```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=40229
 2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     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_13_1 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 = 39
            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] = 59.96 temp_best_value_gen = 59.96
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 59.96 temp_best_value_gen = 59.96
40
         No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 1
41
42
         solution chromosome =
43
            first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
44
            second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
            third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 59.96 temp_best_value_gen = 59.96
49
50
         No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 2
51
         solution chromosome =
52
            first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
53
            second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
54
            third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 59.96 temp best value gen = 59.96
59
         No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 3
60
         solution chromosome =
            first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
61
62
            second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
            third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
         obj[gen-1] = 59.96 temp_best_value_gen = 59.96
67
68
         No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 4
69
         solution chromosome =
70
            first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
            second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
71
            third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 59.96 temp best value gen = 59.96
76
         No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 5
77
78
         solution chromosome =
            first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
```

```
80
          second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
 81
          third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
 82
        The No. 5 iteration is finished!
 83
 84
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 59.96 temp best value gen = 59.96
       No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 6
 86
 87
        solution chromosome =
          first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
 88
 89
          second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
          third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
 90
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 59.96 temp_best_value_gen = 59.96
 95
        No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
 98
          second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
          third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
 99
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obi[gen-1] = 59.96 temp best value gen = 59.96
103
       No, maintain solution and obj[gen] = 59.96, and the tolerance_counter = 8
104
105
        solution chromosome =
          first level: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
106
107
          second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
          third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
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: [ [5.68 3.98 2.65 7.1 2.85 6.64 6.21 2.39 3.67 2.4 8.97 5.35 2.65]
115
116
          second level: [7. 3. 1. 4. 5. 8. 0. 11. 13. 14. 1. 15. 17.]
          third level: [9. 4. 3. 9. 5. 2. 5. 4. 7. 4. 9. 3. 2.]]
117
        Objective function values and some other indicators:
118
                                                          Obj0 + Obj1 = 239.57
119
          Obi0 = 20.00
                                 Obj1 = 219.57
          Total movement of crane: 38.57
120
121
          Total waiting time in berth position: 99.00
122
          Total index of q during berthing: 236.00
123
        Specific arrangement for each vessel:
124
          V_id: 0
                              li: 9.0
                                                   xi: 5.7
                                                                       bow of i: 1.2
                                                                                                   tail of i: 10.2
                                                                                                                               gama_i0: 7.0
                                                                                                                                                           gama_i1: 8.0
                                                                                                                       work load gap i: 0
                     duration_time_i: 1.0
                                                        demand i: 140.0
                                                                                       work load i: 140.0
                                                                       bow of i: 0.5
125
          V_id: 1
                              li: 7.0
                                                   xi: 4.0
                                                                                                   tail of i: 7.5
                                                                                                                             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
126
          V_id: 2
                                                                                                   tail of i: 4.1
                                                                                                                            gama i0: 1.0
                                                                                                                                                         gama i1: 3.0
                              1i: 3.0
                                                   xi: 2.6
                                                                       bow of i: 1.1
                                                                                                                        work load gap_i: 0
                     duration_time_i: 2.0
                                                        demand i: 100.0
                                                                                       work load i: 100.0
127
          V id: 3
                              li: 9.0
                                                   xi: 7.1
                                                                       bow of i: 2.6
                                                                                                   tail of i: 11.6
                                                                                                                               gama i0: 4.0
                                                                                                                                                           gama i1: 5.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
                    duration_time_i: 1.0
128
          V id: 4
                                                                       bow of i: 0.4
                              li: 5.0
                                                   xi: 2.9
                                                                                                   tail of i: 5.4
                                                                                                                            gama i0: 5.0
                                                                                                                                                         gama i1: 7.0
                                                                                       work load_i: 120.0
                     duration_time_i: 2.0
                                                        demand i: 120.0
                                                                                                                        work load gap_i: 0
129
          V id: 5
                              li: 9.0
                                                                       bow of i: 2.1
                                                                                                   tail of i: 11.1
                                                                                                                               gama_i0: 8.0
                                                                                                                                                           gama_i1: 11.
                                                   xi: 6.6
                    duration time i: 3.0
                                                        demand i: 100.0
                                                                                       work load i: 100.0
                                                                                                                        work load gap i: 0
130
                                                                       bow of i: 2.7
                                                                                                                            gama_i0: 0.0
          V_id: 6
                              li: 7.0
                                                   xi: 6.2
                                                                                                   tail of i: 9.7
                                                                                                                                                         gama i1: 1.0
                                                        demand\_i{:}\ 100.0
                     duration_time_i: 1.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
131
          V_id: 7
                              li: 4.0
                                                   xi: 2.4
                                                                       bow of i: 0.4
                                                                                                   tail of i: 4.4
                                                                                                                            gama_i0: 11.0
                                                                                                                                                         gama_i1: 13.0
                                                        demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                        work load gap_i: 0
                    duration time i: 2.0
                                                                       bow of i: 0.2
                                                                                                                            gama_i0: 13.0
132
          V id: 8
                              li: 7.0
                                                   xi: 3.7
                                                                                                   tail of i: 7.2
                                                                                                                                                         gama_i1: 14.0
                     duration time i: 1.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                        work load gap i: 0
133
          V id: 9
                              li: 4.0
                                                                       bow of i: 0.4
                                                                                                   tail of i: 4.4
                                                                                                                            gama i0: 14.0
                                                                                                                                                         gama i1: 15.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                        work load gap_i: 0
                    duration_time_i: 1.0
          V_id: 10
                                                                                                     tail of i: 13.5
134
                                 li: 9.0
                                                      xi: 9.0
                                                                          bow of i: 4.5
                                                                                                                                 gama_i0: 1.0
                                                                                                                                                              gama_i1: 2
                                                           demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                          work load gap_i: 0
     .0
                       duration_time_i: 1.0
                                                     xi: 5.3
135
          V id: 11
                                                                          bow of i: 2.3
                                                                                                     tail of i: 8.3
                                                                                                                               gama i0: 15.0
                                                                                                                                                           gama i1: 17.
                                 li: 6.0
     0
                                                        demand_i: 120.0
                                                                                                                        work load gap i: 0
                     duration_time_i: 2.0
                                                                                       work load i: 120.0
                                                                          bow of i: 1.2
136
          V id: 12
                                 li: 3.0
                                                     xi: 2.7
                                                                                                      tail of i: 4.2
                                                                                                                               gama i0: 17.0
                                                                                                                                                           gama i1: 21.
     0
                    duration_time_i: 4.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                        work load gap_i: 0
137
138
     Algorithm finished and the total CPU time: 1232 s
139
     End
140
```