

**ME 575**  
**Project 2: Genetic Algorithm Project**  
**Due: Tuesday April 10, 11:50 p.m.**

Description

For this project, you are to implement a real-value based genetic algorithm, which you develop, on a problem of your choice, which you should also develop. Please note,

- You should choose a problem that has at least six variables, at least two of which must be discrete. More is better.
- The problem can be constrained or unconstrained. It does not have to be an engineering problem.
- The problem can have one objective or two objectives.
- You should implement a value based algorithm (see Chap. 6 of your notes). This means, among other things, that you will consider crossover, mutation, etc. for each variable.
- You should determine an appropriate set of parameters (generation size, crossover probability, etc.) as well as select a scheme for crossover, choosing parents, etc.
- The primary objective of this project is to gain experience with genetic algorithms. Genetic algorithms are quite robust and will often make progress even if not particularly well implemented. I would like to be impressed, however, that you have a *good* genetic algorithm. I will be concerned if anything about the algorithm seems extreme, e.g. a mutation rate of 90%, a crossover probability of 10% or a tournament size equal to half the population size. If, for some reason, your algorithm works better with a low crossover rate, then you should explore why. It may be that a different kind of crossover should be used.
- You can use any programming language you wish. MATLAB is preferred. Please use good programming practices.

Report

For the report, you should discuss the problem, your implementation of the genetic algorithm, the solution, and any experimenting you did to determine optimal parameters. You should impress me with a complete and concise report. The basic format should be Summary, Procedure, Results, Discussion of Results, Appendix. You will need a complete discussion of the model and of your algorithm, since you are developing both. The key elements (which should be discussed) of a genetic algorithm are design representation, fitness selection and pressure, inheritance and diversity. Graphs showing the progress of the algorithm from generation to generation should be included. Include a listing of your code in the Appendix. Turn in through Learning Suite as a pdf or doc file.

PowerPoint Slides

As part of your report, prepare a few (i.e. half a dozen) PowerPoint slides that discuss the problem, the model, the algorithm, the design variables, the objective, and the results. Compare the beginning and the final designs. Show the fitness as a function of generation. Be prepared to give a 5-10 minute presentation in class. Turn in through Learning Suite as a separate (PowerPoint) file.

The difficulty of the project will be considered when giving a grade. However, it is better to choose a project you can thoroughly explore rather than choose something so large and/or difficult that you don't complete the optimization. Sometimes you can define a simpler problem to start with and, once you have a working algorithm, make it more complex or explore variations of it.

You may work on projects in groups of up to three if you wish.

The biggest problem people have with the project is waiting to begin until it is too late. **Start now!** Remember that software projects always take longer than you think.

Late projects will be penalized 5% per day late.

Projects from a previous semester:

Disneyland ride scheduling  
Touring baseball parks for the shortest route to watch a home game  
Age of Empires optimization  
Metallic glass matrix optimization  
NBA team selection  
Optimization of Provo's street re-pavement plan  
Playing Ticket to Ride  
NFL team optimization  
Optimizing a traffic control system  
Optimal path to cure a pandemic  
Genetic algorithm-based protein structure prediction  
UAV Camera position optimization  
Optimal allocation of political campaign funds  
Optimizing temple site and size selection  
Optimization, Runes and League of Legends  
Genetic algorithm design of a fireworks display  
Building a fantasy basketball team