



# Culminating Experience Project

Department of Applied Mathematics

## Goals

A Culminating Experience (CE) project is intended to have goals that are different from a traditional master's thesis. In particular, students working on a CE project are expected to fulfill any of the following three goals:

1. master an important set of mathematical or statistical methods used in industry;
2. gain experience working with a large, high dimensional, or "messy" dataset; or
3. gain exposure to some tools (e.g., SQL and database management) that aren't typically taught in the program but that are useful for future employment.

## Specifications

Your CE project should include both a **written** component and a **presentation** component. There are many ways of fulfilling these components of the CE project. The requirements are meant to be flexible so that students can use these deliverables to meet their academic and professional needs. For example, if a student is interested in a research-oriented CE project with the aim of submitting it to an academic journal, then the written component would be a paper in the format amenable to the target journal. The presentation could be a talk about the paper. Note that there is no strict page limit for the written component; generally, it should be long enough to describe the question that you are answering, the mathematical or statistical methods you use in some detail, and your results (including tables and figures when applicable).

### Written Component Example

If you are seeking some guidelines on your CE structure, here's an example that might help. If you are working toward goal (2) above, and analyzing a large or messy dataset, you might include the following sections and topics in your paper.

#### 1. Introduction/Background

Introduce your project and data. You might use the following questions to frame the introduction.

- What is the research, scientific, or business question that you seek to address?
- What relevant background information might readers need in order to understand your project? Assume that your audience is not an expert in the application field.
- Is there any prior research on your topic that might be helpful for the audience?
- From where did the data come? Is this an experiment or observational study? Who collected the data? Why was the data collected (if you weren't the one doing the collecting)? How did you obtain the data? A research lab? Government website? Web scraping?

#### 2. Methods/Results (experimental design and data collection)

Describe the methods used and why they are appropriate for addressing the research question stated in the introduction. You might use the following questions to frame this section.

- Describe your exploratory data analysis methods. What needed to be done to the dataset to make it amenable to analysis?
- What analyses are most appropriate to answer the question of interest?
- Describe the analyses used. Check your assumptions!
- Present relevant graphics and interpret results.
- Explicitly connect your technical (e.g., statistical, mathematical) results to the research question stated in the introduction.

### 3. Conclusions

Conclude your paper. You might consider the following questions.

- What are your conclusions? What uncertainties are associated with your conclusions? What did you learn?
- How would you extend this research? What future research ideas come to mind based on your results and experience with this analysis?

## Presentation Component Examples

The presentation component is also interpreted broadly. Again, the goal is to produce something that meets academic and professional needs. Students might:

1. Provide a link to a public portfolio of their CE work (e.g., Github). This would be especially helpful for students who are on the job market. Industry leaders have advised us that job applicants who publicly showcase their technical skills have an advantage in early round interviews. Be sure to include an overview and your conclusions in the folder.
2. Give a [lightning talk](#) alongside other student presenters at a CE presentation session. We plan to hold such sessions at least once every spring semester.
3. Record a short (e.g., 5-15 minute) “promotional talk” about your work, perhaps to be shared with future employers.
4. Give an in-depth talk about your project (e.g., ~30-45 min + questions/discussion).