CSCE A405 Assignment 2

**Due Date: Thursday, October 3, 2019, at 11:59 PM**

Purpose: The goal of this assignment is to gain an understanding of iterative improvement algorithms commonly used to find optimal solutions in a wide variety of problem domains.

Background: A list of the 30 companies that comprise the Dow-Jones Industrial Average (DJIA) and a summary of their recent market performance are available from

<https://money.cnn.com/data/dow30/>

By clicking on each stock symbol, you can find data that show the opening and closing prices of that stock over a selected time frame (e.g., 5 days or 1 month).

Problem: A Trust Fund Baby (TFB) walks into a bar and the bartender says, “How are your stock market investments going?” The TFB replies, “Dude, I really picked a bad investment mix. I wish someone could show me how I could have made more money!” The bartender asks, “How’d you invest your money?” “I didn’t want to put any effort into it,” the TFB replied, “so I just picked 10 random companies from the DJIA, and invested an equal amount into each company.” The bartender says, “Well, I’m no Computer Scientist, but I do know that students in the CSCE A405 class at UAA could write an artificially intelligent program that would show you a mix that could have made a much bigger return!”

Requirements: First, your program should prompt the TFB to select 10 companies from the DJIA, and use data from the above web site to calculate the amount of TFB earnings over a 30-day period for that particular mix. Next, your program should use each the following techniques improve the TFB’s investment return:

1. Hill-Climbing with Random Restart (R&N pp. 122-5)
2. Simulated Annealing (R&N p. 125)

For both HCRR and SA, use the TFB-specified investment mix as the start state. Assume the moveset consists of reducing the investment in one company by 10%, and investing the resulting cash into one of the other stocks in the TFB portfolio. For example, assume that the current investment mix has $11000 in IBM and $9600 in HD (Home Depot) stock; one move might take $1100 from IBM and move it to HD, thus changing the investment in these two stocks to $9900 and $10700, respectively.

For the purposes of this assignment, assume that the amount a particular stock earns over a 30-day investment period is calculated by multiplying the dollar amount invested in each company by the percentage gain (or loss) for that company during the period. The fitness of a particular investment mix is thus the sum of the monetary gains or losses over all stocks in that mix. The best investment mix over the 30-day period maximizes profit. (We are ignoring other factors, such as dividend payments, brokers’ fees, etc.)

Test each program (HCRR and SA) for five different TFB-specified investment mixes, and note relative differences in performance between TFB, HCRR, and SA.

Submit the following items via Blackboard (or, if necessary, as a compressed, zipped folder attached to an email):

1. Your *source code file(s)*.
2. A *report* describing each of the following items:
3. A brief description of *how* you adapted the generic hill-climbing with random restart and simulated annealing algorithms to solve the TFB.
4. A summary (including your tabulated results), comparison, and contrast of the aggregate observed performance of each algorithm over all 10 test runs.

I will test your program interactively, read your report, and send your grade with appropriate comments via electronic mail. As with Assignment 1, your program should be written in a high-level language such as Python, Java, C/C++, C#, or Visual Basic. Depending upon which version of which language you use, I may ask you to demonstrate your program on a laptop or laboratory computer.

*Work in teams of one to three students on both the program and the report*. Clearly identify the name and preferred email address of each team member at the top of your report. Do not copy any part of the code, test results, or report written by another group. Code downloaded from the Internet, copied from a journal, or obtained from an external source may be used as part of your solution if and only if you give explicit credit to the original author(s) in your report. Since this project requires data collection, I strongly suggest getting an early start!