Math 329 Final Projects Fall 2014

1 Pre-proposals– Friday Nov. 14, 2014

Pre-proposals consist of an email with one or two paragraphs describing what you want to do for your project. You should explain the topic sufficiently for me to understand what you will be modeling. Then state the aspect(s) of the topic you wish to explain or explore using numerical techniques.
You should discuss what you have found for background reading. Ideally, you will have a source/citation to a model for this topic with equations. Not all projects need to have a model from a published source, but most do. If you don't have a source, explain what you have done to find one and/or how you will come up with your model.
The content of these pre-proposals will not be graded, as they are intended to start a conversation between us about the topic. A small portion of the final project grade will reflect that the pre-proposal was completed on time.

2 Proposals– Friday Nov. 21, 2014

Project proposals should include a description of the problem you wish to solve; think of it as an introduction to the final paper. Start with a description of the background of the problem and what aspects of the simulation/solution are of interest. It is not enough to simulate a system. You should have an idea of what features of the system you wish to investigate. You should also include a description of the type of model to be used (ODEs, PDEs, linear algebraic equations, etc) and speculation on what class of numerical methods will be involved. A detailed description of the equations forming the model should be included.
I envision these proposals being two to three pages typewritten (double spaced, reasonable font size) with additional equations or pictures as needed.

3 Programs– Friday Dec. 5, 2014

You should have the program written to simulate your system by December 3. This means that you have run it for a few different cases and the results look reasonable. You should be able to do the rest of the project without any programming. The programs should be in shape to hand off to someone else. Hand in a zip file including all files and a REAME.txt file. The README.txt file should include a description of how to run the programs, how they fit together, and how to make common changes... Essentially, make this a brief manual for someone else on how to use these tools.

4 Poster Report– Wednesday Dec. 10, 2014

You should put together a poster to display the results of your project. This is a common format for presenting results at a conference. We will talk more about how to put together a poster. It is essentially a large one-slide powerpoint presentation. The content should consist primarily of figures representing your results. The figures can be plots, tables or diagrams. There should also be a brief introduction/abstract and a conclusion and citations.

5 Final Report– Friday Dec. 12, 2014

The final report should start with a description of the problem, and what you wish to investigate. There should be a section introducing the problem including model description. There should be a section describing the numerical methods used and possible competing methods that were not used. There should be a section exploring the error in the numerical methods. There should be a section presenting your results without interpretation. The final section should discuss those results, their implications, and what further work might be done.

6 Example Project Ideas

This year a project modeling the spread of Ebola might be especially timely. See me if you are interested.
Here are some ideas for what to look at with your model. You should NOT be creating these models. If possible use models that are already formulated.

- Simulate a model to compare with an experiment
- Classify how solutions change as parameters change
- Look for an optimal solution defined in some way
- Show the impact of some intervention to the system

Project topics from previous years:

- Traffic flow model–on ramp traffic lights
- Disease spread models–interventions
- Solar system (n-body problem)–is earth orbit stable?
- Bifurcations of Lorenz Equations leading to chaos
- Pattern Formation–tiger stripes, leopard spots
- Fluid flow–best wing shape for lift; how to curve a baseball
- Population models–species invasion
- Macroeconomic growth models–effect of fiscal stimulus