**CS225 Semester Project Sample Topics**

Students in previous semesters have suggested that providing sample topics would be helpful. Here a few potential topics for your use with reasons as to why they have interest. You are not limited to these topics.

Elevator Study – As it turns out, elevator design is crucial to the design of tall buildings. In this project, the student designs and codes a simulation of a building and its elevators. The building does not need to be represented graphically; in fact doing so would be a waste of time. This is a statistical analysis to determine average and worse case wait times.

The user of the simulation should be able to designate the number of floors in the building, numbers of elevators, and which elevators service which floors. The user may also specify some profile of elevator riders. This profile may specify elevator rider arrival rates for each floor, with some distribution of destination, and perhaps different distributions for different times of day. The user should also specify several sets of rules for the elevators to follow. During the simulation the program determines average and maximum wait times for each rule set. The result of the experiment is a list of “best use” policies in terms of number of elevators and elevator rule sets for specific building designs.

Traffic Study – Relatively simple traffic simulators can produce some fairly sophisticated results. One simple traffic study could consist of a long stretch of highway, populated with virtual cars and trucks, and virtual drivers having various driving styles. How dense can the traffic be and still keep moving smoothly? Under what circumstances does the act of one person putting on their brakes bring everyone to a crawl? A more complex traffic model can incorporate intersections and traffic lights and traffic patterns. For example, what might the effect of a parking garage be on ERAU traffic?

Queuing Model – A queuing model explores how queues (lines) form as services are provided to customers. For example, a banking model may have characteristic customer arrival rates and a range of customer service times. The simulation can then estimate the average and maximum wait times that customers experience when there is one teller available, or two tellers, or three and so on. The simulation can then try to balance reasonable service times with reasonable staffing costs.

Fuzzy Cognitive Maps – A Fuzzy Cognitive Map (FCM) is a math model of complicated systems. Each part of the system is represented by a *node* and are connected to other parts of the system that they affect with an *edge*. For example, an ecosystem can be represented by a FCM that has predators, prey animals, and vegetation. This can be used to study how changes in predator or prey populations affect the other parts of the system. This system has feedback, in that an increase in predators leads to a decrease in prey, which leads to a decrease in predators, which leads to an increase in prey, and so on. I can provide literature on FCM modeling if you choose to use this for your project.

Particle Physics Simulator – This project allows a user to populate two-dimensional field with point masses, each having electric, magnetic, and gravitational forces. The simulation shows how the particles interact.

Opera Problem (or other agent-based models) – The Opera Problem is a well-studied problem in which a group of simulated agents (humans, robots, zombies) are required to traverse from one room to another through a doorway. The problem is studied as a proxy for any situation where multiple independent processes must share a resource. The rules for movement, collision, avoidance, and so on affect how efficiently the agents are able to move from one room to another. The trick is to find (or have the computer develop) the most efficient rule set.

Genetic Algorithm – Genetic algorithms are a machine learning technique in which solutions to a problem are visualized as a genome. An initial population of genomes is created randomly and evaluated. The best genomes are used to create another generation of possible solutions. This process is repeated until an acceptable genome (solution) is obtained. Genetic algorithms are suitable for a class project if they are confined to fairly simple problems.

Othello/Reversi Player – The game of Othello, or Reversi, is played on an 8X8 grid with pieces that are one color on one side, and another color on the other side. When a player plays a piece, every piece of the opponent’s color that is between a previously played friendly piece and the new piece is flipped to the player’s color. A player must put a piece on the board in such a way as to flip at least one opponent piece if possible, and otherwise cannot play. When the board is filled or no legal moves remain, the player with the most pieces with their color wins.

Topics From Previous Semesters Include:

* Frogger Game (just like the classic arcade game)
* Maze Game (with monsters, traps)
* Pokemon deck creator (assists with making optimum deck)
* Inventory System (medical kits, refrigerator, small business)
* Target shooting gallery
* Chess game (piece movement only, no intelligence)
* Blackjack game (one variant investigating strategies)
* MP3 player (with libraries and shuffle capability)