**CS 361 Algorithms – Final Project**

**Background:**

Many problems of practical significance are NP-complete, yet they are too important to abandon merely because we don’t know how to find an optimal solution in polynomial time. One technique to tackle NP-complete problems is to find a near-optimal solution in polynomial time. In practice, near-optimality is often good enough. We call an algorithm that returns near-optimal solutions an approximation algorithm. This project is to investigate an NP-complete problem with an associated approximation algorithm of your choosing.

**Process:**

Step 1: Choose an NP-complete problem with associated an approximation algorithm. There are some examples in your book, and you can find many more with a simple google search.

Step 2: Research your topic. You must use at least three resources and answer the following questions:

* What is your NP-complete problem? Give specific examples.
* How do we know your problem is NP-complete? Did someone prove it?
* Why is your problem important? How does your problem arise in the real world?
* What is an approximation algorithm? How does it work and who invented it?
* Why is the algorithm good enough? Do we know how far off it can be from the optimal solution?
* What is the run-time complexity of your approximation algorithm? How do you know?

Step 3: Design code for an approximation algorithm for your NP-complete problem. It can be based off the well-known approximation algorithms, or you can create your own. You should thoroughly test your algorithm and analyze your results. This analysis should include discussion of the near-optimality of your answers as well as a run-time analysis.

Step 4: Write up your entire process in a lab report. This paper should explain your entire process and answer all the questions above. It should also include your thoroughly-commented code and the analysis of your results.

**Logistics:**

This project should be completed in a group of two or three. You will get in-class time to work on the project during week 9. The lab report is due on **Friday, March 23rd at 10:00 am**, and will be handed in on Moodle. The grading rubric is on Moodle, and this will be part of your final exam grade.