```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=30044
  2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
      sys.path.extend([E:\\] ===\\\\3 ====\\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 ====\\\1 =====\\\1 ====\\\1 ====\\\1 ====\\\1 ====\\\1 ===\\\1 ===\\\1 ==\\\1 ===\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 =\\\1 ==\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 
      01_My_Python_Code'])
  5
 6
     PyDev console: starting.
     Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 8
     python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
      Waiting 1s....
12
13
     This is the R_15_8 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
      Start
16
17 Before iteration:
          Read basic data
18
19
          Parameter setting:
20
             trail = 58
21
             Pop_size = 30
             Tolerance iteration unchanged number = 10
23
             Chrom size = 45
             Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
27
             Mutation rate = 0.95
28
             Mu_oper_type = 1
29
             vessel\_move\_way = 2
30
             coefficient for Obj1= 1.9
             coefficient for Obj2= 0.100000000000000009
31
32
33
      Iteration begin:
34
35
      Beging the No. 0 iteration:
         obj[0] = 64.00 temp_best_value_gen = 64.00
36
          The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
          obj[gen-1] = 64.00 temp_best_value_gen = 64.00
40
          No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 1
41
42
          solution chromosome =
43
             first level: [[ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
44
45
             second level: [6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
46
             third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
47
          The No. 1 iteration is finished!
48
      Beging the No. 2 iteration:
49
50
          obj[gen-1] = 64.00 temp_best_value_gen = 64.00
51
          No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 2
52
          solution chromosome =
53
             first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
54
55
             second level: [6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
             third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
56
57
          The No. 2 iteration is finished!
58
59
      Beging the No. 3 iteration:
          obj[gen-1] = 64.00 temp_best_value_gen = 64.00
60
          No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 3
61
62
          solution chromosome =
63
             first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
64
        2.5]
65
             second level: [ 6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
             third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
66
67
          The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
          obj[gen-1] = 64.00 temp_best_value_gen = 64.00
70
71
          No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 4
72
             first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
73
74
75
             second level: [6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
             third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
76
         The No. 4 iteration is finished!
77
78
      Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 64.00 temp_best_value_gen = 64.00
       No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 5
 81
       solution chromosome =
 82
 83
          first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
 84
 85
          second level: [6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
          third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
 90
       obj[gen-1] = 64.00 temp_best_value_gen = 64.00
 91
        No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
 94
      2.5]
 95
          second level: [6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
          third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
 96
 97
        The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
100
       obj[gen-1] = 64.00 temp_best_value_gen = 64.00
101
        No, maintain solution and obj[gen] = 64.00, and the tolerance_counter = 7
102
       solution chromosome =
103
          first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
104
105
          second level: [6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
          third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
106
107
        The No. 7 iteration is finished!
108
109
110
111 The iteration is terminated and then visulize the solution:
112
        solution chromosome =
          first level: [ [ 1.5 5. 8.5 12. 15.5 19.5 25.5 28. 3.5 4. 2. 3. 1.5 2.
113
114
          second level: [ 6. 1. 1. 3. 5. 0. 1. 5. 4. 9. 10. 12. 1. 14. 16.]
115
          third level: [2. 3. 2. 4. 3. 4. 2. 4. 4. 8. 2. 4. 3. 3. 2.]]
116
117
        Objective function values and some other indicators:
                                Obj1 = 317.00
118
          Obi0 = 17.00
                                                          Obj0 + Obj1 = 334.00
119
          Total movement of crane: 56.00
120
          Total waiting time in berth position: 88.00
121
          Total index of q during berthing: 583.00
122
        Specific arrangement for each vessel:
123
          V_id: 0
                              li: 3.0
                                                  xi: 1.5
                                                                       bow of i: 0.0
                                                                                                  tail of i: 3.0
                                                                                                                           gama_i0: 6.0
                                                                                                                                                       gama i1: 9.0
                    duration_time_i: 3.0
                                                       demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                      work load gap_i: 0
124
          V_id: 1
                              li: 4.0
                                                  xi: 5.0
                                                                       bow of i: 3.0
                                                                                                  tail of i: 7.0
                                                                                                                           gama i0: 1.0
                                                                                                                                                       gama_i1: 4.0
                    duration_time_i: 3.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                      work load gap_i: 0
                                                                       bow of i: 7.0
                                                                                                  tail of i: 10.0
125
          V_id: 2
                              li: 3.0
                                                  xi: 8.5
                                                                                                                              gama_i0: 1.0
                                                                                                                                                          gama_i1: 3.0
                    duration time i: 2.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                      work load gap i: 0
          V id: 3
                                                                                                                                gama_i0: 3.0
126
                              li: 4.0
                                                  xi: 12.0
                                                                         bow of i: 10.0
                                                                                                    tail of i: 14.0
                                                                                                                                                            gama i1:5
     .0
                       duration time i: 2.0
                                                          demand i: 100.0
                                                                                        work load i: 100.0
                                                                                                                         work load gap i: 0
127
          V_id: 4
                              1i: 3.0
                                                  xi: 15.5
                                                                         bow of i: 14.0
                                                                                                    tail of i: 17.0
                                                                                                                                gama_i0: 5.0
                                                                                                                                                            gama_i1: 8
                       duration_time_i: 3.0
                                                                                                                         work load gap_i: 0
     .0
                                                          demand i: 140.0
                                                                                        work load i: 140.0
                                                  xi: 19.5
                                                                         bow of i: 17.0
128
          V_id: 5
                              li: 5.0
                                                                                                    tail of i: 22.0
                                                                                                                                gama_i0: 0.0
                                                                                                                                                            gama_i1: 2
                       duration_time_i: 2.0
                                                          demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                         work load gap_i: 0
     .0
129
          V id: 6
                                                  xi: 25.5
                                                                         bow of i: 22.0
                                                                                                    tail of i: 29.0
                                                                                                                                gama i0: 1.0
                              li: 7.0
                                                                                                                                                            gama i1:3
                       duration time i: 2.0
                                                          demand i: 80.0
                                                                                        work load i: 80.0
                                                                                                                         work load gap i: 0
     .0
130
                                                                                                                                gama_i0: 5.0
          V_id: 7
                              li: 4.0
                                                  xi: 28.0
                                                                         bow of i: 26.0
                                                                                                     tail of i: 30.0
                                                                                                                                                            gama_i1: 7
                                                                                                                         work load gap_i: 0
     .0
                       duration_time_i: 2.0
                                                          demand_i: 120.0
                                                                                        work load_i: 120.0
          V_id: 8
                                                  xi: 3.5
131
                                                                                                                           gama i0: 4.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 7.0
                                                                                                                                                       gama_i1: 6.0
                              li: 7.0
                    duration_time_i: 2.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
132
          V id: 9
                                                  xi: 4.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 8.0
                                                                                                                           gama_i0: 9.0
                                                                                                                                                       gama i1: 10.0
                              li: 8.0
                                                       demand i: 80.0
                    duration time i: 1.0
                                                                                      work load i: 80.0
                                                                                                                      work load gap i: 0
133
          V_id: 10
                                                                         bow of i: 0.0
                                                                                                                              gama_i0: 10.0
                                li: 4.0
                                                                                                    tail of i: 4.0
                                                                                                                                                          gama i1: 12.
                                                     xi: 2.0
     0
                    duration_time_i: 2.0
                                                       demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                      work load gap_i: 0
134
          V_id: 11
                                                                         bow of i: 0.0
                                                                                                     tail of i: 6.0
                                                                                                                              gama_i0: 12.0
                                li: 6.0
                                                     xi: 3.0
                                                                                                                                                          gama_i1: 14.
     0
                                                       demand i: 160.0
                                                                                                                      work load gap i: 0
                    duration time i: 2.0
                                                                                     work load i: 160.0
135
          V_id: 12
                                                                         bow of i: 0.0
                                                                                                                              gama_i0: 1.0
                                 li: 3.0
                                                     xi: 1.5
                                                                                                     tail of i: 3.0
                                                                                                                                                          gama_i1: 4.0
                    duration_time_i: 3.0
                                                       demand i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                      work load gap i: 0
          V_id: 13
136
                                li: 4.0
                                                     xi: 2.0
                                                                         bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                              gama_i0: 14.0
                                                                                                                                                          gama_i1: 16.
     0
                                                       demand_i: 100.0
                                                                                                                      work load gap_i: 0
                    duration time i: 2.0
                                                                                     work load i: 100.0
                                                                         bow of i: 0.0
137
          V id: 14
                                li: 5.0
                                                     xi: 2.5
                                                                                                    tail of i: 5.0
                                                                                                                              gama_i0: 16.0
                                                                                                                                                          gama_i1: 18.
                    duration_time_i: 2.0
     0
                                                       demand_i: 60.0
                                                                                      work load i: 60.0
                                                                                                                      work load gap_i: 0
138
139 Algorithm finished and the total CPU time: 1207 s
140 End
141
```