```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=4425
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01 My Python Code', 'E:/1 0000/3 00000/1 000000/1 0000000/1 000000 0000/1 LW 00002/6 0000/2 python code/
   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')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s....
12
13
  This is the R_14_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 = 42
       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] = 56.50 temp_best_value_gen = 56.50
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 56.50 temp_best_value_gen = 56.50
40
     No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5 ]
       second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
44
       third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 56.50 temp_best_value_gen = 56.50
49
50
     No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5]
53
       second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
54
       third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 56.50 temp best value gen = 56.50
59
     No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 3
60
     solution chromosome =
       first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5 ]
61
       second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.] third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
62
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 56.50 temp_best_value_gen = 56.50
68
     No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 4
69
     solution chromosome =
70
       first\ level; \hbox{\tt [[4.\ 10.5\ 16.5\ 22.\ 26.\ 4.\ 2.5\ 2.\ 1.5\ 3.5\ 4.5\ 4.5\ 3.5\ 3.5]}
       second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
71
       third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 56.50 temp best value gen = 56.50
76
     No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5 ]
```

```
second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
 80
 81
          third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
       obj[gen-1] = 56.50 temp best value gen = 56.50
       No, maintain solution and obj[gen] = \overline{56.50}, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5 ]
          second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
 89
 90
          third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 56.50 temp_best_value_gen = 56.50
 95
        No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [[4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5]
 98
          second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
 99
          third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obj[gen-1] = 56.50 temp best value gen = 56.50
103
       No, maintain solution and obj[gen] = 56.50, and the tolerance_counter = 8
104
105
        solution chromosome =
          first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5 ]
106
          second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.] third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
107
108
109
        The No. 8 iteration is finished!
110
111
112
113
     The iteration is terminated and then visulize the solution:
114
       solution chromosome =
          first level: [ [ 4. 10.5 16.5 22. 26. 4. 2.5 2. 1.5 3.5 4.5 4.5 3.5 3.5]
115
           second level: [5. 0. 3. 3. 1. 3. 7. 2. 1. 10. 4. 14. 15. 17.]
116
          third level: [6. 2. 7. 3. 7. 7. 3. 4. 3. 2. 8. 6. 6. 5.]]
117
118
        Objective function values and some other indicators:
119
          Obi0 = 17.00
                                 Obj1 = 242.00
                                                          Obj0 + Obj1 = 259.00
120
          Total movement of crane: 12.00
121
          Total waiting time in berth position: 85.00
122
          Total index of q during berthing: 438.00
123
        Specific arrangement for each vessel:
124
           V_id: 0
                               li: 8.0
                                                   xi: 4.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                             gama_i0: 5.0
                                                                                                                                                         gama_i1: 7.0
                     duration_time_i: 2.0
                                                        demand i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap i: 0
125
           V_id: 1
                              li: 5.0
                                                   xi: 10.5
                                                                          bow of i: 8.0
                                                                                                      tail of i: 13.0
                                                                                                                                  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
126
           V_id: 2
                              li: 7.0
                                                                          bow of i: 13.0
                                                                                                      tail of i: 20.0
                                                                                                                                  gama i0: 3.0
                                                   xi: 16.5
                                                                                                                                                               gama il: 5
     .0
                       duration_time_i: 2.0
                                                           demand i: 160.0
                                                                                         work load i: 160.0
                                                                                                                           work load gap_i: 0
127
           V id: 3
                               li: 4.0
                                                   xi: 22.0
                                                                          bow of i: 20.0
                                                                                                      tail of i: 24.0
                                                                                                                                  gama i0: 3.0
                                                                                                                                                               gama il: 5
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 2.0
                                                           demand_i: 120.0
                                                                                         work load_i: 120.0
          V_id: 4
128
                                                                          bow of i: 22.0
                                                                                                                                                               gama_i1: 2
                              li: 8.0
                                                   xi: 26.0
                                                                                                      tail of i: 30.0
                                                                                                                                  gama i0: 1.0
                                                                                         work load i: 60.0
                       duration_time_i: 1.0
                                                           demand_i: 60.0
                                                                                                                           work load gap_i: 0
129
           V_id: 5
                               li: 8.0
                                                   xi: 4.0
                                                                       bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                             gama_i0: 3.0
                                                                                                                                                         gama_i1: 4.0
                     duration time i: 1.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap i: 0
          V_id: 6
130
                               li: 5.0
                                                   xi: 2.5
                                                                       bow of i: 0.0
                                                                                                    tail of i: 5.0
                                                                                                                             gama i0: 7.0
                                                                                                                                                         gama i1: 10.0
                     duration_time_i: 3.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
131
           V_id: 7
                               li: 4.0
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                             gama_i0: 2.0
                                                                                                                                                         gama_i1: 3.0
                                                        demand_i: 80.0
                     duration_time_i: 1.0
                                                                                                                        work load gap_i: 0
                                                                                       work load i: 80.0
                                                                       bow of i: 0.0
                                                                                                    tail of i: 3.0
132
          V_id: 8
                               li: 3.0
                                                   xi: 1.5
                                                                                                                             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
133
          V id: 9
                               li: 7.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                             gama i0: 10.0
                                                                                                                                                         gama i1: 14.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
                    duration_time_i: 4.0
134
           V_id: 10
                                 li: 9.0
                                                      xi: 4.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 9.0
                                                                                                                                gama_i0: 4.0
                                                                                                                                                            gama_i1: 5.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
                     duration_time_i: 1.0
135
           V id: 11
                                 1i: 9.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 9.0
                                                                                                                                gama i0: 14.0
                                                      xi: 4.5
                                                                                                                                                            gama i1: 15.
     0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap i: 0
                    duration_time_i: 1.0
                                                                          bow of i: 0.0
136
           V id: 12
                                 li: 7.0
                                                      xi: 3.5
                                                                                                      tail of i: 7.0
                                                                                                                                gama i0: 15.0
                                                                                                                                                            gama i1: 17.
     0
                                                        demand_i: 140.0
                    duration_time_i: 2.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
137
                                                                          bow of i: 0.0
                                                                                                                                gama_i0: 17.0
           V_id: 13
                                li: 7.0
                                                      xi: 3.5
                                                                                                      tail of i: 7.0
                                                                                                                                                            gama_i1: 18.
                                                        demand_i: 80.0
                     duration_time_i: 1.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap_i: 0
     0
138
139
    Algorithm finished and the total CPU time: 1257 s
140 End
141
```