```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50126
 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.
 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_1 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] = 71.30 temp_best_value_gen = 71.30
36
         The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
         obj[gen-1] = 71.30 temp_best_value_gen = 71.30
40
         No, maintain solution and obj[gen] = 71.30, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 4.5 13.5 21. 25.5 3.5 4.5 2.5 1.5 3. 3.5 3.5 3. 3.5 3.5
44
       3. 1.5 3.]
45
             second level: [ 0. 0. 7. 0. 2. 3. 1. 8. 6. 12. 13. 15. 17. 19. 21. 23. 24.]
             third level: [6. 6. 6. 7. 5. 2. 3. 2. 5. 3. 7. 6. 7. 2. 6. 3. 3.]]
46
         The No. 1 iteration is finished!
47
48
49
     Beging the No. 2 iteration:
50
         obj[gen-1] = 71.30 temp_best_value_gen = 71.30
51
         No, maintain solution and obj[gen] = 71.30, and the tolerance_counter = 2
52
         solution chromosome =
53
             first level: [ [ 4.5 13.5 21. 25.5 3.5 4.5 2.5 1.5 3. 3.5 3.5 3. 3.5 3.5
54
55
             second level: [0. 0. 7. 0. 2. 3. 1. 8. 6. 12. 13. 15. 17. 19. 21. 23. 24.]
             third level: [6. 6. 6. 7. 5. 2. 3. 2. 5. 3. 7. 6. 7. 2. 6. 3. 3.]]
56
57
         The No. 2 iteration is finished!
58
59
     Beging the No. 3 iteration:
         obj[gen-1] = 71.30 temp_best_value_gen = 71.30
60
         No, maintain solution and obj[gen] = 71.30, and the tolerance_counter = 3
61
62
         solution chromosome =
63
             first level: [ [ 4.5 13.5 21. 25.5 3.5 4.5 2.5 1.5 3. 3.5 3.5 3. 3.5 3.5
64
       3. 1.5 3.1
             second level: [ 0. 0. 7. 0. 2. 3. 1. 8. 6. 12. 13. 15. 17. 19. 21. 23. 24.]
65
             third level: [6. 6. 6. 7. 5. 2. 3. 2. 5. 3. 7. 6. 7. 2. 6. 3. 3.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
         obj[gen-1] = 71.30 temp_best_value_gen = 71.30
70
71
         No, maintain solution and obj[gen] = 71.30, and the tolerance_counter = 4
         solution chromosome
73
             first level: [ [ 4.5 13.5 21. 25.5 3.5 4.5 2.5 1.5 3. 3.5 3.5 3. 3.5 3.5
74
75
             second level: [0. 0. 7. 0. 2. 3. 1. 8. 6. 12. 13. 15. 17. 19. 21. 23. 24.]
             third level: [6. 6. 6. 7. 5. 2. 3. 2. 5. 3. 7. 6. 7. 2. 6. 3. 3.]]
76
         The No. 4 iteration is finished!
77
78
     Beging the No. 5 iteration:
79
```

```
unknown
         obj[gen-1] = 71.30 temp_best_value_gen = 71.30
        No, maintain solution and obj[gen] = 71.30, and the tolerance_counter = 5
  81
  82
        solution chromosome =
  83
           first level: [ [ 4.5 13.5 21. 25.5 3.5 4.5 2.5 1.5 3. 3.5 3.5 3. 3.5 3.5
  84
  85
           second level: [ 0. 0. 7. 0. 2. 3. 1. 8. 6. 12. 13. 15. 17. 19. 21. 23. 24.]
           third level: [6. 6. 6. 7. 5. 2. 3. 2. 5. 3. 7. 6. 7. 2. 6. 3. 3.]]
  86
  87
        The No. 5 iteration is finished!
  88
  89
  90
      The iteration is terminated and then visulize the solution:
  91
  92
        solution chromosome =
  93
           first level: [ [ 4.5 13.5 21. 25.5 3.5 4.5 2.5 1.5 3. 3.5 3.5 3. 3.5 3.5
  94
           1.5 3.]
  95
           second level: [0. 0. 7. 0. 2. 3. 1. 8. 6. 12. 13. 15. 17. 19. 21. 23. 24.]
           third level: [6. 6. 6. 7. 5. 2. 3. 2. 5. 3. 7. 6. 7. 2. 6. 3. 3.]]
  96
  97
         Objective function values and some other indicators:
  98
           Obj0 = 26.00
                                  Obj1 = 219.00
                                                           Obj0 + Obj1 = 245.00
 99
           Total movement of crane: 48.00
100
           Total waiting time in berth position: 171.00
101
           Total index of q during berthing: 473.00
102
         Specific arrangement for each vessel:
103
           V_id: 0
                               li: 9.0
                                                   xi: 4.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                             gama i0: 0.0
                                                                                                                                                         gama i1: 1.0
                     duration_time_i: 1.0
                                                        demand_i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap_i: 0
           V_id: 1
104
                               li: 9.0
                                                    xi: 13.5
                                                                          bow of i: 9.0
                                                                                                      tail of i: 18.0
                                                                                                                                  gama_i0: 0.0
                                                                                                                                                              gama_i1: 1
      .0
                        duration time i: 1.0
                                                           demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                          work load gap_i: 0
105
           V_id: 2
                                                                                                                                  gama_i0: 7.0
                                                                                                                                                              gama_i1: 9
                               1i: 6.0
                                                   xi: 21.0
                                                                          bow of i: 18.0
                                                                                                      tail of i: 24.0
      .0
                        duration_time_i: 2.0
                                                           demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                          work load gap_i: 0
                                                                                                      tail of i: 30.0
106
           V id: 3
                               li: 9.0
                                                   xi: 25.5
                                                                          bow of i: 21.0
                                                                                                                                  gama_i0: 0.0
                                                                                                                                                              gama_i1: 1
                        duration_time_i: 1.0
                                                           demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                          work load gap i: 0
      .0
107
                                                    xi: 3.5
           V_id: 4
                                                                        bow of i: 0.0
                                                                                                   tail of i: 7.0
                                                                                                                             gama i0: 2.0
                                                                                                                                                         gama_i1: 3.0
                               li: 7.0
                     duration_time_i: 1.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
                                                                        bow of i: 0.0
108
           V_id: 5
                               1i: 9.0
                                                    xi: 4.5
                                                                                                   tail of i: 9.0
                                                                                                                             gama_i0: 3.0
                                                                                                                                                         gama_i1: 6.0
                                                        demand_i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap i: 0
                     duration_time_i: 3.0
                                                    xi: 2.5
                                                                        bow of i: 0.0
109
           V_id: 6
                               li: 5.0
                                                                                                   tail of i: 5.0
                                                                                                                             gama_i0: 1.0
                                                                                                                                                         gama_i1: 2.0
                     duration_time_i: 1.0
                                                         demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
           V_id: 7
                                                    xi: 1.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                             gama i0: 8.0
                                                                                                                                                         gama i1: 12.0
                               li: 3.0
                     duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
111
           V_id: 8
                               li: 6.0
                                                    xi: 3.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                             gama_i0: 6.0
                                                                                                                                                         gama_i1: 8.0
                                                        demand_i: 120.0
                     duration_time_i: 2.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
112
           V id: 9
                                                    xi: 3.5
                                                                        bow of i: 0.0
                                                                                                                             gama_i0: 12.0
                               li: 7.0
                                                                                                   tail of i: 7.0
                                                                                                                                                         gama i1: 13.0
                                                                                       work load_i: 60.0
                                                        demand_i: 60.0
                     duration_time_i: 1.0
                                                                                                                        work load gap_i: 0
113
           V id: 10
                                  li: 7.0
                                                      xi: 3.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                               gama_i0: 13.0
                                                                                                                                                           gama_i1: 15.
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
114
                                                                                                      tail of i: 6.0
           V_id: 11
                                 li: 6.0
                                                      xi: 3.0
                                                                          bow of i: 0.0
                                                                                                                               gama_i0: 15.0
                                                                                                                                                           gama_i1: 17.
      0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
                                                                          bow of i: 0.0
                                                                                                                               gama_i0: 17.0
115
           V_id: 12
                                 li: 7.0
                                                                                                      tail of i: 7.0
                                                                                                                                                           gama_i1: 19.
                                                                                                                        work load gap_i: 0
      0
                                                        demand i: 160.0
                     duration time i: 2.0
                                                                                       work load i: 160.0
116
           V id: 13
                                 1i: 7.0
                                                      xi: 3.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                               gama_i0: 19.0
                                                                                                                                                           gama_i1: 21.
      0
                     duration time i: 2.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap i: 0
117
                                 li: 6.0
                                                      xi: 3.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 6.0
                                                                                                                               gama_i0: 21.0
                                                                                                                                                           gama_i1: 23.
      0
                                                        demand i: 140.0
                                                                                                                        work load gap_i: 0
                     duration time i: 2.0
                                                                                       work load i: 140.0
           V_id: 15
118
                                  li: 3.0
                                                      xi: 1.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 3.0
                                                                                                                               gama_i0: 23.0
                                                                                                                                                           gama_i1: 24.
      0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 1.0
119
           V id: 16
                                 li: 6.0
                                                      xi: 3.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 6.0
                                                                                                                               gama i0: 24.0
                                                                                                                                                           gama i1: 27.
      0
                     duration time i: 3.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap_i: 0
120
121
      Algorithm finished and the total CPU time: 1201 s
122
     End
123
```