```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=31312
 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.
   Waiting 1s....
12
13
   This is the R_16_3 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
       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
34
   Iteration begin:
35
   Beging the No. 0 iteration:
     obj[0] = 57.80 temp_best_value_gen = 57.80
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
     obj[gen-1] = 57.80 temp_best_value_gen = 57.80
40
     No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
44
    2. 4.]
       second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0. 11. 13. 16. 17. 21. 22.]
45
46
       third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
47
     The No. 1 iteration is finished!
48
49
   Beging the No. 2 iteration:
50
     obj[gen-1] = 57.80 temp_best_value_gen = 57.80
51
     No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 2
52
     solution chromosome =
53
       first level: [[2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
54
       4.]
55
       second level: [4, 6, 5, 2, 6, 1, 6, 2, 9, 0, 11, 13, 16, 17, 21, 22,]
       third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
56
57
     The No. 2 iteration is finished!
58
59
   Beging the No. 3 iteration:
     obj[gen-1] = 57.80 temp_best_value_gen = 57.80
60
     No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 3
61
62
     solution chromosome =
63
       first level: [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
64
65
       second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0.11.13.16.17.21.22.]
       third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
66
67
     The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
     obj[gen-1] = 57.80 temp_best_value_gen = 57.80
70
71
     No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 4
     solution chromosome =
73
       first level: [ [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
74
75
       second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0. 11. 13. 16. 17. 21. 22.]
       third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
76
     The No. 4 iteration is finished!
77
78
   Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 57.80 temp_best_value_gen = 57.80
       No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 5
 81
       solution chromosome =
 82
 83
          first level: [ [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
 84
 85
          second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0. 11. 13. 16. 17. 21. 22.]
          third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
 90
        obj[gen-1] = 57.80 temp_best_value_gen = 57.80
 91
        No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
 94
          4.]
 95
          second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0. 11. 13. 16. 17. 21. 22.]
          third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
 96
 97
        The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
100
       obj[gen-1] = 57.80 temp_best_value_gen = 57.80
101
        No, maintain solution and obj[gen] = 57.80, and the tolerance_counter = 7
102
        solution chromosome =
          first level: [ [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
103
104
          4. ]
105
          second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0. 11. 13. 16. 17. 21. 22.]
          third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
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: [ [ 2. 8. 15. 22.5 25.5 3.5 2. 2.5 3.5 3. 1.5 1.5 3.5 2.
113
114
          second level: [4. 6. 5. 2. 6. 1. 6. 2. 9. 0.11.13.16.17.21.22.]
115
          third level: [4. 4. 3. 2. 2. 4. 2. 3. 6. 4. 2. 2. 3. 2. 4. 4.]]
116
117
        Objective function values and some other indicators:
                                Obj1 = 141.00
118
          Obi0 = 23.00
                                                          Obj0 + Obj1 = 164.00
119
          Total movement of crane: 0.00
120
          Total waiting time in berth position: 141.00
121
          Total index of q during berthing: 427.00
122
        Specific arrangement for each vessel:
123
          V_id: 0
                              li: 4.0
                                                  xi: 2.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 4.0
                                                                                                                            gama_i0: 4.0
                                                                                                                                                       gama i1: 6.0
                    duration_time_i: 2.0
                                                       demand_i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
124
          V_id: 1
                              li: 8.0
                                                  xi: 8.0
                                                                       bow of i: 4.0
                                                                                                  tail of i: 12.0
                                                                                                                              gama_i0: 6.0
                                                                                                                                                          gama_i1: 8.0
                    duration_time_i: 2.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
                                                                                                                                gama_i0: 5.0
125
          V id: 2
                              li: 6.0
                                                                         bow of i: 12.0
                                                                                                     tail of i: 18.0
                                                                                                                                                            gama_i1: 7
                       duration time i: 2.0
                                                                                        work load i: 120.0
                                                                                                                         work load gap_i: 0
     .0
                                                          demand i: 120.0
126
                              li: 9.0
                                                  xi: 22.5
          V_id: 3
                                                                         bow of i: 18.0
                                                                                                     tail of i: 27.0
                                                                                                                                 gama_i0: 2.0
                                                                                                                                                            gama_i1: 6
     .0
                       duration time i: 4.0
                                                          demand i: 160.0
                                                                                        work load i: 160.0
                                                                                                                         work load gap i: 0
127
                              li: 9.0
          V_id: 4
                                                                         bow of i: 21.0
                                                                                                     tail of i: 30.0
                                                                                                                                gama_i0: 6.0
                                                                                                                                                            gama_i1: 9
                       duration_time_i: 3.0
                                                          demand_i: 100.0
                                                                                        work load i: 100.0
                                                                                                                         work load gap_i: 0
     .0
                                                  xi: 3.5
128
          V_id: 5
                              1i: 7.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 7.0
                                                                                                                           gama_i0: 1.0
                                                                                                                                                       gama_i1: 2.0
                                                       demand_i: 60.0
                                                                                      work load i: 60.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 1.0
129
          V id: 6
                              li: 4.0
                                                  xi: 2.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 4.0
                                                                                                                           gama i0: 6.0
                                                                                                                                                       gama i1: 9.0
                                                       demand\_i{:}\ 120.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap i: 0
                    duration time i: 3.0
                                                                      bow of i: 0.0
130
          V_id: 7
                              li: 5.0
                                                  xi: 2.5
                                                                                                  tail of i: 5.0
                                                                                                                            gama_i0: 2.0
                                                                                                                                                       gama_i1: 4.0
                                                       demand_i: 100.0
                    duration_time_i: 2.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
131
          V_id: 8
                                                                                                  tail of i: 7.0
                                                                                                                                                       gama_i1: 11.0
                                                  xi: 3.5
                                                                      bow of i: 0.0
                                                                                                                           gama i0: 9.0
                              li: 7.0
                    duration_time_i: 2.0
                                                       demand i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
                                                                                                                                                       gama_i1: 1.0
132
          V id: 9
                                                  xi: 3.0
                                                                       bow of i: 0.0
                                                                                                  tail of i: 6.0
                                                                                                                            gama i0: 0.0
                              li: 6.0
                                                       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
                                                                                                                              gama_i0: 11.0
                                                                                                                                                          gama_i1: 13.
                                li: 3.0
                                                                                                     tail of i: 3.0
                                                     xi: 1.5
     0
                    duration_time_i: 2.0
                                                       demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
134
                                                                         bow of i: 0.0
                                                                                                                              gama_i0: 13.0
                                li: 3.0
                                                     xi: 1.5
                                                                                                     tail of i: 3.0
                                                                                                                                                          gama_i1: 16.
     0
                                                       demand i: 100.0
                                                                                                                       work load gap i: 0
                    duration time i: 3.0
                                                                                      work load i: 100.0
135
          V id: 12
                                                                                                                              gama_i0: 16.0
                                li: 7.0
                                                     xi: 3.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 7.0
                                                                                                                                                          gama_i1: 17.
     0
                    duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap i: 0
          V_id: 13
136
                                                                         bow of i: 0.0
                                li: 4.0
                                                     xi: 2.0
                                                                                                     tail of i: 4.0
                                                                                                                              gama_i0: 17.0
                                                                                                                                                          gama_i1: 21.
     0
                    duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap i: 0
137
          V_id: 14
                                li: 4.0
                                                     xi: 2.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 4.0
                                                                                                                              gama_i0: 21.0
                                                                                                                                                          gama_i1: 22.
     0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 1.0
                                                       demand_i: 60.0
                                                                                      work load_i: 60.0
                                                     xi: 4.0
138
          V id: 15
                                li: 8.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 8.0
                                                                                                                              gama i0: 22.0
                                                                                                                                                          gama i1: 24.
                    duration_time_i: 2.0
                                                       demand i: 120.0
                                                                                     work load_i: 120.0
                                                                                                                       work load gap_i: 0
     0
139
140 Algorithm finished and the total CPU time: 1286 s
141 End
142
```