```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=42910
 2
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'])
 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_18_4_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 = 54
       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] = 89.82 temp_best_value_gen = 89.82
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
     obj[gen-1] = 89.82 temp_best_value_gen = 86.95
40
     Yes, update solution and obj[gen] = 86.95
41
42
     solution chromosome =
43
       first level: [ [ 5.07 4.36 2.93 4.47 4.32 3.75 4.75 3.5 8.12 3.92 10. 4.96
    1.91 2.46 3.64 3.76 10.5 10. ]
44
       second level: [4. 2. 8. 1. 11. 0. 13. 15. 16. 18. 2. 30. 25. 28. 21. 19. 4. 10.]
45
46
       third level: [2. 5. 2. 6. 4. 5. 7. 6. 3. 7. 2. 3. 2. 2. 2. 3. 2. 2.]]
47
     The No. 1 iteration is finished!
48
49
   Beging the No. 2 iteration:
50
     obj[gen-1] = 86.95 temp_best_value_gen = 86.95
51
     No, maintain solution and obj[gen] = 86.95, and the tolerance counter = 1
52
     solution chromosome =
53
       first level: [ [ 5.07 4.36 2.93 4.47 4.32 3.75 4.75 3.5 8.12 3.92 10. 4.96
54
    1.91 2.46 3.64 3.76 10.5 10. ]
55
       second level: [4. 2. 8. 1. 11. 0. 13. 15. 16. 18. 2. 30. 25. 28. 21. 19. 4. 10.]
       third level: [2. 5. 2. 6. 4. 5. 7. 6. 3. 7. 2. 3. 2. 2. 2. 3. 2. 2.]]
56
57
     The No. 2 iteration is finished!
58
59
   Beging the No. 3 iteration:
     obj[gen-1] = 86.95 temp_best_value_gen = 86.32
60
     Yes, update solution and obj[gen] = 86.32
61
62
     solution chromosome =
       first level: [[3.87 4.43 2.41 7.99 4.42 2.93 5.56 4.49 8. 4.31 6.63 3.3
63
64
    2.95 2.15 10.5 13. 8.5 8.5 ]
       second level: [23. 3. 11. 0. 2. 14. 15. 19. 20. 22. 7. 8. 26. 29. 3. 6. 8. 26.]
65
       third level: [3. 2. 2. 2. 5. 4. 2. 3. 3. 5. 5. 3. 2. 2. 3. 4. 2. 2.]]
66
     The No. 3 iteration is finished!
67
68
69 Beging the No. 4 iteration:
     obj[gen-1] = 86.32 temp_best_value_gen = 86.32
70
71
     No, maintain solution and obj[gen] = 86.32, and the tolerance counter = 1
     solution chromosome
       first level: [ [ 3.87 4.43 2.41 7.99 4.42 2.93 5.56 4.49 8. 4.31 6.63 3.3
73
74
    2.95 2.15 10.5 13. 8.5 8.5 ]
       second level: [23. 3. 11. 0. 2. 14. 15. 19. 20. 22. 7. 8. 26. 29. 3. 6. 8. 26.]
75
       third level: [3. 2. 2. 2. 5. 4. 2. 3. 3. 5. 5. 3. 2. 2. 3. 4. 2. 2.]]
76
     The No. 4 iteration is finished!
77
78
   Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 86.32 temp_best_value_gen = 86.32
 81
       No, maintain solution and obj[gen] = 86.32, and the tolerance counter = 2
 82
       solution chromosome =
          first level: [ [ 3.87 4.43 2.41 7.99 4.42 2.93 5.56 4.49 8. 4.31 6.63 3.3
 83
      2.95 2.15 10.5 13. 8.5 8.5
 85
          second level: [23, 3, 11, 0, 2, 14, 15, 19, 20, 22, 7, 8, 26, 29, 3, 6, 8, 26,]
 86
          third level: [3. 2. 2. 2. 5. 4. 2. 3. 3. 5. 5. 3. 2. 2. 3. 4. 2. 2.]]
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 86.32 temp_best_value_gen = 86.32
 90
 91
        No, maintain solution and obj[gen] = 86.32, and the tolerance_counter = 3
 92
       solution chromosome =
 93
          first level: [[ 3.87 4.43 2.41 7.99 4.42 2.93 5.56 4.49 8. 4.31 6.63 3.3
 94
      2.95 2.15 10.5 13. 8.5 8.5]
 95
          second level: [23. 3. 11. 0. 2. 14. 15. 19. 20. 22. 7. 8. 26. 29. 3. 6. 8. 26.]
 96
          third level: [3. 2. 2. 2. 5. 4. 2. 3. 3. 5. 5. 3. 2. 2. 3. 4. 2. 2.]]
 97
        The No. 6 iteration is finished!
 98
 99
100
101
    The iteration is terminated and then visulize the solution:
102
        solution chromosome =
103
          first level: [ [ 3.87 4.43 2.41 7.99 4.42 2.93 5.56 4.49 8. 4.31 6.63 3.3
104
      2.95 2.15 10.5 13. 8.5 8.5 ]
          second level: [23. 3. 11. 0. 2. 14. 15. 19. 20. 22. 7. 8. 26. 29. 3. 6. 8. 26.]
105
          third level: [3. 2. 2. 2. 5. 4. 2. 3. 3. 5. 5. 3. 2. 2. 3. 4. 2. 2.]]
106
107
        Objective function values and some other indicators:
                                                          Obj0 + Obj1 = 323.24
108
          Obi0 = 30.00
                                 Obj1 = 293.24
          Total movement of crane: 51.24
109
110
          Total waiting time in berth position: 242.00
111
          Total index of q during berthing: 391.00
112
        Specific arrangement for each vessel:
                                                  xi: 3.9
                                                                                                                            gama_i0: 23.0
113
          V_id: 0
                              1i: 7.0
                                                                       bow of i: 0.4
                                                                                                  tail of i: 7.4
                                                                                                                                                        gama_i1: 26.0
                    duration_time_i: 3.0
                                                       demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap i: 0
                                                                       bow of i: 1.9
114
          V_id: 1
                              li: 5.0
                                                   xi: 4.4
                                                                                                  tail of i: 6.9
                                                                                                                            gama_i0: 3.0
                                                                                                                                                        gama_i1: 7.0
                    duration_time_i: 4.0
                                                       demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap i: 0
          V id: 2
115
                              li: 4.0
                                                   xi: 2.4
                                                                       bow of i: 0.4
                                                                                                  tail of i: 4.4
                                                                                                                           gama i0: 11.0
                                                                                                                                                        gama i1: 14.0
                    duration_time_i: 3.0
                                                        demand i: 100.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap_i: 0
116
          V_id: 3
                              li: 8.0
                                                   xi: 8.0
                                                                       bow of i: 4.0
                                                                                                  tail of i: 12.0
                                                                                                                              gama_i0: 0.0
                                                                                                                                                          gama_i1: 2.0
                                                       demand i: 80.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
                                                                                      work load_i: 80.0
117
          V id: 4
                                                                       bow of i: 1.9
                                                                                                  tail of i: 6.9
                                                                                                                            gama_i0: 2.0
                              li: 5.0
                                                   xi: 4.4
                                                                                                                                                        gama i1: 3.0
                                                       demand i: 100.0
                    duration_time_i: 1.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap i: 0
118
          V id: 5
                              li: 5.0
                                                   xi: 2.9
                                                                       bow of i: 0.4
                                                                                                  tail of i: 5.4
                                                                                                                            gama_i0: 14.0
                                                                                                                                                        gama i1: 15.0
                    duration_time_i: 1.0
                                                       demand_i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap_i: 0
119
          V_id: 6
                              1i: 7.0
                                                   xi: 5.6
                                                                       bow of i: 2.1
                                                                                                  tail of i: 9.1
                                                                                                                            gama_i0: 15.0
                                                                                                                                                        gama_i1: 19.0
                    duration_time_i: 4.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
                                                                       bow of i: 1.5
                                                                                                  tail of i: 7.5
120
          V_id: 7
                              li: 6.0
                                                   xi: 4.5
                                                                                                                           gama_i0: 19.0
                                                                                                                                                        gama_i1: 20.0
                                                                                                                       work load gap_i: 0
                                                       demand i: 60.0
                                                                                      work load i: 60.0
                    duration time i: 1.0
          V_id: 8
121
                              li: 9.0
                                                   xi: 8.0
                                                                       bow of i: 3.5
                                                                                                  tail of i: 12.5
                                                                                                                              gama i0: 20.0
                                                                                                                                                          gama i1: 22
     0
                    duration time i: 2.0
                                                        demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
122
          V_id: 9
                              1i: 7.0
                                                   xi: 4.3
                                                                       bow of i: 0.8
                                                                                                  tail of i: 7.8
                                                                                                                           gama_i0: 22.0
                                                                                                                                                        gama_i1: 23.0
                                                       demand i: 100.0
                    duration_time_i: 1.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap_i: 0
123
          V_id: 10
                                                                         bow of i: 4.1
                                 li: 5.0
                                                     xi: 6.6
                                                                                                     tail of i: 9.1
                                                                                                                              gama_i0: 7.0
                                                                                                                                                          gama_i1: 8.0
                                                        demand_i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap_i: 0
                    duration time i: 1.0
124
          V id: 11
                                                     xi: 3.3
                                                                         bow of i: 1.8
                                                                                                     tail of i: 4.8
                                                                                                                              gama i0: 8.0
                                                                                                                                                          gama i1:11.
                                li: 3.0
     0
                    duration_time_i: 3.0
                                                       demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap_i: 0
125
          V id: 12
                                 li: 3.0
                                                     xi: 2.9
                                                                         bow of i: 1.4
                                                                                                     tail of i: 4.4
                                                                                                                              gama_i0: 26.0
                                                                                                                                                          gama_i1: 29.
     0
                    duration_time_i: 3.0
                                                       demand_i: 100.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
                                                                                                                              gama_i0: 29.0
126
          V id: 13
                                                                         bow of i: 0.1
                                li: 4.0
                                                     xi: 2.1
                                                                                                     tail of i: 4.1
                                                                                                                                                          gama_i1: 31.
                                                                                                                       work load gap_i: 0
     0
                    duration_time_i: 2.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                                   gama_i0: 3.0
127
          V id: 14
                                 li: 7.0
                                                                            bow of i: 7.0
                                                                                                       tail of i: 14.0
                                                                                                                                                               gama il
                                                     xi: 10.5
     : 6.0
                         duration time i: 3.0
                                                             demand i: 160.0
                                                                                           work load i: 160.0
                                                                                                                            work load gap i: 0
128
          V_id: 15
                                li: 5.0
                                                     xi: 13.0
                                                                           bow of i: 10.5
                                                                                                       tail of i: 15.5
                                                                                                                                   gama_i0: 6.0
                                                                                                                                                               gama_i1
     : 8.0
                         duration_time_i: 2.0
                                                             demand_i: 120.0
                                                                                           work load_i: 120.0
                                                                                                                            work load gap_i: 0
129
                                                     xi: 8.5
                                                                         bow of i: 7.0
                                                                                                     tail of i: 10.0
                                                                                                                                 gama_i0: 8.0
          V_id: 16
                                 li: 3.0
                                                                                                                                                             gama_i1:
     12.0
                         duration time i: 4.0
                                                             demand i: 160.0
                                                                                           work load i: 160.0
                                                                                                                            work load gap i: 0
130
                                                     xi: 8.5
                                                                         bow of it 7.0
                                                                                                     tail of i: 10 0
                                                                                                                                 gama i0: 26.0
          V id: 17
                                 li: 3.0
                                                                                                                                                             gama_i1:
                                                             demand i: 160.0
                                                                                                                            work load gap_i: 0
     30.0
                         duration time i: 4.0
                                                                                           work load i: 160.0
131
    Algorithm finished and the total CPU time: 1278 s
132
133 End
134
```