```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=52946
2
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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.
12
13
  This is the R_8_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 = 24
       Iter_num_GA = 300
24
25
       Select_rate = 0.85
26
       Crossover rate = 0.95
       Mutation rate = 0.95
27
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] = 15.30 temp_best_value_gen = 15.30
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 15.30 temp_best_value_gen = 15.30
40
     No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [[3. 9. 14. 18. 22. 26. 28.5 4.]
       second level: [3. 2. 0. 1. 3. 4. 1. 4.]
44
45
       third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 15.30 temp_best_value_gen = 15.30
49
50
     No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 2
51
     solution chromosome =
       first level: [[3. 9. 14. 18. 22. 26. 28.5 4.]
52
       second level: [3. 2. 0. 1. 3. 4. 1. 4.]
53
54
       third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 15.30 temp best value gen = 15.30
59
     No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [[3. 9. 14. 18. 22. 26. 28.5 4.]
62
       second level: [3. 2. 0. 1. 3. 4. 1. 4.]
       third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 15.30 temp_best_value_gen = 15.30
68
     No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
       second level: [3. 2. 0. 1. 3. 4. 1. 4.]
71
       third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 15.30 temp best value gen = 15.30
76
     No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 5
77
78
     solution chromosome =
       first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
```

```
second level: [3. 2. 0. 1. 3. 4. 1. 4.]
 80
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 15.30 temp best value gen = 15.30
       No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
 89
          second level: [3. 2. 0. 1. 3. 4. 1. 4.]
 90
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 15.30 temp_best_value_gen = 15.30
 95
        No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
 98
          second level: [3. 2. 0. 1. 3. 4. 1. 4.]
 99
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obj[gen-1] = 15.30 temp best value gen = 15.30
103
104
       No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
106
          second level: [3. 2. 0. 1. 3. 4. 1. 4.]
107
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 15.30 temp\_best\_value\_gen = 15.30
        No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 9
113
114
       solution chromosome =
115
          first level: [[3. 9. 14. 18. 22. 26. 28.5 4.]
116
          second level: [3. 2. 0. 1. 3. 4. 1. 4.]
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 15.30 temp_best_value_gen = 15.30
122
       No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
          second level: [3. 2. 0. 1. 3. 4. 1. 4.]
125
126
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
127
        The No. 10 iteration is finished!
128
129
130
131 The iteration is terminated and then visulize the solution:
132
       solution chromosome =
          first level: [ [ 3. 9. 14. 18. 22. 26. 28.5 4. ]
133
134
          second level: [3. 2. 0. 1. 3. 4. 1. 4.]
135
          third level: [4. 5. 2. 2. 4. 3. 2. 3.]]
136
        Objective function values and some other indicators:
137
          Obj0 = 5.00
                                Obj1 = 58.00
                                                       Obj0 + Obj1 = 63.00
138
          Total movement of crane: 40.00
139
          Total waiting time in berth position: 18.00
140
          Total index of q during berthing: 503.00
141
        Specific arrangement for each vessel:
142
          V id: 0
                              li: 6.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 6.0
                                                                                                                           gama i0: 3.0
                                                                                                                                                       gama i1: 4.0
                    duration_time_i: 1.0
                                                       demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                      work load gap_i: 0
143
          V_id: 1
                              li: 6.0
                                                   xi: 9.0
                                                                      bow of i: 6.0
                                                                                                  tail of i: 12.0
                                                                                                                              gama_i0: 2.0
                                                                                                                                                          gama_i1: 3.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 1.0
144
          V id: 2
                                                                         bow of i: 12.0
                                                                                                     tail of i: 16.0
                                                                                                                                 gama i0: 0.0
                              li: 4.0
                                                  xi: 14.0
                                                                                                                                                            gama_i1: 2
                       duration time i: 2.0
                                                                                        work load_i: 60.0
                                                                                                                         work load gap_i: 0
     .0
                                                          demand_i: 60.0
                                                                                                                                 gama_i0: 1.0
145
          V id: 3
                              li: 4.0
                                                   xi: 18.0
                                                                         bow of i: 16.0
                                                                                                     tail of i: 20.0
                                                                                                                                                            gama i1:5
     .0
                       duration_time_i: 4.0
                                                          demand_i: 160.0
                                                                                        work load_i: 160.0
                                                                                                                         work load gap_i: 0
146
                                                                         bow of i: 20.0
          V_id: 4
                                                  xi: 22.0
                                                                                                     tail of i: 24.0
                                                                                                                                gama_i0: 3.0
                              li: 4.0
                                                                                                                                                            gama i1:4
                                                                                        work load_i: 60.0
     .0
                       duration_time_i: 1.0
                                                          demand_i: 60.0
                                                                                                                         work load gap_i: 0
147
          V_id: 5
                              li: 4.0
                                                                         bow of i: 24.0
                                                                                                     tail of i: 28.0
                                                                                                                                 gama_i0: 4.0
                                                   xi: 26.0
                                                                                                                                                            gama_i1: 6
                       duration time i: 2.0
                                                          demand_i: 100.0
                                                                                        work load_i: 100.0
                                                                                                                         work load gap i: 0
     .0
148
          V_id: 6
                                                  xi: 28.5
                                                                         bow of i: 27.0
                                                                                                     tail of i: 30.0
                              1i: 3.0
                                                                                                                                 gama_i0: 1.0
                                                                                                                                                            gama_i1: 4
                                                                                        work load i: 120.0
                       duration time i: 3.0
                                                          demand i: 120.0
                                                                                                                         work load gap i: 0
149
          V_id: 7
                              li: 8.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 8.0
                                                                                                                           gama_i0: 4.0
                                                                                                                                                       gama_i1: 6.0
                    duration_time_i: 2.0
                                                                                                                       work load gap_i: 0
                                                       demand i: 120.0
                                                                                      work load_i: 120.0
151
    Algorithm finished and the total CPU time: 990 s
152
    End
153
```