```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=34102
  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_16_7 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 = 48
             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
34
      Iteration begin:
35
      Beging the No. 0 iteration:
         obj[0] = 61.70 temp_best_value_gen = 61.70
36
          The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
          obj[gen-1] = 61.70 temp_best_value_gen = 61.70
40
          No, maintain solution and obj[gen] = 61.70, and the tolerance_counter = 1
41
42
          solution chromosome =
43
             first level: [ [ 2.5 6.5 12. 19. 25. 27.5 3. 4. 3.5 4.5 1.5 3. 3.5 3.
44
        3.5 4.5]
45
             second level: [1. 0. 2. 0. 0. 1. 5. 2. 6. 7. 11. 15. 18. 19. 21. 23.]
46
             third level: [3. 3. 4. 5. 4. 3. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
47
          The No. 1 iteration is finished!
48
      Beging the No. 2 iteration:
49
50
          obj[gen-1] = 61.70 temp_best_value_gen = 61.00
51
          Yes, update solution and obj[gen] = 61.00
52
          solution chromosome =
53
             first level: [ [ 2.5 6.5 26. 19. 25. 12. 3. 4. 3.5 4.5 1.5 3. 3.5 3.
54
        3.5 4.5]
55
             second level: [1, 0, 1, 0, 0, 2, 5, 2, 6, 7, 11, 15, 18, 19, 21, 23,]
56
             third level: [3. 3. 3. 5. 4. 4. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
57
          The No. 2 iteration is finished!
58
59
      Beging the No. 3 iteration:
          obj[gen-1] = 61.00 temp_best_value_gen = 61.00
60
          No, maintain solution and obj[gen] = 61.00, and the tolerance_counter = 1
61
62
          solution chromosome =
63
             first level: [ 2.5 6.5 26. 19. 25. 12. 3. 4. 3.5 4.5 1.5 3. 3.5 3.
        3.5 4.5]
64
65
             second level: [1. 0. 1. 0. 0. 2. 5. 2. 6. 7. 11. 15. 18. 19. 21. 23.]
             third level: [3. 3. 3. 5. 4. 4. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
66
67
          The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
          obj[gen-1] = 61.00 temp_best_value_gen = 60.80
70
71
          Yes, update solution and obj[gen] = 60.80
          solution chromosome =
73
             first level: [ [ 2.5 6.5 12. 19. 25. 26. 3. 4. 3.5 4.5 1.5 3. 3.5 3.
74
        3.5 \ 4.5
75
             second level: [1. 0. 2. 0. 0. 1. 5. 2. 6. 7. 11. 15. 18. 19. 21. 23.]
             third level: [3. 3. 4. 5. 4. 3. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
76
         The No. 4 iteration is finished!
77
78
      Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 60.80 temp_best_value_gen = 60.80
        No, maintain solution and obj[\overline{gen}] = \overline{60.80}, and the tolerance_counter = 1
 81
 82
        solution chromosome =
 83
          first level: [ [ 2.5 6.5 12. 19. 25. 26. 3. 4. 3.5 4.5 1.5 3. 3.5 3.
 84
 85
          second level: [1. 0. 2. 0. 0. 1. 5. 2. 6. 7. 11. 15. 18. 19. 21. 23.]
          third level: [3. 3. 4. 5. 4. 3. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
 86
 87
        The No. 5 iteration is finished!
 88
     Beging the No. 6 iteration:
 89
        obj[gen-1] = 60.80 temp\_best\_value\_gen = 60.80
 90
 91
        No, maintain solution and obj[gen] = 60.80, and the tolerance_counter = 2
 92
        solution chromosome =
 93
          first level: [ [ 2.5 6.5 12. 19. 25. 26. 3. 4. 3.5 4.5 1.5 3. 3.5 3.
 94
       3.5 4.5]
 95
          second level: [1. 0. 2. 0. 0. 1. 5. 2. 6. 7. 11. 15. 18. 19. 21. 23.]
 96
          third level: [3. 3. 4. 5. 4. 3. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
 97
        The No. 6 iteration is finished!
 98
 99
100
101
    The iteration is terminated and then visulize the solution:
102
        solution chromosome =
103
          first level: [ [ 2.5 6.5 12. 19. 25. 26. 3. 4. 3.5 4.5 1.5 3. 3.5 3.
104
       3.5 4.5]
105
           second level: [1. 0. 2. 0. 0. 1. 5. 2. 6. 7. 11. 15. 18. 19. 21. 23.]
          third level: [3. 3. 4. 5. 4. 3. 6. 3. 5. 2. 2. 3. 5. 3. 6. 5.]]
106
107
        Objective function values and some other indicators
                                 Obj1 = 152.00
                                                           Obj0 + Obj1 = 176.00
108
           Obi0 = 24.00
           Total movement of crane: 21.00
109
110
           Total waiting time in berth position: 131.00
111
          Total index of q during berthing: 405.00
112
        Specific arrangement for each vessel:
                                                                                                                              gama_i0: 1.0
113
           V_id: 0
                               li: 5.0
                                                   xi: 2.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 5.0
                                                                                                                                                          gama_i1: 2.0
                     duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap i: 0
                                                                        bow of i: 5.0
114
           V_id: 1
                               li: 3.0
                                                   xi: 6.5
                                                                                                    tail of i: 8.0
                                                                                                                              gama_i0: 0.0
                                                                                                                                                          gama_i1: 1.0
                     duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
           V id: 2
115
                               li: 8.0
                                                                          bow of i: 8.0
                                                                                                      tail of i: 16.0
                                                                                                                                  gama i0: 2.0
                                                   xi: 12.0
                                                                                                                                                              gama il: 4
                       duration\_time\_i{:}~2.0
     .0
                                                           demand_i: 140.0
                                                                                          work load_i: 140.0
                                                                                                                           work load gap_i: 0
116
           V_id: 3
                               li: 6.0
                                                   xi: 19.0
                                                                          bow of i: 16.0
                                                                                                      tail of i: 22.0
                                                                                                                                   gama_i0: 0.0
                                                                                                                                                               gama_i1: 1
                                                                                                                           work load gap_i: 0
                                                           demand i: 80.0
     .0
                       duration_time_i: 1.0
                                                                                          work load_i: 80.0
117
           V id: 4
                                                   xi: 25.0
                                                                          bow of i: 22.0
                                                                                                                                  gama_i0: 0.0
                              li: 6.0
                                                                                                      tail of i: 28.0
                                                                                                                                                               gama i1:1
                                                                                          work load i: 60.0
     .0
                       duration_time_i: 1.0
                                                           demand_i: 60.0
                                                                                                                           work load gap_i: 0
                                                                                                                                  gama_i0: 1.0
118
           V id: 5
                               li: 5.0
                                                   xi: 26.0
                                                                          bow of i: 23.5
                                                                                                      tail of i: 28.5
                                                                                                                                                               gama i1:3
                                                                                          work load_i: 100.0
                                                                                                                           work load gap_i: 0
                       duration_time_i: 2.0
                                                           demand_i: 100.0
     .0
119
                                                                                                                             gama i0: \hat{5}.\overline{0}
           V_id: 6
                               li: 6.0
                                                   xi: 3.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                                                          gama_i1: 6.0
                                                        demand\_i{:}\ 120.0
                     duration_time_i: 1.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 8.0
120
           V_id: 7
                               li: 8.0
                                                   xi: 4.0
                                                                                                                             gama_i0: 2.0
                                                                                                                                                          gama_i1: 5.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap_i: 0
                     duration time i: 3.0
121
                                                                        bow of i: 0.0
           V id: 8
                               li: 7.0
                                                   xi: 3.5
                                                                                                    tail of i: 7.0
                                                                                                                              gama i0: 6.0
                                                                                                                                                          gama_i1: 7.0
                     duration time i: 1.0
                                                         demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap i: 0
122
           V_id: 9
                               li: 9.0
                                                   xi: 4.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                             gama_i0: 7.0
                                                                                                                                                          gama_i1: 11.0
                     duration_time_i: 4.0
                                                        demand i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
                                                                          bow of i: 0.0
123
           V_id: 10
                                 li: 3.0
                                                      xi: 1.5
                                                                                                      tail of i: 3.0
                                                                                                                                gama_i0: 11.0
                                                                                                                                                            gama_i1: 15.
     0
                                                        demand_i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 4.0
124
           V id: 11
                                                                          bow of i: 0.0
                                                                                                      tail of i: 6.0
                                                                                                                                gama i0: 15.0
                                 li: 6.0
                                                      xi: 3.0
                                                                                                                                                            gama i1: 18.
     0
                                                        demand i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
                     duration time i: 3.0
125
           V_id: 12
                                 li: 7.0
                                                      xi: 3.5
                                                                          bow of i: 0.0
                                                                                                       tail of i: 7.0
                                                                                                                                gama_i0: 18.0
                                                                                                                                                            gama_i1: 19.
     0
                     duration_time_i: 1.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
           V_id: 13
                                                                          bow of i: 0.0
                                                                                                                                gama_i0: 19.0
126
                                                      xi: 3.0
                                                                                                      tail of i: 6.0
                                                                                                                                                            gama_i1: 21.
                                 li: 6.0
                                                        demand_i: 100.0
                                                                                                                        work load gap_i: 0
     0
                     duration_time_i: 2.0
                                                                                       work load i: 100.0
                                                      xi: 3.5
127
           V id: 14
                                 li: 7.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                                gama i0: 21.0
                                                                                                                                                            gama_i1: 23.
     0
                     duration time i: 2.0
                                                        demand i: 140.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap i: 0
128
           V_id: 15
                                 li: 9.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 9.0
                                                                                                                                gama_i0: 23.0
                                                      xi: 4.5
                                                                                                                                                            gama i1: 25.
     0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
129
130
     Algorithm finished and the total CPU time: 1205 s
131
     End
132
```