```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50854
 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.
 8 Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
     python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
      Waiting 1s.....
12
13 This is the R_17_5 _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 = 51
             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] = 74.90 temp_best_value_gen = 74.90
36
          The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
          obj[gen-1] = 74.90 temp_best_value_gen = 74.90
40
          No, maintain solution and obj[gen] = 74.90, and the tolerance_counter = 1
41
42
          solution chromosome =
43
             first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
        2.17 5.36 13.5 3.57 11. ]
44
             second level: [ 1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.] third level: [ 2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.] ]
45
46
47
         The No. 1 iteration is finished!
48
49
      Beging the No. 2 iteration:
50
          obj[gen-1] = 74.90 temp_best_value_gen = 74.90
51
          No, maintain solution and obj[gen] = 74.90, and the tolerance counter = 2
52
          solution chromosome =
53
             first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
54
        2.17 5.36 13.5 3.57 11. ]
55
             second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
             third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.]]
56
57
          The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
          obj[gen-1] = 74.90 temp_best_value_gen = 74.90
60
          No, maintain solution and obj[gen] = 74.90, and the tolerance_counter = 3
61
62
          solution chromosome =
             first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
63
        2.17 5.36 13.5 3.57 11. ]
64
             second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
65
             third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
          obj[gen-1] = 74.90 temp\_best\_value\_gen = 74.90
70
71
          No, maintain solution and obj[gen] = 74.90, and the tolerance counter = 4
          solution chromosome =
             first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
73
74
        2.17 5.36 13.5 3.57 11. ]
75
             second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
             third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.]]
76
         The No. 4 iteration is finished!
77
78
      Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 74.90 temp_best_value_gen = 74.90
 80
 81
       No, maintain solution and obj[gen] = 74.90, and the tolerance counter = 5
 82
       solution chromosome =
 83
          first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
      2.17 5.36 13.5 3.57 11. ]
 85
          second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
          third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
 90
       obj[gen-1] = 74.90 temp_best_value_gen = 74.90
 91
        No, maintain solution and obj[gen] = 74.90, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
 94
      2.17 5.36 13.5 3.57 11. ]
 95
          second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
          third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.]]
 96
 97
       The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
100
       obj[gen-1] = 74.90 temp_best_value_gen = 74.90
101
        No, maintain solution and obj[gen] = 74.90, and the tolerance_counter = 7
102
        solution chromosome =
          first level: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
103
      2.17 5.36 13.5 3.57 11. ]
104
105
          second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
          third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 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: [ [ 5.13 7.09 3.54 7.19 3.81 4.01 4.57 2.13 2.67 5.98 1.89 2.22
113
      2.17 5.36 13.5 3.57 11. ]
114
          second level: [1. 5. 7. 0. 9. 11. 13. 5. 14. 16. 17. 20. 23. 24. 24. 26. 1.]
115
          third level: [2. 5. 5. 7. 5. 3. 8. 2. 5. 5. 3. 3. 3. 5. 6. 6. 2.]]
116
117
        Objective function values and some other indicators:
                                Obj1 = 255.00
                                                          Obj0 + Obj1 = 281.00
          Obi0 = 26.00
118
119
          Total movement of crane: 39.00
120
          Total waiting time in berth position: 216.00
121
          Total index of q during berthing: 309.00
122
        Specific arrangement for each vessel:
123
          V_id: 0
                              li: 8.0
                                                  xi: 5.1
                                                                       bow of i: 1.1
                                                                                                  tail of i: 9.1
                                                                                                                           gama_i0: 1.0
                                                                                                                                                       gama i1: 5.0
                    duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
124
          V_id: 1
                              li: 5.0
                                                  xi: 7.1
                                                                       bow of i: 4.6
                                                                                                  tail of i: 9.6
                                                                                                                           gama i0: 5.0
                                                                                                                                                       gama_i1: 7.0
                    duration_time_i: 2.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                      work load gap_i: 0
125
          V_id: 2
                              li: 6.0
                                                  xi: 3.5
                                                                       bow of i: 0.5
                                                                                                  tail of i: 6.5
                                                                                                                           gama_i0: 7.0
                                                                                                                                                       gama_i1: 9.0
                                                       demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                      work load gap i: 0
                    duration time i: 2.0
126
                                                                                                                              gama_i0: 0.0
          V id: 3
                              li: 8.0
                                                  xi: 7.2
                                                                       bow of i: 3.2
                                                                                                  tail of i: 11.2
                                                                                                                                                          gama_i1: 1.0
                    duration time i: 1.0
                                                        demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                      work load gap i: 0
127
          V_id: 4
                              li: 6.0
                                                  xi: 3.8
                                                                       bow of i: 0.8
                                                                                                  tail of i: 6.8
                                                                                                                           gama_i0: 9.0
                                                                                                                                                       gama_i1: 11.0
                    duration_time_i: 2.0
                                                       demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                      work load gap_i: 0
          V_id: 5
128
                                                  xi: 4.0
                                                                       bow of i: 0.0
                              li: 8.0
                                                                                                  tail of i: 8.0
                                                                                                                           gama_i0: 11.0
                                                                                                                                                       gama_i1: 13.0
                                                        demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 2.0
129
          V id: 6
                                                  xi: 4.6
                                                                      bow of i: 0.6
                                                                                                  tail of i: 8.6
                                                                                                                           gama i0: 13.0
                              li: 8.0
                                                                                                                                                       gama i1: 14.0
                                                       demand_i: 100.0
                                                                                      work load i: 100.0
                                                                                                                      work load gap i: 0
                    duration time i: 1.0
                                                                      bow of i: 0.6
130
          V_id: 7
                              1i: 3.0
                                                   xi: 2.1
                                                                                                  tail of i: 3.6
                                                                                                                            gama_i0: 5.0
                                                                                                                                                       gama_i1: 7.0
                                                       demand_i: 60.0
                    duration_time_i: 2.0
                                                                                      work load_i: 60.0
                                                                                                                      work load gap_i: 0
131
          V_id: 8
                                                                                                  tail of i: 5.2
                                                                                                                           gama i0: 14.0
                                                                                                                                                       gama_i1: 16.0
                              li: 5.0
                                                  xi: 2.7
                                                                      bow of i: 0.2
                    duration_time_i: 2.0
                                                       demand i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
                                                                                                                                                       gama_i1: 17.0
132
          V id: 9
                                                  xi: 6.0
                                                                       bow of i: 3.0
                                                                                                  tail of i: 9.0
                                                                                                                            gama i0: 16.0
                              li: 6.0
                                                       demand i: 60.0
                    duration time i: 1.0
                                                                                      work load i: 60.0
                                                                                                                      work load gap i: 0
133
          V_id: 10
                                                                         bow of i: 0.4
                                                                                                                              gama_i0: 17.0
                                li: 3.0
                                                     xi: 1.9
                                                                                                    tail of i: 3.4
                                                                                                                                                          gama i1: 20.
     0
                    duration_time_i: 3.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
134
                                                                         bow of i: 0.2
                                                                                                                              gama_i0: 20.0
                                li: 4.0
                                                     xi: 2.2
                                                                                                     tail of i: 4.2
                                                                                                                                                          gama_i1: 23.
     0
                                                       demand i: 140.0
                                                                                                                      work load gap i: 0
                    duration time i: 3.0
                                                                                      work load i: 140.0
135
          V id: 12
                                                                         bow of i: 0.7
                                                                                                                              gama_i0: 23.0
                                li: 3.0
                                                     xi: 2.2
                                                                                                    tail of i: 3.7
                                                                                                                                                          gama_i1: 24.
     0
                    duration_time_i: 1.0
                                                       demand i: 60.0
                                                                                      work load i: 60.0
                                                                                                                      work load gap i: 0
136
          V_id: 13
                                li: 8.0
                                                     xi: 5.4
                                                                         bow of i: 1.4
                                                                                                    tail of i: 9.4
                                                                                                                              gama_i0: 24.0
                                                                                                                                                          gama_i1: 26.
     0
                                                       demand_i: 160.0
                                                                                                                      work load gap_i: 0
                    duration time i: 2.0
                                                                                     work load i: 160.0
                                                                                                       tail of i: 17.5
137
          V_id: 14
                                li: 8.0
                                                     xi: 13.5
                                                                           bow of i: 9.5
                                                                                                                                   gama_i0: 24.0
                                                                                                                                                               gama_i1
                         duration_time_i: 1.0
     : 25.0
                                                            demand i: 120.0
                                                                                           work load i: 120.0
                                                                                                                            work load gap_i: 0
                                                                                                                                                          gama_i1: 27.
138
          V id: 15
                                li: 7.0
                                                                         bow of i: 0.1
                                                                                                    tail of i: 7.1
                                                                                                                              gama i0: 26.0
                                                       demand i: 60.0
                                                                                     work load i: 60.0
     0
                    duration_time_i: 1.0
                                                                                                                      work load gap_i: 0
139
          V id: 16
                                li: 3.0
                                                     xi: 11.0
                                                                           bow of i: 9.5
                                                                                                       tail of i: 12.5
                                                                                                                                   gama i0: 1.0
                                                                                                                                                               gama il
                         duration_time_i: 3.0
                                                             demand_i: 120.0
                                                                                          work load_i: 120.0
                                                                                                                            work load gap_i: 0
140
     Algorithm finished and the total CPU time: 1338 s
141
142
     End
143
```