Instructor Name: Mary Parker


Course Description:

Topics covered include:
- Mistakes involving uncertainty, probability, or randomness
- Biased sampling
- Problematical choice of measures
- Methods for checking model assumptions
- Misinterpretations and misuses of p-values
- Mistakes involving statistical power
- Publication Bias
- Multiple Inference
- Data Snooping
- The Statistical Significance Filter
- The Replicability Crisis

To aid understanding of these mistakes, about half the course time will be spent deepening understanding of the basics of frequentist statistical inference (model assumptions, sampling distributions, p-values, significance levels, confidence intervals, Type I and II errors, robustness, power) beyond what is typically covered in an introductory statistics course.

Day 1: Fundamental Mistakes and Misunderstandings

I. Mistakes involving uncertainty
II. Mistakes involving probability
III. Confusions involving the word “random”
IV. Biased sampling and extrapolation
V. Problems involving choice of measures

Day 2: Important Details about Statistical Inference

I. Random sampling
II. Why random sampling is important
III. Overview of frequentist hypothesis testing
IV. Frequentist confidence Intervals
V. Methods for checking model assumptions
VI. Methods for inference which make fewer model assumptions.
Day 3: Type I and II Errors, and Publication Bias

I. Interpretation (and misinterpretations) of p-values
II. Type I errors and significance level
III. Trade-off between type I and type II errors
IV. Deciding what significance level to use
V. Publication Bias

Day 4: Power, Multiple Inference, and Wrap-Up

I. Power of a statistical procedure
II. Common mistakes involving power
III. Multiple inference
IV. Data Snooping