```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=30421
  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_15_10 _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 = 45
             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] = 63.20 temp_best_value_gen = 63.20
36
          The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
          obj[gen-1] = 63.20 temp_best_value_gen = 63.20
40
          No, maintain solution and obj[gen] = 63.20, and the tolerance_counter = 1
41
42
          solution chromosome =
43
             first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
44
             second level: [ 2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.]
45
             third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
46
47
          The No. 1 iteration is finished!
48
      Beging the No. 2 iteration:
49
50
          obj[gen-1] = 63.20 temp_best_value_gen = 63.20
51
          No, maintain solution and obj[gen] = 63.20, and the tolerance_counter = 2
52
          solution chromosome =
53
             first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
54
55
             second level: [2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.]
             third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
56
57
          The No. 2 iteration is finished!
58
59
      Beging the No. 3 iteration:
          obj[gen-1] = 63.20 temp_best_value_gen = 63.20
60
          No, maintain solution and obj[gen] = 63.20, and the tolerance_counter = 3
61
62
          solution chromosome =
63
             first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
64
        2.5]
65
             second level: [ 2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.]
             third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
66
67
          The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
          obj[gen-1] = 63.20 temp_best_value_gen = 63.20
70
71
          No, maintain solution and obj[gen] = 63.20, and the tolerance_counter = 4
72
          solution chromosome
73
             first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
74
75
             second level: [2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.]
             third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
76
         The No. 4 iteration is finished!
77
78
      Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 63.20 temp_best_value_gen = 63.20
 80
        No, maintain solution and obj[gen] = \overline{63.20}, and the tolerance_counter = 5
 81
 82
        solution chromosome =
 83
          first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
 84
 85
           second level: [ 2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.]
          third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
 86
 87
        The No. 5 iteration is finished!
 88
     Beging the No. 6 iteration:
 89
 90
        obj[gen-1] = 63.20 temp_best_value_gen = 63.20
 91
        No, maintain solution and obj[gen] = 63.20, and the tolerance_counter = 6
 92
        solution chromosome =
 93
          first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
 94
       2.5]
 95
          second level: [2, 3, 7, 0, 2, 4, 4, 0, 6, 7, 8, 10, 11, 13, 15,]
          third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
 96
 97
        The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
100
        obj[gen-1] = 63.20 temp_best_value_gen = 63.20
101
        No, maintain solution and obj[gen] = 63.20, and the tolerance_counter = 7
102
        solution chromosome =
103
          first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
104
105
          second level: [2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.]
          third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
106
107
        The No. 7 iteration is finished!
108
109
110
111 The iteration is terminated and then visulize the solution:
112
        solution chromosome =
          first level: [ [ 4.5 12. 17. 21.5 26.5 28. 4. 3.5 4. 4.5 3.5 4. 3.5 4.
113
114
          second level: [2. 3. 7. 0. 2. 4. 4. 0. 6. 7. 8. 10. 11. 13. 15.] third level: [2. 2. 4. 2. 4. 2. 2. 3. 6. 5. 4. 6. 5. 3. 2.]]
115
116
117
        Objective function values and some other indicators:
                                 Obj1 = 328.00
118
          Obi0 = 16.00
                                                           Obj0 + Obj1 = 344.00
119
           Total movement of crane: 48.00
120
          Total waiting time in berth position: 92.00
121
          Total index of q during berthing: 550.00
122
        Specific arrangement for each vessel:
123
           V_id: 0
                               li: 9.0
                                                   xi: 4.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 9.0
                                                                                                                              gama_i0: 2.0
                                                                                                                                                          gama i1: 4.0
                     duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                         work load gap_i: 0
                                                                                                                                   gama_i0: 3.0
124
           V_id: 1
                               li: 6.0
                                                   xi: 12.0
                                                                          bow of i: 9.0
                                                                                                      tail of i: 15.0
                                                                                                                                                               gama_i1: 7
     .0
                       duration_time_i: 4.0
                                                           demand_i: 140.0
                                                                                          work load_i: 140.0
                                                                                                                           work load gap_i: 0
125
           V_id: 2
                               li: 4.0
                                                   xi: 17.0
                                                                          bow of i: 15.0
                                                                                                      tail of i: 19.0
                                                                                                                                  gama_i0: 7.0
                                                                                                                                                               gama_i1: 9
                       duration time i: 2.0
                                                           demand i: 140.0
                                                                                                                           work load gap i: 0
     .0
                                                                                          work load i: 140.0
126
           V_id: 3
                               li: 5.0
                                                   xi: 21.5
                                                                          bow of i: 19.0
                                                                                                      tail of i: 24.0
                                                                                                                                   gama_i0: 0.0
                                                                                                                                                               gama i1:4
     .0
                       duration time i: 4.0
                                                           demand i: 160.0
                                                                                          work load i: 160.0
                                                                                                                           work load gap i: 0
127
           V_id: 4
                               li: 5.0
                                                   xi: 26.5
                                                                          bow of i: 24.0
                                                                                                      tail of i: 29.0
                                                                                                                                  gama_i0: 2.0
                                                                                                                                                               gama_i1: 4
                                                           demand_i: 100.0
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 2.0
                                                                                         work load i: 100.0
                                                                          bow of i: 26.0
128
           V_id: 5
                                                   xi: 28.0
                               li: 4.0
                                                                                                      tail of i: 30.0
                                                                                                                                   gama_i0: 4.0
                                                                                                                                                               gama_i1: 6
                       duration_time_i: 2.0
                                                           demand_i: 60.0
                                                                                          work load i: 60.0
                                                                                                                           work load gap_i: 0
     .0
129
           V id: 6
                               li: 8.0
                                                   xi: 4.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                             gama i0: 4.0
                                                                                                                                                          gama i1: 6.0
                     duration time i: 2.0
                                                        demand_i: 60.0
                                                                                       work load i: 60.0
                                                                                                                         work load gap i: 0
130
           V_id: 7
                               1i: 7.0
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                              gama_i0: 0.0
                                                                                                                                                          gama_i1: 2.0
                     duration_time_i: 2.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                         work load gap_i: 0
131
           V_id: 8
                                                                                                                                                          gama_i1: 7.0
                                                   xi: 4.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                             gama i0: 6.0
                               li: 8.0
                     duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                         work load gap_i: 0
132
           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: 8.0
                                                        demand i: 60.0
                     duration time i: 1.0
                                                                                       work load i: 60.0
                                                                                                                         work load gap i: 0
133
           V_id: 10
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                                gama_i0: 8.0
                                 li: 7.0
                                                      xi: 3.5
                                                                                                                                                            gama i1: 10.
                                                        demand\_i{:}\ 100.0
     0
                     duration_time_i: 2.0
                                                                                       work load_i: 100.0
                                                                                                                         work load gap_i: 0
134
           V_id: 11
                                                                          bow of i: 0.0
                                                                                                      tail of i: 8.0
                                                                                                                                gama_i0: 10.0
                                 li: 8.0
                                                      xi: 4.0
                                                                                                                                                            gama_i1: 11.
     0
                                                        demand i: 100.0
                                                                                                                         work load gap i: 0
                    duration time i: 1.0
                                                                                       work load i: 100.0
135
           V id: 12
                                                                          bow of i: 0.0
                                                                                                                                gama_i0: 11.0
                                 li: 7.0
                                                      xi: 3.5
                                                                                                      tail of i: 7.0
                                                                                                                                                            gama_i1: 13.
     0
                     duration_time_i: 2.0
                                                        demand i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                         work load gap i: 0
           V_id: 13
136
                                 li: 8.0
                                                      xi: 4.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 8.0
                                                                                                                                gama_i0: 13.0
                                                                                                                                                            gama_i1: 15.
     0
                                                        demand_i: 120.0
                     duration time i: 2.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap i: 0
137
                                                                          bow of i: 0.0
           V id: 14
                                 li: 5.0
                                                      xi: 2.5
                                                                                                      tail of i: 5.0
                                                                                                                                gama_i0: 15.0
                                                                                                                                                            gama_i1: 17.
     0
                     duration_time_i: 2.0
                                                        demand_i: 60.0
                                                                                       work load i: 60.0
                                                                                                                         work load gap_i: 0
138
139 Algorithm finished and the total CPU time: 1211 s
140 End
141
```