```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=8533
  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_15_2 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
      Iteration begin:
34
35
      Beging the No. 0 iteration:
         obj[0] = 105.95 temp_best_value_gen = 105.95
36
          The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
          obj[gen-1] = 105.95 temp_best_value_gen = 105.95
          No, maintain solution and o\overline{bj}[gen] = 105.95, and the tolerance counter = 1
41
42
          solution chromosome =
43
             first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
44
             second level: [13. 0. 5. 7. 8. 11. 5. 12. 2. 3. 17. 19. 21. 23. 25.]
45
             third level: [2. 2. 3. 5. 3. 7. 7. 8. 3. 4. 4. 4. 3. 3. 2.]]
46
47
         The No. 1 iteration is finished!
48
49
      Beging the No. 2 iteration:
50
          obj[gen-1] = 105.95 temp_best_value_gen = 105.95
          No, maintain solution and obj[gen] = 1\overline{05.95}, and the tolerance_counter = 2
51
52
          solution chromosome =
             first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
53
54
55
             second level: [13. 0. 5. 7. 8. 11. 5. 12. 2. 3. 17. 19. 21. 23. 25.]
             third level: [2. 2. 3. 5. 3. 7. 7. 8. 3. 4. 4. 4. 3. 3. 2.]]
56
57
          The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
          obj[gen-1] = 105.95 temp_best_value_gen = 105.95
60
          No, maintain solution and obj[gen] = 105.95, and the tolerance_counter = 3
61
62
          solution chromosome =
             first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
63
64
      2.32]
65
             second level: [13. 0. 5. 7. 8. 11. 5. 12. 2. 3. 17. 19. 21. 23. 25.]
             third level: [2. 2. 3. 5. 3. 7. 7. 8. 3. 4. 4. 4. 3. 3. 2.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
          obj[gen-1] = 105.95 temp_best_value_gen = 105.95
70
71
          No, maintain solution and obj[gen] = 105.95, and the tolerance counter = 4
             first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
73
74
             second level: [13, 0, 5, 7, 8, 11, 5, 12, 2, 3, 17, 19, 21, 23, 25,] third level: [2, 2, 3, 5, 3, 7, 7, 8, 3, 4, 4, 4, 3, 3, 2,]]
75
76
         The No. 4 iteration is finished!
77
78
      Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 105.95 temp_best_value_gen = 105.95
 80
        No, maintain solution and obj[gen] = 105.95, and the tolerance_counter = 5
 81
 82
        solution chromosome =
 83
          first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
 84
          second level: [13, 0, 5, 7, 8, 11, 5, 12, 2, 3, 17, 19, 21, 23, 25,] third level: [2, 2, 3, 5, 3, 7, 7, 8, 3, 4, 4, 4, 3, 3, 2,]]
 85
 86
 87
        The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
        obj[gen-1] = 105.95 temp_best_value_gen = 105.95
 90
 91
        No, maintain solution and obj[gen] = 105.95, and the tolerance_counter = 6
 92
        solution chromosome =
 93
          first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
 94
      2.32]
 95
          second level: [13. 0. 5. 7. 8. 11. 5. 12. 2. 3. 17. 19. 21. 23. 25.]
          third level: [2. 2. 3. 5. 3. 7. 7. 8. 3. 4. 4. 4. 3. 3. 2.]]
 96
 97
        The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
100
        obj[gen-1] = 105.95 temp_best_value_gen = 105.95
101
        No, maintain solution and obj[gen] = 105.95, and the tolerance_counter = 7
102
        solution chromosome =
103
          first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
104
105
          second level: [13. 0. 5. 7. 8. 11. 5. 12. 2. 3. 17. 19. 21. 23. 25.]
          third level: [2. 2. 3. 5. 3. 7. 7. 8. 3. 4. 4. 4. 3. 3. 2.]]
106
        The No. 7 iteration is finished!
107
108
109
110
111 The iteration is terminated and then visulize the solution:
112
        solution chromosome =
          first level: [ [4.52 1.96 1.69 4.75 3.41 4.9 7.36 6.19 4.69 4.47 3.7 2.6 1.83 1.77
113
114
          second level: [13. 0. 5. 7. 8. 11. 5. 12. 2. 3. 17. 19. 21. 23. 25.] third level: [2. 2. 3. 5. 3. 7. 7. 8. 3. 4. 4. 4. 3. 3. 2.]]
115
116
117
        Objective function values and some other indicators:
          Obi0 = 27.00
                                  Obj1 = 546.51
                                                           Obj0 + Obj1 = 573.51
118
119
          Total movement of crane: 40.51
120
          Total waiting time in berth position: 171.00
121
          Total index of q during berthing: 123.00
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: 13.0
                                                                                                                                                            gama i1: 16.0
                     duration_time_i: 3.0
                                                         demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                          work load gap_i: 0
124
          V_id: 1
                               1i: 3.0
                                                    xi: 2.0
                                                                         bow of i: 0.5
                                                                                                     tail of i: 3.5
                                                                                                                               gama i0: 0.0
                                                                                                                                                            gama_i1: 2.0
                     duration_time_i: 2.0
                                                         demand_i: 60.0
                                                                                        work load_i: 60.0
                                                                                                                          work load gap_i: 0
125
          V_id: 2
                               li: 3.0
                                                                         bow of i: 0.2
                                                                                                     tail of i: 3.2
                                                                                                                               gama_i0: 5.0
                                                                                                                                                            gama_i1: 7.0
                     duration time i: 2.0
                                                                                        work load i: 100.0
                                                                                                                          work load gap_i: 0
                                                         demand i: 100.0
126
                                                                                                                               gama_i0: 7.0
          V id: 3
                               li: 8.0
                                                    xi: 4.7
                                                                         bow of i: 0.7
                                                                                                     tail of i: 8.7
                                                                                                                                                            gama_i1: 8.0
                     duration time i: 1.0
                                                         demand i: 100.0
                                                                                        work load i: 100.0
                                                                                                                          work load gap i: 0
127
          V_id: 4
                               li: 5.0
                                                                         bow of i: 0.9
                                                                                                     tail of i: 5.9
                                                                                                                               gama_i0: 8.0
                                                                                                                                                            gama_i1: 11.0
                                                         demand_i: 140.0
                     duration_time_i: 3.0
                                                                                        work load_i: 140.0
                                                                                                                          work load gap_i: 0
128
          V_id: 5
                                                    xi: 4.9
                                                                         bow of i: 0.9
                               li: 8.0
                                                                                                     tail of i: 8.9
                                                                                                                               gama_i0: 11.0
                                                                                                                                                            gama_i1: 12.0
                                                         demand_i: 120.0
                                                                                        work load i: 120.0
                                                                                                                          work load gap_i: 0
                     duration_time_i: 1.0
129
           V id: 6
                                                                        bow of i: 3.4
                                                                                                     tail of i: 11.4
                                                                                                                                 gama i0: 5.0
                                                                                                                                                              gama i1: 6.0
                               li: 8.0
                                                    xi: 7.4
                                                         demand_i: 100.0
                     duration_time_i: 1.0
                                                                                        work load i: 100.0
                                                                                                                          work load gap_i: 0
                                                                        bow of i: 1.7
130
           V_id: 7
                               li: 9.0
                                                    xi: 6.2
                                                                                                     tail of i: 10.7
                                                                                                                                 gama_i0: 12.0
                                                                                                                                                              gama_i1: 13.
                                                         demand_i: 60.0
                     duration_time_i: 1.0
                                                                                        work load_i: 60.0
                                                                                                                          work load gap_i: 0
131
           V_id: 8
                                                                                                                               gama i0: 2.0
                                                                                                                                                            gama_i1: 3.0
                                                    xi: 4.7
                                                                        bow of i: 3.2
                                                                                                     tail of i: 6.2
                               li: 3.0
                     duration_time_i: 1.0
                                                         demand i: 60.0
                                                                                        work load_i: 60.0
                                                                                                                          work load gap_i: 0
132
           V id: 9
                                                    xi: 4.5
                                                                         bow of i: 1.5
                                                                                                     tail of i: 7.5
                                                                                                                               gama i0: 3.0
                               li: 6.0
                                                                                                                                                            gama_i1: 5.0
                                                         demand i: 100.0
                     duration time i: 2.0
                                                                                        work load i: 100.0
                                                                                                                          work load gap i: 0
133
           V_id: 10
                                                                           bow of i: 1.7
                                                                                                                                 gama_i0: 17.0
                                 li: 4.0
                                                                                                       tail of i: 5.7
                                                                                                                                                              gama i1: 19.
                                                       xi: 3.7
     0
                     duration_time_i: 2.0
                                                         demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                          work load gap_i: 0
134
                                                                                                                                 gama_i0: 19.0
                                 li: 4.0
                                                       xi: 2.6
                                                                           bow of i: 0.6
                                                                                                        tail of i: 4.6
                                                                                                                                                              gama_i1: 21.
     0
                                                         demand i: 120.0
                                                                                                                          work load gap i: 0
                    duration time i: 2.0
                                                                                        work load i: 120.0
135
           V id: 12
                                                                                                                                  gama_i0: 21.0
                                 li: 3.0
                                                       xi: 1.8
                                                                           bow of i: 0.3
                                                                                                        tail of i: 3.3
                                                                                                                                                              gama_i1: 23.
     0
                     duration_time_i: 2.0
                                                         demand i: 100.0
                                                                                        work load i: 100.0
                                                                                                                          work load gap i: 0
           V_id: 13
136
                                 li: 3.0
                                                       xi: 1.8
                                                                           bow of i: 0.3
                                                                                                       tail of i: 3.3
                                                                                                                                 gama_i0: 23.0
                                                                                                                                                              gama_i1: 25.
     0
                                                         demand_i: 120.0
                                                                                                                          work load gap_i: 0
                     duration time i: 2.0
                                                                                        work load i: 120.0
                                                                           bow of i: 0.8
137
           V id: 14
                                 li: 3.0
                                                       xi: 2.3
                                                                                                       tail of i: 3.8
                                                                                                                                 gama_i0: 25.0
                                                                                                                                                              gama_i1: 28.
                     duration_time_i: 3.0
     0
                                                         demand_i: 120.0
                                                                                        work load i: 120.0
                                                                                                                          work load gap_i: 0
138
139 Algorithm finished and the total CPU time: 1261 s
140 End
141
```