Rutgers, The State University Of New Jersey
Department of Electrical and Computer Engineering

332:541 **Stochastic Signals and Systems** Fall 2008

Course Project Information

As noted on the first day of class, this course will have a short project. The goal of the project is to apply the material of the course to problems or physical systems more complicated than the typical homework problem. It is expected that the project ought to consume roughly two weeks of moderately concentrated effort. You should plan on forming teams of 2-3 students. The project output must be proportional to the number of students.

A starting point for a fairly straightforward project would be to solve variations on one of the more complicated Markov chain problems (12.11.6 – 12.11.8, but not 12.11.5 or 12.11.9) in the text. A more interesting project would involve modeling and simulation of physical phenomena. This would involve literature search for recognized models, in addition to analysis and/or simulation of these models. A good project might ask a simple question for which a simple stochastic model might provide a instructive answer. Some possible topics for such a project might include

- Evaluation of tournament formats. For example, Tiger Woods won five straight "open" tournaments this year but his streak was broken in a "match play" tournament. Does match play make it more difficult to win for an exceptional player like Tiger? Another format often used, such as in the World Cup, is the preliminary round-robin followed by elimination rounds. Does this favor certain types of competitors?
- What is the validity of the RPI (Ratings Percentage Index) for seeding NCAA tournament teams?
- Prediction markets, which permit betting on random events such as horse races and sports matches have emerged. What is the mathematical basis, if any, for their perceived efficiency?
- Automobile traffic on crowded highways. Is it better to leave a large (several car) gaps between your car and the car in front of you?
- How many lifts does a ski area need? Does it depend on whether the lifts are regular-speed or high-speed lifts? Are two lifts of length L better or worse than a single lift of length $2L$?
- Is there an optimal size of sports stadiums? Why do new football and baseball stadiums generally seat fewer people than the stadums built 20-30 years ago?

Some other topics suggested earlier include

- Data traffic in wireless LANs, LANs, or wide area networks
- Fluctuations of prices in the stock or bond market.
- Stochastic models for weather, such as variations in space or time of temperature or precipitation
- Models for multiuser communication
- Evaluation of strategies for games of chance or competitive board games.
- Evaluation of betting strategies for football pools.

Of course, creative topics of your own choosing are encouraged.

The project schedule should follow

- October 1: Submission of one page project description
- October 29: Submission of a preliminary progress report
- December 8-10: In-class project presentations and submission of final report.