Instructor Name: Nate Marti

Course Name: Power Analysis for Proposal Writing

Course Description:
Power analysis is a critical component of research planning that conveys the feasibility of achieving research goals with finite amounts of time and resources. This course will begin with estimating effect sizes and power analysis for conventional research designs. Next, the course will cover simulation-based methods for power analyses that can be used for virtually any data structure and research design, extending power analysis beyond the limited designs available in traditional power analysis software. The course will begin with strategies for research synthesis and effect size conversions that will form the basis of estimating power. We will use GPower to cover comparisons of means, comparisons of proportions, correlation, analysis of variance (ANOVA), repeated measures ANOVA, and regression models. Next, the course will cover simulation-based power analysis methods, using examples that may include nested data, auto-correlated data, and missing data. The presentation of power analyses in the context of proposal writing will be covered throughout the course. The course will also be useful for applications in meta-analysis and simulation studies.

Day 1:
- Introduction to Power
  - Types of power analysis: a priori, post hoc, compromise, criterion, and sensitivity
  - Evaluating the extant literature to estimate an effect size
- Effect Size Estimates: common measures of effect size (d, f, h, r, eta squared)
  - Justifying effect size estimates
- Effect Size conversion
- Introduction to Gpower

Day 2:
- Comparisons of means
- Comparisons, of proportions
- Correlation
- Analysis of variance (ANOVA)
- Repeated measures ANOVA
- Regression models
- Custom Power analysis

Day 3:
- Power Curves
- Monte Carlo Power analysis
- Simulation-based power analysis for the comparison of means
- Simulation-based power analysis for correlations
Day 4:
  Data with correlated error: nested and auto-correlated data
  Missing data in power analysis
  Tradeoffs in power analysis: cost v. sample size; time v. sample size
  Writing up the power analysis