EE126 Fall 2015 Project Guidelines

October 10, 2015

This semester you will be able to choose between two different open-ended project choices, both of which were introduced to you in Lab 5:

1 PageRank

Now that you guys understand the fundamental idea that led to the success of the PageRank algorithm, it's time to see how else you can apply this strategy to do something other than rank web pages on the Internet. In part 1 of Lab 5, we used PageRank to "rank" Berkeley EECS professors (admittedly, the rankings were rather poor). In discussion this week, you saw many examples of projects from last year. With these examples in mind, come up with a *new* application for either PageRank or perhaps a modified/tweaked/more robust version of something like PageRank. It can build on the mini-application you did in Lab 5. Be creative, be ambitious!

2 Stochastic Optimization

The real world is a very uncertain place. There are many day-to-day situations that can be framed as an optimization problem under uncertainty. For example, airlines have numerous flights every day. They want to ensure that they do not fly with too few passengers; this will cost the airline a tremendous amount of money! But at the same time they do not want to over-book their flights too much and anger their passengers. Additionally, flight times can be random and the airline needs to make sure passengers don't wait for too long and that they don't have too many flights arriving and departing at the same time! Problems such as this are abundant in the world around us, and stochastic optimization methods give us a setting to reason about such problems. In part 2 of Lab 5, we applied stochastic optimization in the setting of hospital scheduling by creating a mathematical model for "patient happiness" and then modeling this problem as a stochastic optimization problem. If you decide to pursue this project theme, you will be able to create your own stochastic optimization model to solve a problem you think could benefit from such a model. (For the brave, we outlined another option within the lab which is a model that arises very often. If you would like to pursue this problem, please send an email to the staff; it is quite hard).

3 Logistics

- You will be working in groups of 2 or 3.
- You will have two weeks to complete your project.
- You are not required to use Python/iPython.
- Only one of you will be submitting the project.

3.1 Deadlines

- **Thursday 10/15:** You will be required to submit a project proposal including the names of everyone in your group and which project theme you will be pursuing. If you are doing PageRank, you will need to specify what your idea is and how you will be using the algorithm (e.g. what "dataset" will you be exploring/analyzing). Please be specific about what the motivation is behind your idea and why you would like to study it. If you are doing stochastic optimization, you will need to specify the use case and a first draft of a mathematical model. No code will be required.
- **Thursday 10/22:** You will be required to submit your entire project by 9am. Your submission should include the following in a zip file:

  1. readme.txt - Include the full names of each team member. Below that, write how we can run your code to reproduce your results.
  2. report.pdf - Summarize your project in a 2 page report (preferably in LaTeX). An example structure to the report may include the following sections: introduction, methods (explain the theory and give pseudocode for your algorithm), experiments, results/analysis (with figures), and discussion/limitations.
  3. src - folder that includes all code you wrote / used. Be sure to cite any code you pulled off from the web with comments.

3.2 Grading

This project is worth 5 percent of your overall final grade in the class. The first check-off will be worth 5 points and the second will be worth 10. For the check-off, the 5 points will be awarded based on proposal detail and clarity. For the final check-off, for PageRank, a score of 8 out of 10 reflects a good understanding of the algorithm and a well-done implementation. For stochastic optimization, a score of 8 out of 10 represents a correct mathematical representation of a model of your creation and an implementation of a solver for this model. This project is very open-ended and you can take it as far as you would like. Creativity and interesting results count — these aspects will distinguish scores of 8 out of 10 from perfect scores. In addition, there will be bonus points awarded to the top three overall teams as follows:

1. +3% to *overall* grade
2. +2% to *overall* grade
3. +1% to *overall* grade

*First and second place will be awarded to *different* project options, so strategize accordingly.

Please feel free to come to office hours and homework party to discuss the project. Kangwook is especially happy to help with choosing a project topic during his Monday office hours.

Most importantly: Have fun! You should learn a lot no matter what you do! :)