

Guidelines for the Culminating Project for the Master of Science degree in Applied Statistics

Department of Human Development Teachers College, Columbia University

One of the program requirements for the M.S. degree in Applied Statistics is a special project to be completed in consultation with an advisor. Here we give some guidelines as to the options and requirements for the special project.

Overall guidelines

- The culminating project should be written in APA or some other common format.
- The culminating project will represent new work. It is acceptable for the culminating project to be *motivated* by coursework, though, in that case, the research question posed for the culminating project must be distinct.
- The culminating project should be 15-20 pages of double spaced text (plus up to 5 pages of tables and figures).
- The culminating project should be presented with a cover page that specifies the date, the author's name, and the classes upon which the work relies.

Options

1. **Data analysis.** A data analysis project is appropriate if you are interested in applying some of the methods you worked with in your coursework to address a research question with real data. Suggestions for appropriate methods and the courses they were covered in (in parentheses) include:
 - tests of statistical hypotheses (HUDM 4125)
 - linear or generalized linear regression analysis (HUDM 5122/5126)
 - ANOVA or ANCOVA models (HUDM 5123)
 - meta-analysis (HUDM 5130)
 - propensity score or regression discontinuity analysis (HUDM 5133)
 - nonparametric regression or data mining techniques (HUDM 6026)
 - item response theory methods (HUDM 6052)
 - multilevel or longitudinal regression models (HUDM 6055)
 - structural equation models (HUDM 6055)
 - principal components analysis, factor analysis, or other multivariate methods (HUDM 6122)

You may have covered other methods in your electives or in other statistics or methods courses taken elsewhere in the Columbia University system. If you are interested in applying methods from courses outside HUDM, check with your advisor to make sure they are appropriate for the project.

The best data analysis project will focus on a research question that can be investigated by applying one or more of the above methodologies. The research

question should guide the selection of an appropriate data set and the selection of the methods to use with the data.

Essential components include: an introduction, a statement outlining the goals of the analysis, a description of the data set, a description of the statistical framework used to investigate the question (including a description of assumptions and whether they were likely violated or not), a summary of results, and a conclusion.

2. **Simulation study.** A simulation study is appropriate if you are interested in either (a) investigating the relative performance of competing estimators or (b) investigating the robustness of a statistical test or family of tests under violations of assumptions.

Essential components include introduction, statement of the goals of the study, description of the data generation process, description of the statistical models being evaluated, description of the performance outcomes, summary of results, and conclusion.

3. **Critical review.** A critical review is appropriate if you are interested in investigating a research question related to statistical methodology by reviewing published results in the literature. The emphasis on *critical* here implies that you should make some effort to compare and contrast competing claims in the literature and weigh in with your own voice, based on what you find.

Essential components include: an introduction, a statement of the goals of the review, a presentation of the literature, a critical evaluation of the literature including your thoughts on where future efforts should be focused, and a conclusion.

The critical review might be especially appropriate for students planning on pursuing a doctoral degree. In that case, it could be thought of as a light literature review on a topic you are considering pursuing further in your studies.