```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=46886
2
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01_My_Python_Code'])
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')
  Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s.....
12
13
  This is the R_2_1 _standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
18
     Read basic data
19
     Parameter setting:
       trail = 38
20
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 5
23
       Chrom\_size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.75
26
       Crossover rate = 0.9
27
       Mutation rate = 0.8
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.0
       coefficient for Obj2= 1.0
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
36
     obj[0] = 18.00 temp_best_value_gen = 18.00
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 18.00 temp_best_value_gen = 12.00
     Yes, update solution and obj[gen] = 12.00
41
     solution chromosome =
42
43
       first level: [ [2. 8.]
       second level: [4, 1,]
44
       third level: [2. 3.]]
45
     The No. 1 iteration is finished!
46
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 12.00 temp_best_value_gen = 12.00
49
50
     No, maintain solution and obj[gen] = 12.00, and the tolerance_counter = 1
51
     solution chromosome =
       first level: [ [2. 8.]
52
       second level: [4. 1.]
53
54
       third level: [2. 3.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 12.00 temp best value gen = 12.00
59
     No, maintain solution and obj[gen] = 12.00, and the tolerance_counter = 2
60
     solution chromosome =
61
       first level: [ [2. 8.]
62
       second level: [4. 1.]
       third level: [2. 3.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 12.00 temp_best_value_gen = 11.00
68
     Yes, update solution and obj[gen] = 11.00
69
     solution chromosome =
70
       first level: [ [8. 4.]
       second level: [1. 4.]
71
       third level: [3. 2.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 11.00 temp best value gen = 10.00
76
     Yes, update solution and obj[gen] = 10.00
77
     solution chromosome =
78
       first level: [ [2. 8.]
```

```
80
          second level: [4, 1,]
 81
          third level: [4. 3.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 10.00 temp best value gen = 5.00
       Yes, update solution and obj[gen] = 5.00
 86
 87
       solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [1, 1,]
 90
          third level: [3. 3.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
       obj[gen-1] = 5.00 temp_best_value_gen = 5.00
 95
       No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 1
 96
       solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [1. 1.]
 99
          third level: [3. 3.]
       The No. 7 iteration is finished!
100
101
102
     Beging the No. 8 iteration:
       obj[gen-1] = 5.00 temp best value gen = 5.00
103
104
       No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 2
105
       solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [1.1.]
108
          third level: [3. 3.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
       obj[gen-1] = 5.00 temp_best_value_gen = 5.00
113
       No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 3
114
       solution chromosome =
115
          first level: [ [2. 8.]
116
          second level: [1. 1.]
117
          third level: [3. 3.]]
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 5.00 temp best value gen = 5.00
       No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 4
122
123
       solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [1. 1.]
126
          third level: [3. 3.]]
127
       The No. 10 iteration is finished!
128
129
     Beging the No. 11 iteration:
130
       obj[gen-1] = 5.00 temp_best_value_gen = 5.00
131
       No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 5
132
       solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [1. 1.]
135
          third level: [3. 3.]]
136
       The No. 11 iteration is finished!
137
138
139
140 The iteration is terminated and then visulize the solution:
141
       solution chromosome =
142
          first level: [ [2. 8.]
          second level: [1. 1.]
143
          third level: [3. 3.]]
144
145
       Objective function values and some other indicators:
                                                      Obj0 + Obj1 = 5.00
146
          Obj0 = 3.00
                                Obj1 = 2.00
          Total movement of crane: 0.00
147
148
          Total waiting time in berth position: 2.00
149
          Total index of q during berthing: 37.00
150
       Specific arrangement for each vessel:
                                                                                                 tail of i: 4.0
151
          V_id: 0
                             li: 4.0
                                                 xi: 2.0
                                                                     bow of i: 0.0
                                                                                                                          gama_i0: 1.0
                                                                                                                                                     gama_i1: 4.0
                    duration_time_i: 3.0
                                                      demand_i: 160.0
                                                                                     work load_i: 160.0
                                                                                                                     work load gap_i: 0
152
                                                                     bow of i: 4.0
                                                                                                tail of i: 12.0
          V id: 1
                             li: 8.0
                                                                                                                            gama i0: 1.0
                                                                                                                                                       gama i1: 3.0
                    duration_time_i: 2.0
                                                      demand_i: 120.0
                                                                                    work load_i: 120.0
                                                                                                                     work load gap_i: 0
153
154 Algorithm finished and the total CPU time: 91 s
155 End
156
```