

UNCERTAINTY IN CAMPUS DATA: CAN REVEREND BAYES HELP?

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Overview

- What is a Bayesian approach to statistics?
- An example of a Bayesian problem.
- Where you may see Bayes in the future.

What is Bayesian Statistics?

- Is it an approach or method?
- Clear model assumptions.
- The ability to make probability statements about “real” quantities.
- Ability to use qualitative knowledge in modeling.

Sad Frequentist Statistics

- Hypothesis Testing
- Confidence Intervals
- Buried Assumptions

“A Possible Answer”



The Rule

- The **Posterior** is Proportional to the **Prior** times the **Likelihood**
- $P(A|B) \propto P(A) \times P(B|A)$
- A Posterior is any parameter of interest.
- Likelihood is the distribution of the data.

What Is a Prior?

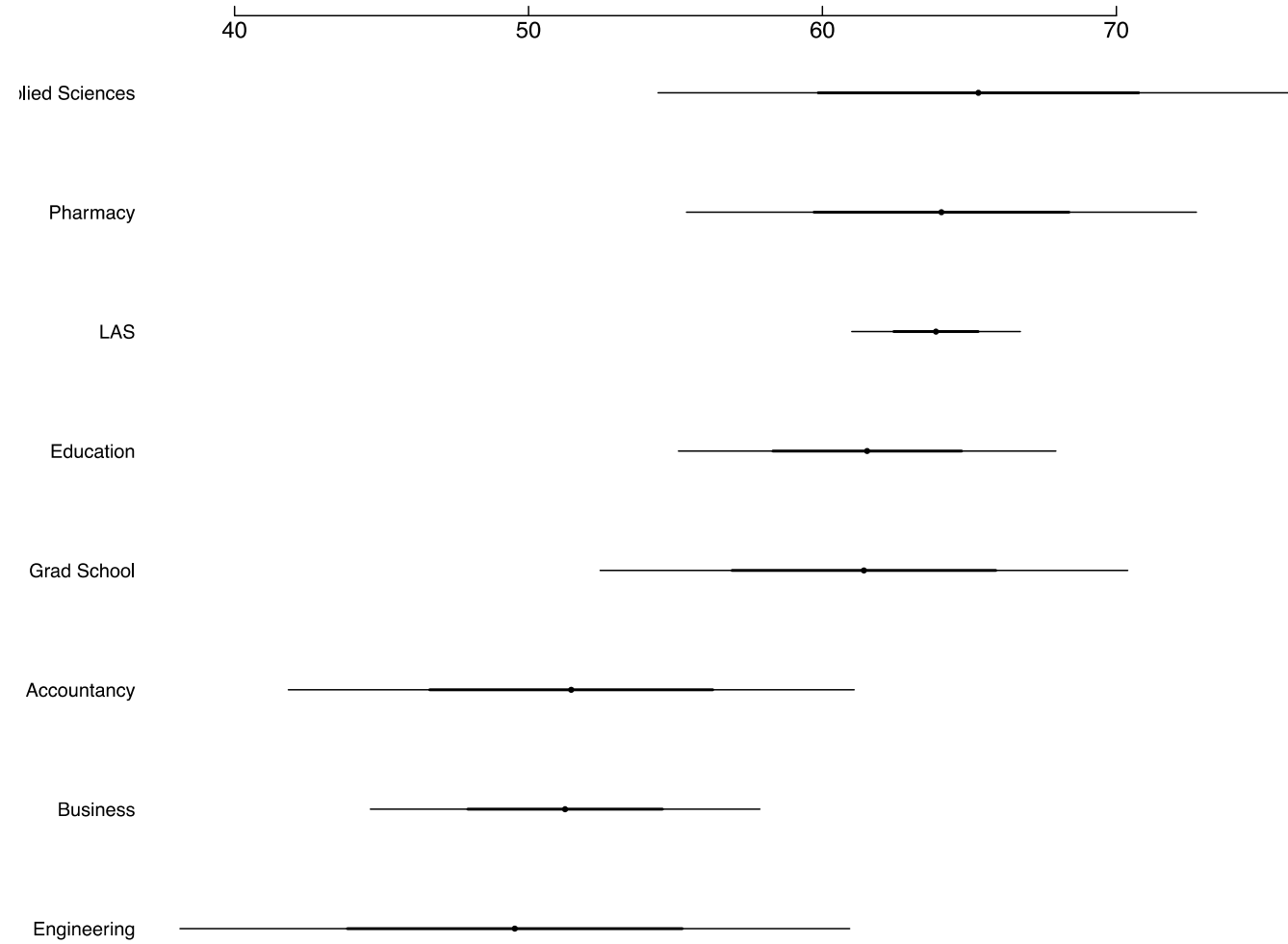
- Subjectivity?
- Data is fixed, parameters are not.
- Bayesian Updating.
- Many types of priors.
- Sample size.

Example:

- Let's hypothetically say I am interested in survey responses on average for the different colleges at my university.
- We have a sample of 1,500 individuals who take the survey.

School	Percent Satisfied
Education	62.2
Business	50.0
Engineering	45.5
Applied Sciences	68.7
Accountancy	48.7
Liberal Arts/Sciences	64.1
Graduate School	62.5
Pharmacy	66.0

Percent Satisfied by Advising



GPA Example

- GPA Dataset
- DV: College GPA 1st Semester
- IV: High School GPA, Gender(M), College Bound School
- Sample Size: 219

CONSTO BAYESIAN ANALYSIS

- Time and Effort = Tradeoffs
- Time in learning Bayes.
- Time in compiling a model.

CURRENT APPLICATIONS

- Social Science Applications
- Using Expert or Literature for Priors

TOOLS

- BUGS (Bayesian inference Using Gibbs Sampling)
- JAGS (Just Another Gibbs Sampler)
- STAN

BOOKS

- Gelman et al.'s *Bayesian Data Analysis*
- Gill's *Bayesian Methods: A Social and Behavioral Sciences Approach*
- Jackman's *Bayesian Analysis for Social Science*

FINAL THOUGHTS

- Possibly savior in RStanArm package in R.