```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=1969
 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_18_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 = 54
             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] = 80.80 temp_best_value_gen = 80.80
36
         The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
         obj[gen-1] = 80.80 temp_best_value_gen = 80.80
40
         No, maintain solution and obj[gen] = 80.80, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 4. 11. 3. 21.5 28. 25.5 1.5 1.5 4. 4. 1.5 3.5 3.5 4.
44
       3.5 2.5 3. 15.5]
45
             second level: [4. 2. 0. 0. 4. 2. 5. 2. 3. 9. 13. 26. 19. 21. 17. 28. 24. 4.]
46
             third level: [7. 2. 3. 4. 1. 5. 2. 3. 5. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
47
         The No. 1 iteration is finished!
48
     Beging the No. 2 iteration:
49
50
         obj[gen-1] = 80.80 temp_best_value_gen = 80.80
51
         No, maintain solution and obj[gen] = 80.80, and the tolerance_counter = 2
52
         solution chromosome =
53
             first level: [ [ 4. 11. 3. 21.5 28. 25.5 1.5 1.5 4. 4. 1.5 3.5 3.5 4.
54
       3.5 2.5 3. 15.5]
55
             second level: [4. 2. 0. 0. 4. 2. 5. 2. 3. 9. 13. 26. 19. 21. 17. 28. 24. 4.]
56
             third level: [7. 2. 3. 4. 1. 5. 2. 3. 5. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
57
         The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
         obj[gen-1] = 80.80 temp_best_value_gen = 80.80
60
         No, maintain solution and obj[gen] = 80.80, and the tolerance_counter = 3
61
62
         solution chromosome =
63
             first level: [ [ 4. 11. 3. 21.5 28. 25.5 1.5 1.5 4. 4. 1.5 3.5 3.5 4.
64
       3.5 2.5 3. 15.5]
             second level: [4. 2. 0. 0. 4. 2. 5. 2. 3. 9. 13. 26. 19. 21. 17. 28. 24. 4.]
65
             third level: [7. 2. 3. 4. 1. 5. 2. 3. 5. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
66
         The No. 3 iteration is finished!
67
68
69 Beging the No. 4 iteration:
         obj[gen-1] = 80.80 temp_best_value_gen = 80.80
70
71
         No, maintain solution and obj[gen] = 80.80, and the tolerance counter = 4
         solution chromosome =
73
             first level: [ [ 4. 11. 3. 21.5 28. 25.5 1.5 1.5 4. 4. 1.5 3.5 3.5 4.
74
       3.5 2.5 3. 15.5]
75
             second level: [4. 2. 0. 0. 4. 2. 5. 2. 3. 9. 13. 26. 19. 21. 17. 28. 24. 4.]
             third level: [7. 2. 3. 4. 1. 5. 2. 3. 5. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
76
         The No. 4 iteration is finished!
77
78
     Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 80.80 temp\_best\_value\_gen = 79.80
 81
        Yes, update solution and obj[gen] = 79.80
       solution chromosome =
 82
 83
          first level: [ [ 4. 11. 3. 4.5 28. 25.5 1.5 1.5 21.5 4. 1.5 3.5 3.5 4.
      3.5 2.5 3. 15.51
 85
          second level: [4. 2. 0. 5. 4. 2. 6. 2. 0. 10. 14. 26. 19. 21. 3. 28. 24. 4.]
          third level: [7. 2. 3. 5. 1. 5. 2. 3. 4. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 79.80 temp_best_value_gen = 79.80
 90
 91
        No, maintain solution and obj[gen] = 79.80, and the tolerance_counter = 1
 92
       solution chromosome =
 93
          first level: [ [ 4. 11. 3. 4.5 28. 25.5 1.5 1.5 21.5 4. 1.5 3.5 3.5 4.
 94
      3.5 2.5 3. 15.5]
 95
          second level: [4. 2. 0. 5. 4. 2. 6. 2. 0. 10. 14. 26. 19. 21. 3. 28. 24. 4.]
 96
          third level: [7. 2. 3. 5. 1. 5. 2. 3. 4. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
 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: [ [ 4. 11. 3. 4.5 28. 25.5 1.5 1.5 21.5 4. 1.5 3.5 3.5 4.
104
      3.5 2.5 3. 15.5]
105
          second level: [4. 2. 0. 5. 4. 2. 6. 2. 0. 10. 14. 26. 19. 21. 3. 28. 24. 4.]
          third level: [7. 2. 3. 5. 1. 5. 2. 3. 4. 2. 2. 2. 3. 2. 6. 2. 4. 2.]]
106
107
        Objective function values and some other indicators:
                                Obj1 = 228.00
                                                          Obj0 + Obj1 = 258.00
108
          Obi0 = 30.00
          Total movement of crane: 54.00
109
110
          Total waiting time in berth position: 174.00
111
          Total index of q during berthing: 471.00
112
        Specific arrangement for each vessel:
                                                                                                  tail of i: 8.0
113
          V_id: 0
                              1i: 8.0
                                                  xi: 4.0
                                                                       bow of i: 0.0
                                                                                                                           gama_i0: 4.0
                                                                                                                                                       gama_i1: 5.0
                    duration_time_i: 1.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                      work load gap i: 0
114
          V_id: 1
                                                                         bow of i: 8.0
                              li: 6.0
                                                  xi: 11.0
                                                                                                    tail of i: 14.0
                                                                                                                                gama_i0: 2.0
                                                                                                                                                            gama_i1: 4
     .0
                       duration_time_i: 2.0
                                                          demand i: 60.0
                                                                                        work load i: 60.0
                                                                                                                         work load gap_i: 0
115
          V_id: 2
                              li: 3.0
                                                                                                  tail of i: 4.5
                                                                                                                           gama i0: 0.0
                                                                                                                                                       gama i1: 2.0
                                                                      bow of i: 1.5
                                                                                                                      work load gap_i: 0
                    duration_time_i: 2.0
                                                       demand_i: 120.0
                                                                                      work load_i: 120.0
116
          V_id: 3
                              li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                  tail of i: 9.0
                                                                                                                           gama_i0: 5.0
                                                                                                                                                       gama_i1: 6.0
                                                                                      work load_i: 100.0
                                                       demand i: 100.0
                    duration_time_i: 1.0
                                                                                                                      work load gap_i: 0
117
          V id: 4
                              li: 4.0
                                                                         bow of i: 26.0
                                                                                                    tail of i: 30.0
                                                                                                                                                            gama_i1: 8
                                                  xi: 28.0
                                                                                                                                gama i0: 4.0
                                                                                                                         work load gap_i: 0
     .0
                       duration time i: 4.0
                                                          demand_i: 80.0
                                                                                        work load i: 80.0
                                                                                                                                gama_i0: 2.0
118
          V id: 5
                              li: 9.0
                                                                         bow of i: 21.0
                                                                                                    tail of i: 30.0
                                                                                                                                                            gama i1:4
                                                                                        work load_i: 160.0
                                                                                                                         work load gap_i: 0
                       duration_time_i: 2.0
                                                          demand_i: 160.0
     .0
119
          V_id: 6
                              li: 3.0
                                                  xi: 1.5
                                                                      bow of i: 0.0
                                                                                                  tail of i: 3.0
                                                                                                                           gama i0: 6.0
                                                                                                                                                       gama_i1: 10.0
                    duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
                                                                       bow of i: 0.0
120
          V id: 7
                              li: 3.0
                                                   xi: 1.5
                                                                                                  tail of i: 3.0
                                                                                                                           gama_i0: 2.0
                                                                                                                                                       gama_i1: 3.0
                                                       demand i: 60.0
                                                                                      work load i: 60.0
                                                                                                                      work load gap i: 0
                    duration time i: 1.0
                                                                                                                                gama_i0: 0.0
                                                                         bow of i: 17.5
121
          V id: 8
                              li: 8.0
                                                  xi: 21.5
                                                                                                    tail of i: 25.5
                                                                                                                                                            gama_i1: 2
                                                                                        work load i: 100.0
     .0
                       duration time i: 2.0
                                                          demand i: 100.0
                                                                                                                         work load gap i: 0
122
                                                                                                                           gama_i0: 10.0
          V_id: 9
                              1i: 8.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 8.0
                                                                                                                                                       gama_i1: 14.0
                    duration_time_i: 4.0
                                                       demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                      work load gap_i: 0
          V_id: 10
                                                                         bow of i: 0.0
123
                                li: 3.0
                                                     xi: 1.5
                                                                                                     tail of i: 3.0
                                                                                                                              gama_i0: 14.0
                                                                                                                                                          gama_i1: 18.
     0
                                                       demand_i: 140.0
                                                                                      work load i: 140.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 4.0
124
          V id: 11
                                                     xi: 3.5
                                                                         bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                              gama i0: 26.0
                                                                                                                                                          gama i1: 28.
                                li: 7.0
     0
                    duration_time_i: 2.0
                                                       demand i: 60.0
                                                                                     work load_i: 60.0
                                                                                                                      work load gap_i: 0
125
                                                                         bow of i: 0.0
          V_id: 12
                                li: 7.0
                                                     xi: 3.5
                                                                                                     tail of i: 7.0
                                                                                                                              gama_i0: 19.0
                                                                                                                                                          gama_i1: 21.
     0
                    duration_time_i: 2.0
                                                       demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                      work load gap_i: 0
          V_id: 13
                                                                         bow of i: 0.0
                                                                                                                              gama_i0: 21.0
126
                                                                                                    tail of i: 8.0
                                li: 8.0
                                                     xi: 4.0
                                                                                                                                                          gama_i1: 24.
                                                       demand_i: 100.0
                                                                                                                      work load gap_i: 0
     0
                    duration_time_i: 3.0
                                                                                      work load i: 100.0
127
                                                                                                                              gama_i0: 3.0
          V id: 14
                                                     xi: 3.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 7.0
                                                                                                                                                          gama i1: 4.0
                                 li: 7.0
                                                       demand i: 80.0
                    duration time i: 1.0
                                                                                      work load i: 80.0
                                                                                                                      work load gap i: 0
128
          V_id: 15
                                                                         bow of i: 0.0
                                                                                                    tail of i: 5.0
                                                                                                                              gama_i0: 28.0
                                li: 5.0
                                                     xi: 2.5
                                                                                                                                                          gama i1: 31.
                                                       demand_i: 120.0
     0
                    duration_time_i: 3.0
                                                                                      work load_i: 120.0
                                                                                                                      work load gap_i: 0
129
          V_id: 16
                                                                         bow of i: 0.0
                                                                                                     tail of i: 6.0
                                                                                                                              gama_i0: 24.0
                                li: 6.0
                                                     xi: 3.0
                                                                                                                                                          gama_i1: 26.
     0
                    duration time i: 2.0
                                                       demand i: 120.0
                                                                                     work load i: 120.0
                                                                                                                      work load gap_i: 0
                                                                                                                                   gama_i0: 4.0
                                                                           bow of i: 12.5
130
          V_id: 17
                                                                                                       tail of i: 18.5
                                li: 6.0
                                                     xi: 15.5
                                                                                                                                                               gama il
                                                                                          work load i: 60.0
                         duration time i: 2.0
                                                            demand i: 60.0
                                                                                                                            work load gap_i: 0
131
132 Algorithm finished and the total CPU time: 1258 s
133 End
134
```