DSA/ISE 5113 Advanced Analytics and Metaheuristics Homework #5

April 19, 2020

Rachel Bennett

Question 1: Simulated Annealing

- The starting temperature was found by using the current best solution value found (15218.80, from Random Restart). This was compared with the initial temperature, which in this case had a very negative value due to penalization of solutions over the weigh limit.The initial temperature was adjusted until a 0.99 probability of acceptance was found(in this case, $T_0 = 10,000,000,00$).
- The temperature cooling schedule was fairly basic, with each round of cooling updating like so:

  $$T = \alpha * T$$

  Each temperature was held for a static 10 iterations before being cooled to a lower one.
- The search proceeded until the temperature was below 1.

Question 2: Variable Neighborhood Search

Variable Neighborhood Search had far and away the best results, with a final value of 19310.70. The neighborhoods used were the 1, 2, and 3 flip neighborhoods, and the local search procedure implemented was Variable Neighborhood Descent. In order for the program to reach a solution in a reasonable amount of time, the local search was limited to run for only 1 minute per search.

Question 3: Tabu Search

Question 4: Guided Local Search

Guided local search was set with a dynamic lambda that updated with a given neighborhood's minimum, and tuned with an alpha of 1. The stopping

criterion was 10000 iterations. This search procedure ran very well, giving a final objective value of 17784.6

Results

Algorithm	Iterations	# Items Selected	Weight	Objective
Local Search (Best Improvement)	7050	28	1499.6	14170.60
Local Search (First Improvement)	3055	16	1497.1	6391.79
Local Search (Random Restarts)	71400	31	1494.6	15218.80
Local Search (Random Walk)	6635	19	1495.1	7801.60
Local Beam Search	12600	26	1499.3	11866.50
Simulated Annealing	309300	25	1495.1	14766.40
Variable Neighborhood Search	307280	31	1494.4	19310.70
Tabu Search				place
Guided Local Search	10050	31	1493.2	17784.60