CMSE 201 - Semester Project

As part of your semester in CMSE 201, you are expected to complete a fully-fledged data analysis or computational modeling project. This is your opportunity to choose a topic that sounds interesting to you and dig into it.

At the end of the semester you'll submit your work as a Jupyter Notebook and you'll present your findings to the rest of the class.

Choosing your project

You have the freedom to choose from any of the techniques that we have covered and will be covering in class. These techniques include, but are not limited to:

- Data Science: analyzing and modeling data
- Modeling with ordinary differential equations
- Modeling with compartmental models
- Modeling with agent-based models
- Modeling with random numbers

Furthermore, you can also choose nearly any topic that you find interesting or exciting. Possible areas of interest may be:

- Physical Systems: modeling problems in physics, chemistry, ecology, biology, etc.
- Social Science: modeling people and their interactions
- Finance, Banking, and Economics
- Diseases: modeling the tissue scale or the person scale

No matter what you choose, the main goal is to define a question that you think you can answer using the techniques we're learning in class and not just a question that you can look up the answer for on the internet.

Project requirements

Your project must include all of the following components:

- You must have a question. (hopefully an answerable one!)
- You must have a model, expressed in broad mathematical terms, that can be applied to your chosen data or chosen topic.

- You must use computing to "solve" the model. (This will vary from project to project, depending on the context).
- You must include at least one advanced visualization method (e.g. contour plot, surface plot, 3D plot, imshow, etc.)
- You must use at least one form of data manipulation. (e.g. Pandas dataframes, NumPy arrays, etc.)
- You must provide an answer to the question.

Locating data and models

You'll need to spend some time figuring out what model is the right model to use or what data are available to answer your question. The internet is your friend for this part. You should be able to find the details you need to compute your model or the data you want to analyze on the web. These are possible resources for locating data:

- Data.gov - Federal
- Data.gov - State of Michigan
- Kaggle
- Data.world
- Fivethirtyeight

You may also which to explore some of the resources listed on this page: https://www.dataquest.io/blog/free-datasets-for-projects/

For the models, you'll need to do a bit of background research and determine which of the models we're working with in class are the most appropriate for your question.

VERY IMPORTANT NOTE: When you're finding datasets online you should make sure to record exactly where you found the dataset and cite the source in your final project notebook. Additionally, if you use any code that you find online to complete part of your project you *must* give credit to the original source code and cite this in your project as well. Any code you use that is found online and not properly cited will be considered plagiarism and violates the academic integrity expected of you in this course.

Project Timeline

The following is a tentative plan for the timeline we'll be following to ensure that you successfully complete your assignment. There may end up being slight shifts in these days based on our progress through the course material.

- October 21/22: Project brainstorming in pre-class assignment for this class period.

For this component, you are expected to brainstorm two possible topics for a modeling-focused project and two possible topics for a data-focused project. See the pre-class assignment for details.

- October 30/31: Project Proposals due before start of class.

For this component, you are expected to write up what you think you want to do for your semester project. This should address the question you hope to answer and the data/models you plan to use. You may be asked to present your project proposal to your classmates.

- November 13/14: Project Updates due before the start of class.

You will be expected to update the instructors on the state of your project. Again, you may be asked to present your progress to your classmates.

- December 2/3 and December 4/5: Project Presentations in class on these days.

We'll spend the end of the semester having everyone present the outcomes of their projects. The requirements for the presentation will come out later in the semester.