```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50298
 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_17_4_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] = 89.07
                                 temp_best_value_gen = 89.07
36
         The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
         obj[gen-1] = 89.07 temp_best_value_gen = 89.07
40
         No, maintain solution and obj[gen] = 89.07, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [1.93 4.32 4.6 8.75 4.36 4.68 2.32 2.11 3.9 1.62 4.42 8.81 6.89 4.84
44
      2.13 2.46 4.94]
45
             second level: [5. 3. 0. 9. 8. 11. 14. 18. 2. 21. 24. 5. 21. 4. 9. 27. 30.]
46
             third level: [2. 4. 4. 4. 5. 3. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
47
         The No. 1 iteration is finished!
48
49
     Beging the No. 2 iteration:
50
         obj[gen-1] = 89.07 temp_best_value_gen = 89.07
51
         No, maintain solution and obj[gen] = 89.07, and the tolerance_counter = 2
52
         solution chromosome =
53
             first level: [ [1.93 4.32 4.6 8.75 4.36 4.68 2.32 2.11 3.9 1.62 4.42 8.81 6.89 4.84
54
      2.13 2.46 4.94]
55
             second level: [5. 3. 0. 9. 8. 11. 14. 18. 2. 21. 24. 5. 21. 4. 9. 27. 30.]
             third level: [2. 4. 4. 4. 5. 3. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
56
57
         The No. 2 iteration is finished!
58
59
     Beging the No. 3 iteration:
         obj[gen-1] = 89.07 temp_best_value_gen = 85.10
60
         Yes, update solution and obj[gen] = 85.10
61
62
         solution chromosome =
63
             first level: [ [ 1.5 5.5 4.5 2. 23.5 19. 1.5 1.5 25.5 1.5 12.5 4.5 3.5 3.5
       2. 1.5 4.1
64
65
             second level: [3. 2. 1.11. 0. 2. 6.18. 6.21.24.10.14.17.24.27.30.]
             third level: [2. 5. 8. 2. 2. 4. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
         obj[gen-1] = 85.10 temp_best_value_gen = 85.10
70
71
         No, maintain solution and obj[gen] = 85.10, and the tolerance_counter = 1
         solution chromosome =
73
             first level: [ [ 1.5 5.5 4.5 2. 23.5 19. 1.5 1.5 25.5 1.5 12.5 4.5 3.5 3.5
74
75
             second level: [ 3. 2. 1.11. 0. 2. 6.18. 6.21.24.10.14.17.24.27.30.]
             third level: [2. 5. 8. 2. 2. 4. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
76
         The No. 4 iteration is finished!
77
78
     Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 85.10 temp_best_value_gen = 85.10
 80
       No, maintain solution and obj[\overline{gen}] = \overline{85.10}, and the tolerance_counter = 2
 81
       solution chromosome =
 82
 83
          first level: [ [ 1.5 5.5 4.5 2. 23.5 19. 1.5 1.5 25.5 1.5 12.5 4.5 3.5 3.5
 84
 85
          second level: [ 3. 2. 1. 11. 0. 2. 6. 18. 6. 21. 24. 10. 14. 17. 24. 27. 30.]
          third level: [2. 5. 8. 2. 2. 4. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 85.10 temp_best_value_gen = 85.10
 90
 91
        No, maintain solution and obj[gen] = 85.10, and the tolerance_counter = 3
 92
       solution chromosome =
 93
          first level: [ [ 1.5 5.5 4.5 2. 23.5 19. 1.5 1.5 25.5 1.5 12.5 4.5 3.5 3.5
 94
      2. 1.5 4.]
 95
          second level: [ 3. 2. 1. 11. 0. 2. 6. 18. 6. 21. 24. 10. 14. 17. 24. 27. 30.]
 96
          third level: [2. 5. 8. 2. 2. 4. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
 97
        The No. 6 iteration is finished!
 98
 99
100
101
    The iteration is terminated and then visulize the solution:
102
        solution chromosome =
          first level: [ [ 1.5 5.5 4.5 2. 23.5 19. 1.5 1.5 25.5 1.5 12.5 4.5 3.5 3.5
103
104
          1.5 4. ]
105
          second level: [ 3. 2. 1. 11. 0. 2. 6. 18. 6. 21. 24. 10. 14. 17. 24. 27. 30.]
          third level: [2. 5. 8. 2. 2. 4. 2. 3. 4. 3. 6. 3. 3. 7. 4. 2. 3.]]
106
107
        Objective function values and some other indicators:
                                 Obj1 = 243.00
                                                          Obj0 + Obj1 = 275.00
108
          Obi0 = 32.00
          Total movement of crane: 27.00
109
110
          Total waiting time in berth position: 216.00
111
          Total index of q during berthing: 428.00
112
        Specific arrangement for each vessel:
113
           V_id: 0
                              li: 3.0
                                                   xi: 1.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                             gama_i0: 3.0
                                                                                                                                                         gama_i1: 6.0
                                                        demand_i: 100.0
                    duration_time_i: 3.0
                                                                                       work load i: 100.0
                                                                                                                        work load gap i: 0
                                                                       bow of i: 3.0
114
           V_id: 1
                              li: 5.0
                                                   xi: 5.5
                                                                                                   tail of i: 8.0
                                                                                                                             gama_i0: 2.0
                                                                                                                                                         gama_i1: 3.0
                    duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
           V id: 2
115
                              li: 9.0
                                                   xi: 4.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                             gama i0: 1.0
                                                                                                                                                         gama i1: 2.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 1.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
116
           V_id: 3
                              li: 4.0
                                                   xi: 2.0
                                                                        bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                             gama_i0: 11.0
                                                                                                                                                         gama_i1: 14.0
                                                                                       work load_i: 120.0
                                                        demand i: 120.0
                                                                                                                        work load gap_i: 0
                    duration_time_i: 3.0
117
           V id: 4
                              li: 5.0
                                                                          bow of i: 21.0
                                                                                                                                  gama i0: 0.0
                                                                                                                                                              gama_i1: 2
                                                   xi: 23.5
                                                                                                      tail of i: 26.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 2.0
                                                           demand i: 80.0
                                                                                         work load i: 80.0
                                                                                                                                  gama_i0: 2.0
118
           V id: 5
                              li: 9.0
                                                   xi: 19.0
                                                                          bow of i: 14.5
                                                                                                      tail of i: 23.5
                                                                                                                                                              gama i1:4
                       duration_time_i: 2.0
                                                          demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                           work load gap_i: 0
     .0
119
                                                                                                                             gama i0: \hat{6}.\overline{0}
           V_id: 6
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                                                         gama_i1: 10.0
                              li: 3.0
                     duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
120
           V id: 7
                              li: 3.0
                                                   xi: 1.5
                                                                        bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                             gama_i0: 18.0
                                                                                                                                                         gama_i1: 21.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap i: 0
                     duration time i: 3.0
                                                        demand i: 140.0
                                                                                                                                  gama_i0: 6.0
                                                                          bow of i: 23.5
121
           V id: 8
                              li: 4.0
                                                   xi: 25.5
                                                                                                      tail of i: 27.5
                                                                                                                                                              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
                              1i: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                             gama_i0: 21.0
                                                                                                                                                         gama_i1: 24.0
                    duration\_time\_i{:}~3.0
                                                        demand i: 140.0
                                                                                                                        work load gap_i: 0
                                                                                       work load i: 140.0
                                                                                                                                     gama_i0: 24.0
123
           V_id: 10
                                                                                                        tail of i: 16.0
                                 li: 7.0
                                                      xi: 12.5
                                                                            bow of i: 9.0
                                                                                                                                                                 gama_i1
     : 26.0
                          duration_time_i: 2.0
                                                             demand_i: 140.0
                                                                                            work load i: 140.0
                                                                                                                             work load gap_i: 0
124
           V id: 11
                                 1i: 9.0
                                                                                                      tail of i: 9.0
                                                                                                                               gama i0: 10.0
                                                                                                                                                            gama i1: 11.
                                                                          bow of i: 0.0
     0
                    duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
125
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
           V_id: 12
                                 1i: 7.0
                                                      xi: 3.5
                                                                                                                                gama_i0: 14.0
                                                                                                                                                            gama_i1: 17.
     0
                    duration_time_i: 3.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
           V_id: 13
                                                                          bow of i: 0.0
                                                                                                                               gama_i0: 17.0
126
                                                                                                                                                            gama_i1: 18.
                                 li: 7.0
                                                      xi: 3.5
                                                                                                      tail of i: 7.0
                                                        demand_i: 60.0
     0
                     duration time i: 1.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
127
           V id: 14
                                 li: 4.0
                                                      xi: 2.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 4.0
                                                                                                                                gama i0: 24.0
                                                                                                                                                            gama i1: 26.
     0
                    duration time i: 2.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap i: 0
128
           V_id: 15
                                 1i: 3.0
                                                                          bow of i: 0.0
                                                                                                                               gama_i0: 27.0
                                                      xi: 1.5
                                                                                                      tail of i: 3.0
                                                                                                                                                            gama i1: 30.
     0
                     duration_time_i: 3.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
129
                                 li: 8.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 8.0
                                                                                                                               gama_i0: 30.0
                                                      xi: 4.0
                                                                                                                                                            gama_i1: 33.
     0
                    duration time i: 3.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap_i: 0
130
131
     Algorithm finished and the total CPU time: 1225 s
132
133
```