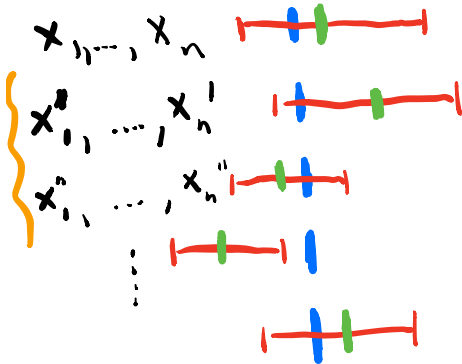


Frequentist
Confidence Interval

$\hat{\theta}$

θ^*

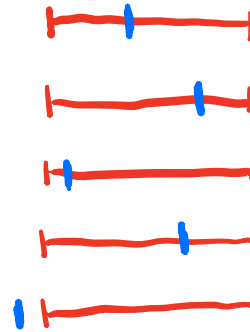
interval



95% Conf. int. =
red region (changing)
contains blue point (fixed)
under 95% of possible realizations
of data

Bayesian
Credible Interval

θ^* : random under posterior
($p(\theta^* | X)$)



95% of blue points (θ^* , changing)
lie in red interval (fixed)

Bootstraps frequentist

→ Approx. 1: assumes distribution of $\hat{\theta}$ is
a good confidence interval

(usually true if $\hat{\theta}$ approximately unbiased)

→ Approx. 2: new samples x', x'', \dots can
be approximated by sampling w/ replacement
from original data

$$\rightarrow |E[\hat{\theta}] - \theta^*| = \underbrace{O\left(\frac{1}{n}\right)}_{\text{}})$$

$$\eta > 1$$

Decision-making, Decision theory

→ Bayesian + frequentist perspectives

→ Loss function

→ Decision function

Hypothesis, multiple hypothesis, FDR

↳ LORD algorithm

Fairness, privacy

Bayesian modeling + graphical models

→ flexible language for expressing dependency

→ beware false independence assumptions

(election forecasting)

→ Piazza; Andrew Gelman blog post

Sampling (Rejection + MCMC)

→ nice way of summarizing posterior

→ curse of dimensionality

→ rejection sampling

→ MCMC: Markov chains + rejection sampling

Regression

- Bayesian perspective
 - MLE = least squares
 - MAP = ridge regression
 - full posterior distⁿ PyMC3
- COVID modeling
 - Gaussian, Poisson, Negative Binomial
- Bayesian logistic regression
- Confidence intervals + bootstrap
 - statsmodels → confidence intervals (under assumptions)
 - fragile
 - bootstrap more robust

Next: Causal Inference