Optimization Methods
Lab 5 Session

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Task1

Cooling Schedules:

Constant-high-temperature: 10000.0

Constant-low-temperature: 1.0

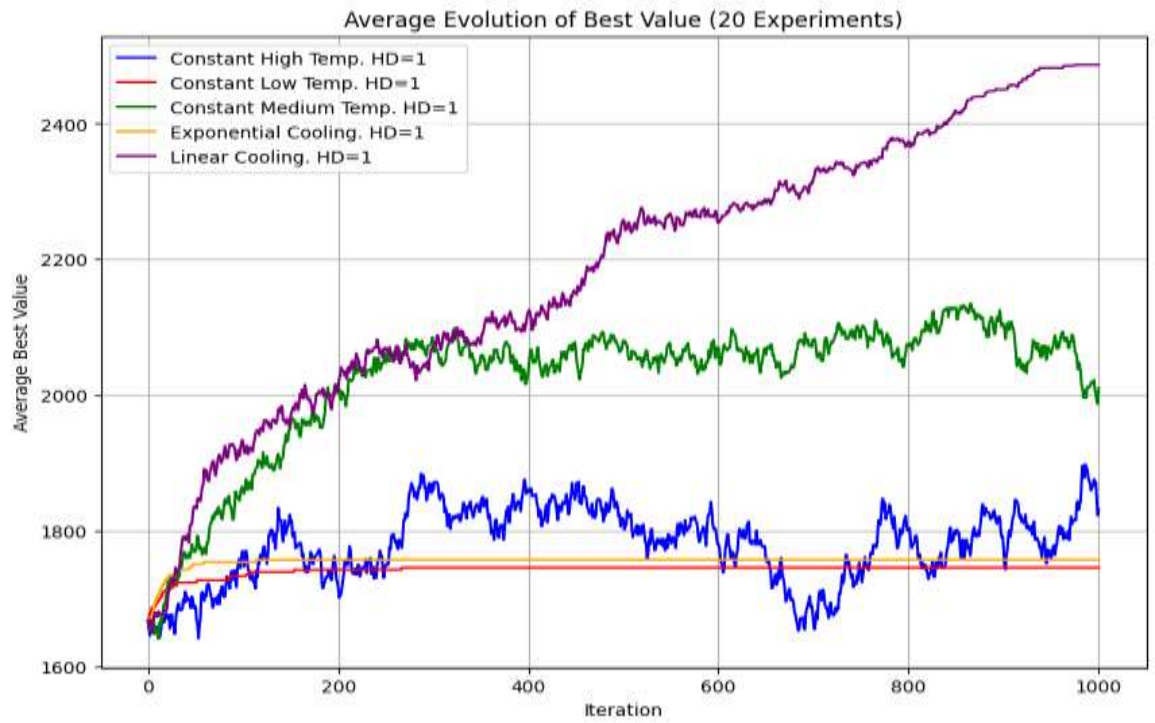
Constant-medium-temperature: 100.0

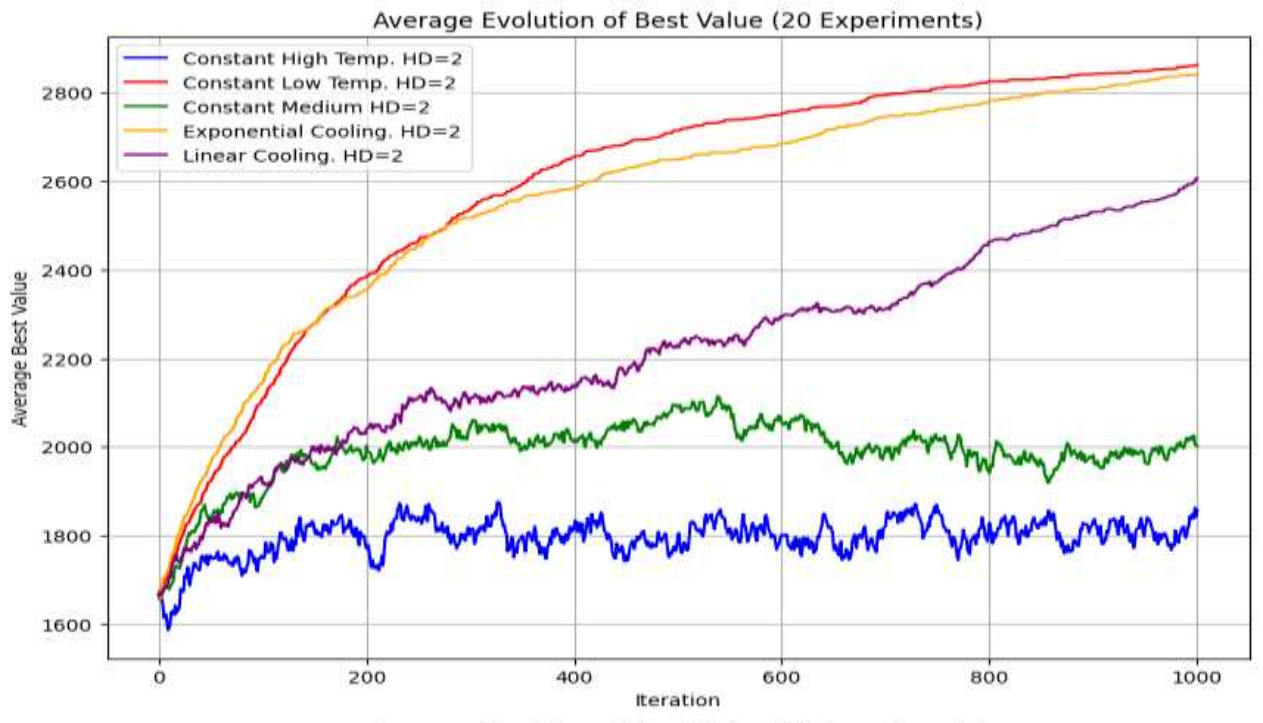
Linear-cooling: decrease linearly with initial value 100.0

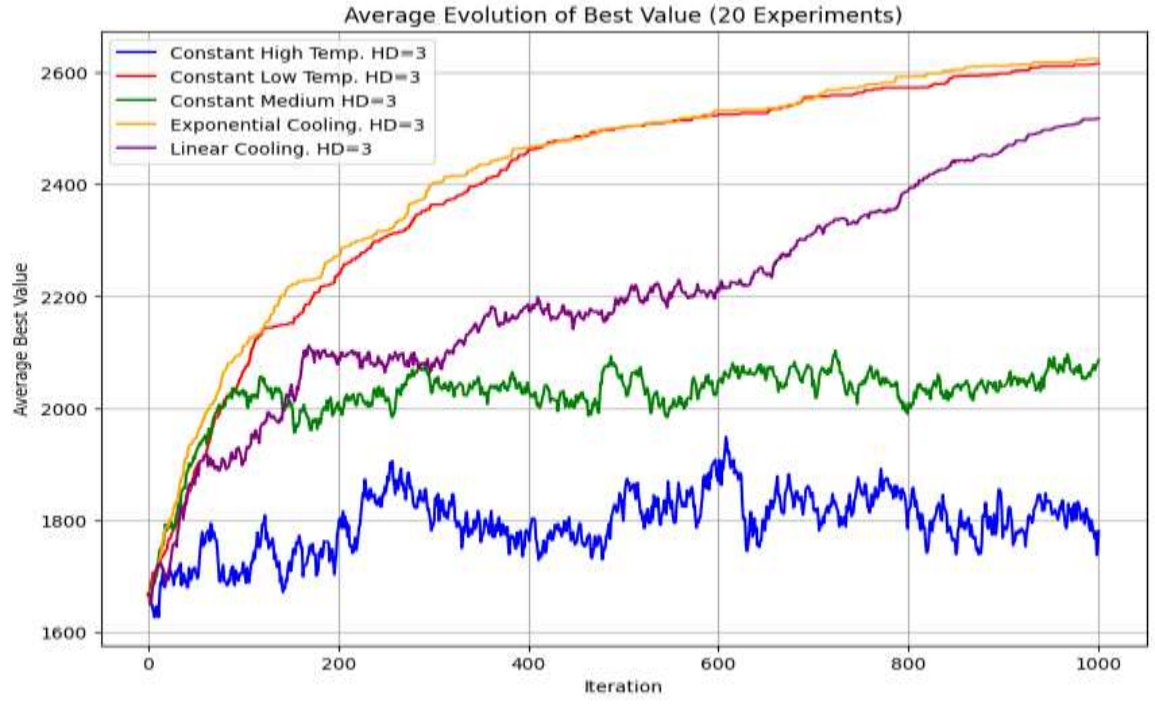
Exponential-cooling: decrease exponentially with initial value 100.0

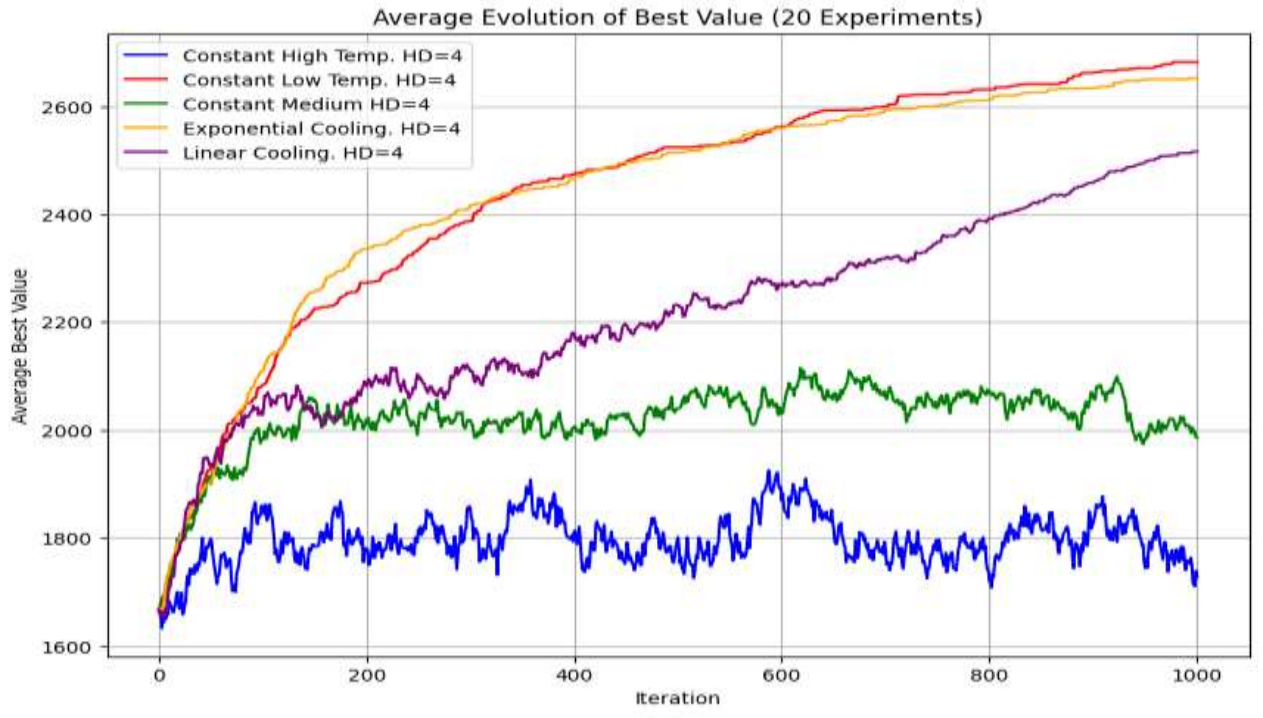
Experiment process

- To start with, read all related data from excel files. And we choose the first k items as what the ppt said. We find that k is 38, which means the initial solution contains the first 38 items.
- Then start SA process. As for generating new solution in each iteration, we use Hamming distance from 1 to 4 respectively. The result of simulated annealing has randomness, so we conducted 20 parallel averages for a round of experiments as the final result to avoid the influence of randomness on the result.
- At last, we draw the result figures and divided them into 4 parts according to their Hamming distance.


Average Evolution of Best Value (20 Experiments)
Constant High Temp. HD=1
Constant Low Temp. HD=1
Constant Medium Temp. HD=1
Exponential Cooling. HD=1
Linear Cooling. HD=1
Average Best Value
Iteration


Average Evolution of Best Value (20 Experiments)
Constant High Temp. HD=2
Constant Low Temp. HD=2
Constant Medium HD=2
Exponential Cooling. HD=2
Linear Cooling. HD=2
Average Best Value
Iteration


Average Evolution of Best Value (20 Experiments)
Constant High Temp. HD=3
Constant Low Temp. HD=3
Constant Medium HD=3
Exponential Cooling. HD=3
Linear Cooling. HD=3
Average Best Value
Iteration


Average Evolution of Best Value (20 Experiments)
Constant High Temp. HD=4
Constant Low Temp. HD=4
Constant Medium HD=4
Exponential Cooling. HD=4
Linear Cooling. HD=4
Average Best Value
Iteration

Interpretation of result

- When Hamming distance is 1, we can find that constant low temperature and exponential decrease case perform bad. This is because 1 HD for this problem with fixed initial solution always can’t generate a legal and better solution by only change 1 position. While exp-decrease is a little bit better than fixed low temperature, because initial temperature of decrease is higher which can more easily get out of local optimal solution.
- At the same time, we can find that the result with constant high temperature is always oscillating since it is similar with random search.
- When Hamming distance is larger that 2, we can see that constant low and exponential decrease temperature always lead to good results.