

Introduction to Mathematical Modeling

Professor:

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OFFICE: DUKE 209

Final Project Guidelines

The final math modeling project is your chance to use what you have learned in class to model a problem that is of interest to you. The problem can be from any area of interest, including your major area of study (Chemistry, Biology, Environmental Studies, Economics, Business, Physics) or from your outside interests (Gambling, Disease Spread, Social Justice). Some students use this math modeling project as a way to get a head start on their capstone project. The projects should use discrete modeling and be sufficiently scientific. It helps to be VERY SPECIFIC about the question you hope to answer.

Here is a short list of ideas:

- Spread of invasive species.
- Future of wildlife populations or endangered species.
- Strategies for the card game Blackjack.
- Life expectancy, resource availability, or poverty in developing countries.
- Traffic flow and capacity on freeways.
- Disease spread and impacts of disease on a population.
- Impact of environmental factors or climate change on wildlife or plants.
- Park management and wildlife issues, such as moving animals between parks or migration.
- Water management, fire management, or resource availability.
- Effects of laws on environmental or social issues.
- Income, housing, education, etc inequality, coming up with new metrics for measuring inequality
- Spread of information or political ideas.

I would suggest starting TODAY by writing down a list of things that you are interested in. Then for each item on that list come up with a few issues that arise, unanswered questions, or changes that you would like to make. Think about how you can change the world! The internet is also

a great resource for brainstorming project ideas. You are welcome to be very creative as long as you create a great model that contains some interesting mathematics. Topics that have a lot of uncertainty (eg. modeling aspects of human behavior) or are based completely on statistics (eg. sports stats) are really difficult to do well in the context of this class. You must go beyond data analysis to model a question that otherwise would go unanswered.

Once you have a few ideas it is worth a trip to the library or a visit with one of your professors to get an idea of how doable your project is. Is there data available or can you collect the data? Have others done a similar model that you can add to or improve? Make sure you have a concrete question that you are trying to answer!

Mid-Semester Check In

You will submit two documents: Draft Proposal and Final Proposal and Assumptions, during the semester. You will also schedule an individual meeting with Joanna to go over the progress you have made prior to Thanksgiving Break. (100 points)

Poster Session

You will create a professional poster that describes your model, your assumptions, any data that you collected, and your results. The poster should include enough explanation of your model so that your colleagues/classmates can look at your poster and get the general idea for what you did in your model. You should also be prepared to answer questions about your model. (100 points)

Final Report

This is the final write-up describing your model and assumptions. It will be graded similar to your group projects and you should use the project check list as a guide. Your final model will also be evaluated according to the difficulty of the model, the originality of the project, the appropriateness of the model chosen, conclusions drawn from the model, and the quality of your writing. Make sure to reference any books or articles that you use, as well as the source for any data, in a bibliography.(400 points)

More info and example projects can be found at our course website:

MathematicalModeling.JoannaBieri.com