GIIE Course: 546U4030 SOFT COMPUTING METHODS AND APPLICATIONS

Brutal Force Method for Assignment Problems (2020)

Solve a Job Assignment (or Assembly Sequencing, or TSP problem) problem by using brutal force method to enumerate all possible solutions and compute their objective values. Report the best solution and objective value.

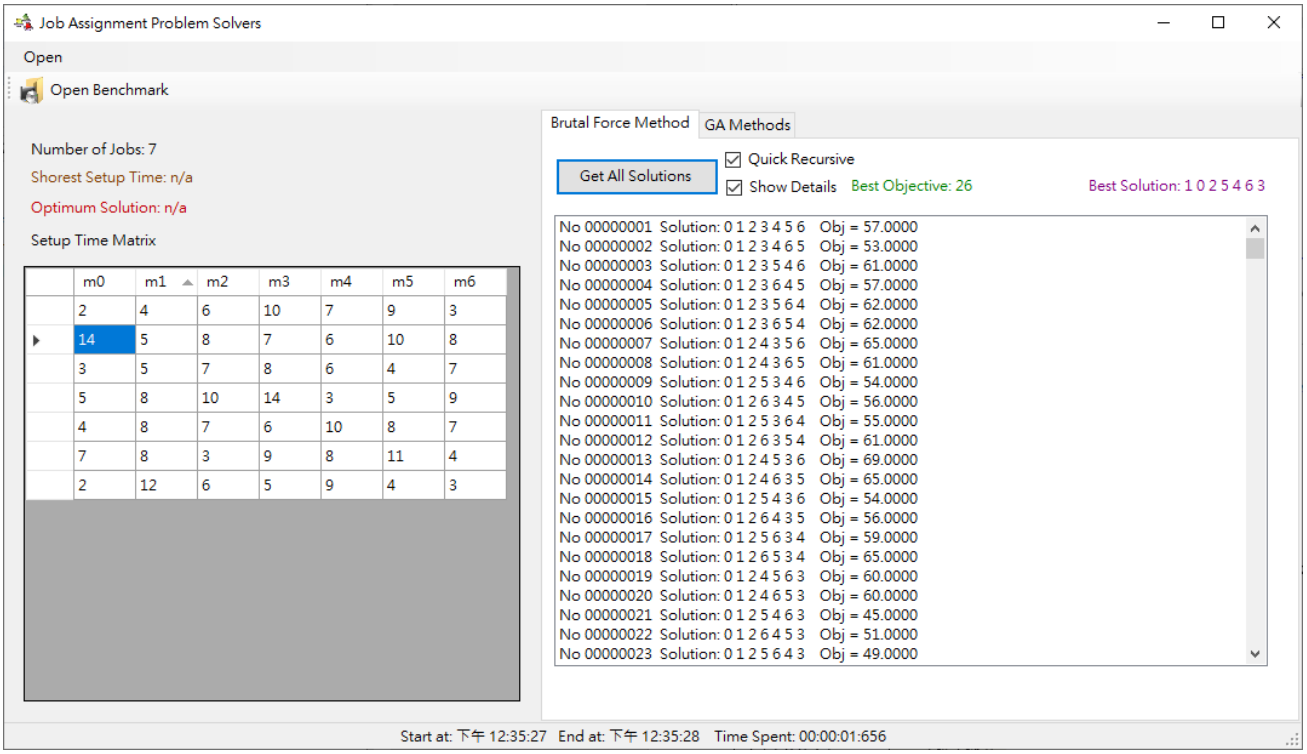
1. Read the input files from a text file with the format given at the end of this document.
2. Loop through each possible assignment, evaluated its setup time, and display the content of the assignment on the UI.
3. Recursive function is required in your code to systematically constitute all compositions of the jobs in difference sequences.
4. In addition, report the best solution and the minimal setup time.

Job Assignment Problem:

A company has *n* machines and *n* jobs to be processed. Each job must be assigned with exactly one machine to process the job. The setup time for a machine to process a job is dependent on the job and the machine. Assume that $\mathbf{C} = \lfloor C_{i,j} \rfloor$, $C_{i,j}$ is the setup time of machine *j* to process job *i*. The company wants to minimize the total setup time. Let a solution $\mathbf{x} = [x_0, x_1, \cdots, x_{n-1}], x_j \in \{0,1,\cdots,n-1\} \wedge x_j \neq x_{j'}$ such that job x_j is assigned to machine *j*. Therefore, the total setup time of the given solution $\mathbf{x}$ is $\mathrm{T} = \sum_{j=0}^{n-1} C_{x_j,j}$, which is to be minimized.

The benchmarks of job assignment problems are defined files with file extension “aop”. Sample file:

7	*n*
14 5 8 7 6 10 8	c_{00}~$c_{0(n-1)}$
2 12 6 5 9 4 3	c_{10}~$c_{1(n-1)}$
7 8 3 9 8 11 4	c_{20}~$c_{2(n-1)}$
2 4 6 10 7 9 3	c_{30}~$c_{3(n-1)}$
5 8 10 14 3 5 9	c_{40}~$c_{4(n-1)}$
4 8 7 6 10 8 7	c_{50}~$c_{5(n-1)}$
3 5 7 8 6 4 7	c_{60}~$c_{6(n-1)}$


Job Assignment Problem Solvers
Open
Open Benchmark
Number of Jobs: 7
Shorest Setup Time: n/a
Optimum Solution: n/a
Setup Time Matrix
m0 m1 m2 m3 m4 m5 m6
2 4 6 10 7 9 3
14 5 8 7 6 10 8
3 5 7 8 6 4 7
5 8 10 14 3 5 9
4 8 7 6 10 8 7
7 8 3 9 8 11 4
2 12 6 5 9 4 3
Brutal Force Method
GA Methods
Get All Solutions
Quick Recursive
Show Details
Best Objective: 26
Best Solution: 1 0 2 5 4 6 3
No 00000001 Solution: 0 1 2 3 4 5 6 Obj = 57.0000
No 00000002 Solution: 0 1 2 3 4 6 5 Obj = 53.0000
No 00000003 Solution: 0 1 2 3 5 4 6 Obj = 61.0000
No 00000004 Solution: 0 1 2 3 6 4 5 Obj = 57.0000
No 00000005 Solution: 0 1 2 3 5 6 4 Obj = 62.0000
No 00000006 Solution: 0 1 2 3 6 5 4 Obj = 62.0000
No 00000007 Solution: 0 1 2 4 3 5 6 Obj = 65.0000
No 00000008 Solution: 0 1 2 4 3 6 5 Obj = 61.0000
No 00000009 Solution: 0 1 2 5 3 4 6 Obj = 54.0000
No 00000010 Solution: 0 1 2 6 3 4 5 Obj = 56.0000
No 00000011 Solution: 0 1 2 5 3 6 4 Obj = 55.0000
No 00000012 Solution: 0 1 2 6 3 5 4 Obj = 61.0000
No 00000013 Solution: 0 1 2 4 5 3 6 Obj = 69.0000
No 00000014 Solution: 0 1 2 4 6 3 5 Obj = 65.0000
No 00000015 Solution: 0 1 2 5 4 3 6 Obj = 54.0000
No 00000016 Solution: 0 1 2 6 4 3 5 Obj = 56.0000
No 00000017 Solution: 0 1 2 5 6 3 4 Obj = 59.0000
No 00000018 Solution: 0 1 2 6 5 3 4 Obj = 65.0000
No 00000019 Solution: 0 1 2 4 5 6 3 Obj = 60.0000
No 00000020 Solution: 0 1 2 4 6 5 3 Obj = 60.0000
No 00000021 Solution: 0 1 2 5 4 6 3 Obj = 45.0000
No 00000022 Solution: 0 1 2 6 4 5 3 Obj = 51.0000
No 00000023 Solution: 0 1 2 5 6 4 3 Obj = 49.0000
Start at: 下午 12:35:27 End at: 下午 12:35:28 Time Spent: 00:00:01:656