Applied Math 9

Possible Projects

- **Hidden Markov models and speech recognition.** Review the use of Hidden Markov models in modeling speech. What are hidden Markov models, how do they differ from Markov models? Investigate and report back on how they are used in speech recognition. Perhaps investigate the use of statistical methods (maximum likelihood, etc.) in speech to estimate the words that are spoken based on data.

- **Long range dependence in nature.** Markov processes have what is called short range dependence. Much controversy has been raised in recent years over claims that data observed in nature possesses long range dependence. Investigate some of the situations where long range effects are claimed (e.g., Nile river data), and mathematical models that have long range effects.

- **Dynamic programming.** Model a dynamic optimization problem, and construct a solution by dynamic programming. Examples include tic-tac-toe (a dynamic game) and optimal packing problems (a dynamic optimization problem).

- **Population dynamics.** Investigate some of the elementary models, deterministic and stochastic, used for population dynamics. For the stochastic models, investigate questions like, "is the population ever extinct?" Does it grow without bound? Confirm via simulation.