```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=30622
  2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
      sys.path.extend([E:\\] ===\\\\3 ====\\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 ====\\\1 =====\\\1 ====\\\1 ====\\\1 ====\\\1 ====\\\1 ===\\\1 ===\\\1 ==\\\1 ===\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 =\\\1 ==\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 
      01_My_Python_Code'])
  5
 6
     PyDev console: starting.
     Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 8
     python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
      Waiting 1s....
12
13
     This is the R_16_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 = 48
             Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
27
             Mutation rate = 0.95
28
             Mu_oper_type = 1
29
             vessel\_move\_way = 2
30
             coefficient for Obj1= 1.9
             coefficient for Obj2= 0.100000000000000009
31
32
33
      Iteration begin:
34
35
      Beging the No. 0 iteration:
         obj[0] = 70.94 temp_best_value_gen = 70.94
36
          The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
          obj[gen-1] = 70.94 temp_best_value_gen = 70.94
40
          No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 1
41
42
          solution chromosome =
43
             first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
44
      3.11 7.87]
             second level: [ 6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
45
             third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
46
47
         The No. 1 iteration is finished!
48
49
      Beging the No. 2 iteration:
50
          obj[gen-1] = 70.94 temp_best_value_gen = 70.94
51
          No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 2
52
          solution chromosome =
53
             first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
54
55
             second level: [6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
             third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
56
57
          The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
          obj[gen-1] = 70.94 temp_best_value_gen = 70.94
60
          No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 3
61
62
          solution chromosome =
63
             first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
64
      3.11 7.871
             second level: [ 6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
65
             third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
66
67
          The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
          obj[gen-1] = 70.94 temp_best_value_gen = 70.94
70
71
          No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 4
73
             first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
74
75
             second level: [ 6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
             third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
76
         The No. 4 iteration is finished!
77
78
      Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 70.94 temp_best_value_gen = 70.94
 80
 81
       No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 5
       solution chromosome =
 82
 83
          first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
          second level: [ 6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
 85
          third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 70.94 temp_best_value_gen = 70.94
 90
 91
        No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
 94
      3.11 7.87]
 95
          second level: [6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
          third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
 96
 97
        The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
       obj[gen-1] = 70.94 temp_best_value_gen = 70.94
100
101
        No, maintain solution and obj[gen] = 70.94, and the tolerance_counter = 7
102
        solution chromosome =
103
          first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
104
     3.11 7.87]
105
          second level: [ 6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
          third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
106
        The No. 7 iteration is finished!
107
108
109
110
    The iteration is terminated and then visulize the solution:
111
112
        solution chromosome =
          first level: [ [6.93 5.93 6.09 3.6 4.07 3.88 1.62 8.68 2.99 2.58 3.38 4.31 5.24 3.42
113
114
           second level: [ 6. 2. 0. 3. 4. 10. 11. 11. 14. 15. 17. 19. 21. 22. 24. 12.]
115
          third level: [2. 7. 4. 4. 2. 7. 2. 9. 3. 4. 3. 2. 5. 3. 4. 6.]]
116
117
        Objective function values and some other indicators:
                                 Obj1 = 234.39
          Obi0 = 25.00
                                                          Obi0 + Obi1 = 259.39
118
119
          Total movement of crane: 43.39
120
          Total waiting time in berth position: 191.00
121
          Total index of q during berthing: 244.00
122
        Specific arrangement for each vessel:
123
          V_id: 0
                              li: 9.0
                                                   xi: 6.9
                                                                       bow of i: 2.4
                                                                                                   tail of i: 11.4
                                                                                                                               gama i0: 6.0
                                                                                                                                                            gama i1: 10.
                     duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
124
          V_id: 1
                              li: 7.0
                                                   xi: 5.9
                                                                       bow of i: 2.4
                                                                                                   tail of i: 9.4
                                                                                                                             gama_i0: 2.0
                                                                                                                                                         gama_i1: 3.0
                     duration_time_i: 1.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
125
           V_id: 2
                              li: 7.0
                                                   xi: 6.1
                                                                       bow of i: 2.6
                                                                                                   tail of i: 9.6
                                                                                                                             gama_i0: 0.0
                                                                                                                                                         gama_i1: 2.0
                                                        demand i: 140.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap_i: 0
                     duration time i: 2.0
                                                                                                                             gama_i0: 3.0
126
          V id: 3
                              li: 5.0
                                                   xi: 3.6
                                                                       bow of i: 1.1
                                                                                                   tail of i: 6.1
                                                                                                                                                         gama_i1: 4.0
                     duration time i: 1.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap i: 0
                                                                       bow of i: 1.6
127
          V_id: 4
                              li: 5.0
                                                                                                   tail of i: 6.6
                                                                                                                             gama_i0: 4.0
                                                                                                                                                         gama_i1: 6.0
                                                        demand_i: 80.0
                     duration_time_i: 2.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap i: 0
          V_id: 5
128
                                                   xi: 3.9
                              li: 7.0
                                                                       bow of i: 0.4
                                                                                                   tail of i: 7.4
                                                                                                                             gama_i0: 10.0
                                                                                                                                                         gama_i1: 11.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 1.0
129
           V id: 6
                                                                       bow of i: 0.1
                                                                                                   tail of i: 3.1
                                                                                                                             gama i0: 11.0
                              li: 3.0
                                                   xi: 1.6
                                                                                                                                                         gama i1: 14.0
                                                        demand_i: 100.0
                                                                                       work load i: 100.0
                                                                                                                        work load gap_i: 0
                     duration time i: 3.0
130
           V_id: 7
                              li: 9.0
                                                   xi: 8.7
                                                                       bow of i: 4.2
                                                                                                   tail of i: 13.2
                                                                                                                               gama_i0: 11.0
                                                                                                                                                            gama_i1: 12.
                                                        demand_i: 140.0
     0
                    duration_time_i: 1.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
131
           V_id: 8
                                                                                                                             gama i0: 14.0
                                                                                                                                                         gama_i1: 15.0
                              li: 5.0
                                                   xi: 3.0
                                                                       bow of i: 0.5
                                                                                                   tail of i: 5.5
                     duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
132
           V id: 9
                                                   xi: 2.6
                                                                       bow of i: 0.1
                                                                                                   tail of i: 5.1
                                                                                                                             gama i0: 15.0
                                                                                                                                                         gama i1: 17.0
                              li: 5.0
                                                        demand i: 160.0
                    duration time i: 2.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap i: 0
133
          V_id: 10
                                                                         bow of i: 0.9
                                                                                                                               gama_i0: 17.0
                                 li: 5.0
                                                                                                      tail of i: 5.9
                                                                                                                                                           gama i1: 19.
                                                      xi: 3.4
     0
                     duration_time_i: 2.0
                                                        demand_i: 100.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
134
                                                                          bow of i: 0.8
                                                                                                                               gama_i0: 19.0
                                 li: 7.0
                                                      xi: 4.3
                                                                                                      tail of i: 7.8
                                                                                                                                                            gama_i1: 21.
     0
                                                        demand i: 80.0
                                                                                                                        work load gap i: 0
                    duration time i: 2.0
                                                                                       work load i: 80.0
135
           V id: 12
                                 li: 6.0
                                                      xi: 5.2
                                                                          bow of i: 2.2
                                                                                                      tail of i: 8.2
                                                                                                                               gama_i0: 21.0
                                                                                                                                                            gama_i1: 22.
     0
                    duration_time_i: 1.0
                                                        demand i: 100.0
                                                                                       work load i: 100.0
                                                                                                                        work load gap i: 0
136
           V_id: 13
                                 li: 6.0
                                                      xi: 3.4
                                                                          bow of i: 0.4
                                                                                                      tail of i: 6.4
                                                                                                                               gama_i0: 22.0
                                                                                                                                                            gama_i1: 24.
     0
                                                        demand_i: 100.0
                                                                                                                        work load gap_i: 0
                    duration time i: 2.0
                                                                                       work load i: 100.0
137
           V id: 14
                                 li: 4.0
                                                      xi: 3.1
                                                                          bow of i: 1.1
                                                                                                      tail of i: 5.1
                                                                                                                               gama_i0: 24.0
                                                                                                                                                            gama_i1: 26.
     0
                    duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
138
           V id: 15
                                 li: 8.0
                                                                          bow of i: 3.9
                                                                                                      tail of i: 11.9
                                                                                                                                 gama i0: 12.0
                                                      xi: 7.9
                                                                                                                                                              gama i1:
                         duration_time_i: 2.0
                                                                                           work load_i: 140.0
                                                                                                                             work load gap_i: 0
     14.0
                                                             demand i: 140.0
139
140
    Algorithm finished and the total CPU time: 1282 s
141 End
142
```