```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=5475
 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')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s....
12
13
  This is the R_19_5 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
18
     Read basic data
19
     Parameter setting:
20
       trail = 58
21
       Pop_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom size = 57
24
       Iter_num_GA = 300
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] = 88.60
36
                  temp_best_value_gen = 88.60
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
     obj[gen-1] = 88.60 temp_best_value_gen = 88.60
41
     No, maintain solution and obj[gen] = 88.60, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [[3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
44
    3.5 1.5 4.5 1.5 3.]
45
       second level: [ 1. 12. 1. 4. 5. 6. 4. 9. 10. 2. 13. 0. 16. 3. 20. 22. 24. 27.
46
   30.]
47
       third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obj[gen-1] = 88.60 temp best value gen = 88.60
52
     No, maintain solution and obj[gen] = 88.60, and the tolerance counter = 2
53
     solution chromosome =
54
       first level: [ [ 3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
55
    3.5 1.5 4.5 1.5 3.]
56
       second level: [ 1. 12. 1. 4. 5. 6. 4. 9. 10. 2. 13. 0. 16. 3. 20. 22. 24. 27.
57
   30.]
58
       third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
62
     obj[gen-1] = 88.60 temp best value gen = 88.60
63
     No, maintain solution and obj[gen] = 88.60, and the tolerance_counter = 3
64
     solution chromosome =
       first level: [ [ 3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
65
    3.5 1.5 4.5 1.5 3.]
66
67
       second level: [ 1. 12. 1. 4. 5. 6. 4. 9. 10. 2. 13. 0. 16. 3. 20. 22. 24. 27.
68
   30.]
69
       third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
70
     The No. 3 iteration is finished!
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 88.60 temp_best_value_gen = 88.60
74
     No, maintain solution and obj[gen] = 88.60, and the tolerance_counter = 4
75
     solution chromosome =
       first level: [ ] 3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
76
    3.5 1.5 4.5 1.5 3.1
77
78
       second level: [ 1. 12. 1. 4. 5. 6. 4. 9. 10. 2. 13. 0. 16. 3. 20. 22. 24. 27.
    30.]
79
```

```
80
          third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
 81
        The No. 4 iteration is finished!
 82
 83
     Beging the No. 5 iteration:
        obj[gen-1] = 88.60 temp best value gen = 88.60
 84
 85
        No, maintain solution and obj[gen] = 88.60, and the tolerance_counter = 5
 86
        solution chromosome =
 87
          first level: [ [ 3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
 88
      3.5 1.5 4.5 1.5 3.]
 89
          second level: [ 1. 12. 1. 4. 5. 6. 4. 9. 10. 2. 13. 0. 16. 3. 20. 22. 24. 27.
      30.]
 90
 91
          third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
 92
        The No. 5 iteration is finished!
 93
 94
     Beging the No. 6 iteration:
 95
        obj[gen-1] = 88.60 temp_best_value_gen = 88.60
        No, maintain solution and obj[\overline{gen}] = \overline{88.60}, and the tolerance_counter = 6
 96
 97
        solution chromosome =
 98
          first level: [ [ 3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
 99
      3.5 1.5 4.5 1.5 3.]
100
          second level: [1. 12. 1. 4. 5. 6. 4. 9. 10. 2. 13. 0. 16. 3. 20. 22. 24. 27.
101
      30.]
102
          third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
103
        The No. 6 iteration is finished!
104
105
106
107
    The iteration is terminated and then visulize the solution:
108
        solution chromosome =
109
          first level: [ [ 3. 4.5 19. 26. 26.5 2. 4. 4. 3.5 10.5 2.5 4.5 4. 3.
110
      3.5 1.5 4.5 1.5 3.]
          second\ level;\ [\ 1.\ 12.\ \ 1.\ \ 4.\ \ 5.\ \ 6.\ \ 4.\ \ 9.\ 10.\ \ 2.\ 13.\ \ 0.\ 16.\ \ 3.\ 20.\ 22.\ 24.\ 27.
111
112
      30.]
113
          third level: [4. 8. 7. 5. 2. 2. 6. 4. 6. 4. 2. 9. 2. 5. 2. 3. 2. 2. 2.]]
114
        Objective function values and some other indicators:
                                                           Obj0 + Obj1 = 292.00
115
          Obi0 = 33.00
                                 Obj1 = 259.00
116
          Total movement of crane: 50.00
117
          Total waiting time in berth position: 209.00
118
          Total index of q during berthing: 505.00
119
        Specific arrangement for each vessel:
                                                                                                                             gama_i0: 1.0
120
          V_id: 0
                              li: 6.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 6.0
                                                                                                                                                          gama_i1: 3.0
                                                        demand i: 100.0
                                                                                       work load i: 100.0
                    duration time i: 2.0
                                                                                                                        work load gap i: 0
121
           V id: 1
                                                                        bow of i: 0.0
                              1i: 9.0
                                                   xi: 45
                                                                                                    tail of i. 9.0
                                                                                                                              gama i0: 12.0
                                                                                                                                                          gama_i1: 13.0
                     duration_time_i: 1.0
                                                         demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap_i: 0
122
           V_id: 2
                              li: 8.0
                                                   xi: 19.0
                                                                          bow of i: 15.0
                                                                                                      tail of i: 23.0
                                                                                                                                   gama_i0: 1.0
                                                                                                                                                               gama_i1: 2
     .0
                       duration time i: 1.0
                                                           demand_i: 100.0
                                                                                          work load_i: 100.0
                                                                                                                           work load gap_i: 0
123
           V_id: 3
                              li: 6.0
                                                   xi: 26.0
                                                                          bow of i: 23.0
                                                                                                      tail of i: 29.0
                                                                                                                                   gama_i0: 4.0
                                                                                                                                                               gama_i1: 5
                                                                                                                            work load gap_i: 0
     .0
                       duration_time_i: 1.0
                                                           demand_i: 100.0
                                                                                          work load_i: 100.0
124
           V_id: 4
                              li: 7.0
                                                                                                      tail of i: 30.0
                                                                                                                                   gama i0: 5.0
                                                                                                                                                               gama i1:9
                                                   xi: 26.5
                                                                          bow of i: 23.0
     .0
                       duration_time_i: 4.0
                                                           demand i: 140.0
                                                                                          work load i: 140.0
                                                                                                                           work load gap i: 0
125
           V id: 5
                               li: 4.0
                                                    xi: 2.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                              gama i0: 6.0
                                                                                                                                                          gama i1: 9.0
                    duration_time_i: 3.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                         work load gap_i: 0
                                                                        bow of i: 0.0
126
           V id: 6
                              li: 8.0
                                                   xi: 4.0
                                                                                                    tail of i: 8.0
                                                                                                                              gama i0: 4.0
                                                                                                                                                          gama i1: 6.0
                     duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                         work load gap_i: 0
127
           V_id: 7
                                                                        bow of i: 0.0
                                                                                                    tail of i: 8.0
                                                                                                                              gama_i0: 9.0
                                                                                                                                                          gama_i1: 10.0
                               li: 8.0
                                                   xi: 4.0
                     duration time i: 1.0
                                                        demand i: 60.0
                                                                                                                         work load gap i: 0
                                                                                       work load i: 60.0
128
          V id: 8
                                                   xi: 3.5
                                                                        bow of i: 0.0
                                                                                                    tail of i: 7.0
                                                                                                                              gama_i0: 10.0
                                                                                                                                                          gama i1: 12.0
                              li: 7.0
                     duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                         work load gap_i: 0
129
           V_id: 9
                               li: 9.0
                                                   xi: 10.5
                                                                          bow of i: 6.0
                                                                                                       tail of i: 15.0
                                                                                                                                   gama_i0: 2.0
                                                                                                                                                               gama_i1: 4
                       duration_time_i: 2.0
                                                           demand_i: 160.0
     .0
                                                                                          work load_i: 160.0
                                                                                                                           work load gap_i: 0
130
           V_id: 10
                                 li: 5.0
                                                      xi: 2.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 5.0
                                                                                                                                gama_i0: 13.0
                                                                                                                                                             gama_i1: 16.
     0
                                                        demand i: 100.0
                                                                                                                         work load gap_i: 0
                    duration_time_i: 3.0
                                                                                       work load_i: 100.0
131
                                 li: 9.0
                                                      xi: 4.5
                                                                                                       tail of i: 9.0
           V id: 11
                                                                          bow of i: 0.0
                                                                                                                                gama i0: 0.0
                                                                                                                                                             gama i1: 1.0
                                                        demand_i: 140.0
                                                                                                                         work load gap_i: 0
                    duration time i: 1.0
                                                                                       work load i: 140.0
132
           V_id: 12
                                 li: 8.0
                                                      xi: 4.0
                                                                          bow of i: 0.0
                                                                                                       tail of i: 8.0
                                                                                                                                gama_i0: 16.0
                                                                                                                                                             gama_i1: 20.
     0
                                                        demand_i: 140.0
                     duration_time_i: 4.0
                                                                                       work load_i: 140.0
                                                                                                                         work load gap_i: 0
133
           V id: 13
                                                                          bow of i: 0.0
                                                      xi: 3.0
                                                                                                      tail of i: 6.0
                                                                                                                                gama i0: 3.0
                                                                                                                                                             gama i1: 4.0
                                 li: 6.0
                                                        demand_i: 100.0
                     duration time i: 1.0
                                                                                       work load i: 100.0
                                                                                                                         work load gap_i: 0
                                                      xi: 3.5
134
           V id: 14
                                 li: 7.0
                                                                          bow of i: 0.0
                                                                                                       tail of i: 7.0
                                                                                                                                gama i0: 20.0
                                                                                                                                                             gama i1: 22.
     0
                    duration_time_i: 2.0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                         work load gap_i: 0
135
          V_id: 15
                                                                          bow of i: 0.0
                                                                                                                                gama_i0: 22.0
                                                                                                      tail of i: 3.0
                                                                                                                                                             gama i1: 24.
                                 li: 3.0
                                                      xi: 1.5
                                                        demand\_i{:}\ 120.0
     0
                    duration_time_i: 2.0
                                                                                       work load_i: 120.0
                                                                                                                         work load gap_i: 0
136
           V id: 16
                                 li: 9.0
                                                      xi: 4.5
                                                                          bow of i: 0.0
                                                                                                       tail of i: 9.0
                                                                                                                                gama_i0: 24.0
                                                                                                                                                             gama_i1: 27.
     0
                                                        demand i: 100.0
                                                                                       work load i: 100.0
                                                                                                                         work load gap i: 0
                    duration_time_i: 3.0
137
           V_id: 17
                                                                          bow of i: 0.0
                                                                                                      tail of i: 3.0
                                                                                                                                gama_i0: 27.0
                                                                                                                                                             gama_i1: 30.
                                 1i: 3.0
                                                      xi: 1.5
     0
                    duration time i: 3.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap i: 0
138
           V_id: 18
                                 li: 6.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 6.0
                                                                                                                                gama_i0: 30.0
                                                                                                                                                             gama_i1: 34.
                                                                                                                         work load gap_i: 0
     0
                    duration_time_i: 4.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
139
140
    Algorithm finished and the total CPU time: 1262 s
141 End
142
```