```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=56144
 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'])
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_20_5 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 = 60
       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 = 0.100000000000000000
31
32
33
34
   Iteration begin:
35
   Beging the No. 0 iteration:
     obj[0] = 143.32 temp_best_value_gen = 143.32
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
     obj[gen-1] = 143.32 temp_best_value_gen = 143.32
     No, maintain solution and \overline{obj}[\overline{gen}] = 1\overline{43}.32, and the tolerance counter = 1
41
42
     solution chromosome =
43
        first level: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
44
    4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
45
        second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
46
    5. 8.]
47
       third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 2.]]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obi[gen-1] = 143.32 temp best value gen = 143.32
     No, maintain solution and obj[gen] = 143.32, and the tolerance_counter = 2
52
53
     solution chromosome =
54
       first level: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
55
    4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
56
        second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
57
58
       third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 2.]]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
62
     obi[gen-1] = 143.32 temp best value gen = 143.32
     No, maintain solution and obj[gen] = 143.32, and the tolerance_counter = 3
63
64
     solution chromosome =
       first level: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
65
    4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
66
67
        second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
68
69
       third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 2.]]
     The No. 3 iteration is finished!
70
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 143.32 temp_best_value_gen = 143.32
74
     No, maintain solution and obj[gen] = 143.32, and the tolerance_counter = 4
75
     solution chromosome =
76
       first level: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
    4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
77
        second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
78
79
    5. 8.]
```

```
80
          third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 2.]]
 81
       The No. 4 iteration is finished!
 82
 83
     Beging the No. 5 iteration:
       obj[gen-1] = 143.32 temp best value gen = 143.32
 84
 85
       No, maintain solution and obj[gen] = 143.32, and the tolerance counter = 5
 86
        solution chromosome =
 87
          first level: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
 88
      4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
 89
          second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
 90
      5. 8.1
 91
          third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 2.]]
 92
       The No. 5 iteration is finished!
 93
 94
     Beging the No. 6 iteration:
 95
       obj[gen-1] = 143.32 temp_best_value_gen = 143.32
       No, maintain solution and obj[gen] = 1\overline{43.32}, and the tolerance_counter = 6
 96
 97
        solution chromosome =
 98
          first level: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
 99
      4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
100
          second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
      5. 8.]
101
102
          third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 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: [ [ 3.98 3.89 4.83 3.78 4.84 4.31 4.44 8.85 5.06 6.92 2.11 5.07
110
      4.16 5.96 2.91 9. 12.5 14. 12. 11. ]
111
          second level: [29. 0. 6. 8. 10. 11. 12. 14. 16. 18. 19. 23. 25. 3. 32. 1. 2. 4.
112
113
          third level: [2. 3. 5. 4. 3. 5. 6. 7. 5. 7. 2. 4. 2. 2. 2. 5. 2. 9. 4. 2.]]
114
       Objective function values and some other indicators:
                                                          Obj0 + Obj1 = 803.22
115
          Obi0 = 35.00
                                 Obj1 = 768.22
116
          Total movement of crane: 33.22
117
          Total waiting time in berth position: 246.00
118
          Total index of q during berthing: 520.00
119
        Specific arrangement for each vessel:
                              li: 7.0
                                                                                                                            gama_i0: 29.0
120
          V_id: 0
                                                                       bow of i: 0.5
                                                                                                   tail of i: 7.5
                                                                                                                                                         gama_i1: 32.0
                    duration_time_i: 3.0
                                                        demand_i: 120.0
                                                                                       work load i: 120.0
                                                                                                                       work load gap i: 0
          V_id: 1
121
                                                   xi: 3.9
                              1i: 5.0
                                                                       bow of i: 1.4
                                                                                                   tail of i: 6.4
                                                                                                                            gama i0: 0.0
                                                                                                                                                         gama_i1: 3.0
                     duration_time_i: 3.0
                                                        demand i: 140.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap_i: 0
122
          V_id: 2
                              li: 7.0
                                                   xi: 4.8
                                                                       bow of i: 1.3
                                                                                                   tail of i: 8.3
                                                                                                                            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
123
          V_id: 3
                              li: 5.0
                                                   xi: 3.8
                                                                       bow of i: 1.3
                                                                                                   tail of i: 6.3
                                                                                                                             gama_i0: 8.0
                                                                                                                                                         gama_i1: 10.0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
124
          V_id: 4
                              li: 5.0
                                                                                                                            gama i0: 10.0
                                                   xi: 4.8
                                                                       bow of i: 2.3
                                                                                                   tail of i: 7.3
                                                                                                                                                         gama i1: 11.0
                     duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap_i: 0
125
          V id: 5
                              li: 8.0
                                                   xi: 4.3
                                                                       bow of i: 0.3
                                                                                                   tail of i: 8.3
                                                                                                                             gama i0: 11.0
                                                                                                                                                         gama i1: 12.0
                                                        demand_i: 100.0
                    duration_time_i: 1.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
126
                                                                                                                            gama_i0: 12.0
          V id: 6
                              li: 6.0
                                                   xi: 4.4
                                                                       bow of i: 1.4
                                                                                                   tail of i: 7.4
                                                                                                                                                         gama i1: 14.0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
127
          V_id: 7
                              li: 9.0
                                                                       bow of i: 4.3
                                                                                                   tail of i: 13.3
                                                                                                                               gama_i0: 14.0
                                                   xi: 8.8
                                                                                                                                                           gama_i1: 16.
     0
                    duration time i: 2.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap i: 0
128
          V id: 8
                                                   xi: 5.1
                                                                       bow of i: 2.1
                                                                                                   tail of i: 8.1
                                                                                                                            gama_i0: 16.0
                                                                                                                                                         gama i1: 18.0
                              li: 6.0
                     duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
129
          V_id: 9
                              li: 8.0
                                                   xi: 6.9
                                                                       bow of i: 2.9
                                                                                                   tail of i: 10.9
                                                                                                                               gama_i0: 18.0
                                                                                                                                                           gama_i1: 19.
                                                        demand_i: 80.0
     0
                    duration time i: 1.0
                                                                                      work load i: 80.0
                                                                                                                        work load gap_i: 0
          V_id: 10
130
                                 li: 3.0
                                                     xi: 2.1
                                                                          bow of i: 0.6
                                                                                                      tail of i: 3.6
                                                                                                                               gama_i0: 19.0
                                                                                                                                                           gama_i1: 23.
     0
                                                        demand i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
                    duration time i: 4.0
131
                                 li: 7.0
                                                     xi: 5.1
          V id: 11
                                                                          bow of i: 1.6
                                                                                                      tail of i: 8.6
                                                                                                                               gama i0: 23.0
                                                                                                                                                           gama i1: 25.
     0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                        work load gap_i: 0
                    duration time i: 2.0
          V_id: 12
                                                     xi: 4.2
132
                                 li: 5.0
                                                                          bow of i: 1.7
                                                                                                      tail of i: 6.7
                                                                                                                               gama_i0: 25.0
                                                                                                                                                           gama_i1: 29.
     0
                                                        demand_i: 160.0
                     duration_time_i: 4.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
133
          V id: 13
                                                                          bow of i: 4.5
                                 li: 3.0
                                                     xi: 6.0
                                                                                                     tail of i: 7.5
                                                                                                                               gama i0: 3.0
                                                                                                                                                           gama i1: 6.0
                                                        demand_i: 100.0
                     duration_time_i: 3.0
                                                                                      work load_i: 100.0
                                                                                                                        work load gap_i: 0
                                                     xi: 2.9
                                                                          bow of i: 0.9
134
          V id: 14
                                 li: 4.0
                                                                                                      tail of i: 4.9
                                                                                                                               gama i0: 32.0
                                                                                                                                                           gama i1: 36.
     0
                                                        demand_i: 140.0
                    duration_time_i: 4.0
                                                                                      work load_i: 140.0
                                                                                                                        work load gap_i: 0
135
          V_id: 15
                                                                          bow of i: 6.5
                                                     xi: 9.0
                                                                                                                                 gama_i0: 1.0
                                li: 5.0
                                                                                                     tail of i: 11.5
                                                                                                                                                              gama i1:2
     .0
                       duration_time_i: 1.0
                                                           demand_i: 100.0
                                                                                         work load_i: 100.0
                                                                                                                          work load gap_i: 0
                                                                                                                                    gama_i0: 2.0
136
                                                                            bow of i: 9.5
                                                                                                        tail of i: 15.5
          V_id: 16
                                 li: 6.0
                                                     xi: 12.5
                                                                                                                                                                gama_i1
     : 4.0
                         duration time i: 2.0
                                                             demand i: 60.0
                                                                                            work load i: 60.0
                                                                                                                             work load gap i: 0
137
          V_id: 17
                                 1i: 9.0
                                                     xi: 14 0
                                                                            bow of it 9.5
                                                                                                        tail of i: 18.5
                                                                                                                                    gama_i0: 4.0
                                                                                                                                                                gama il
     : 5.0
                         duration time i: 1.0
                                                             demand i: 160.0
                                                                                            work load i: 160.0
                                                                                                                             work load gap i: 0
138
          V_id: 18
                                 li: 5.0
                                                                            bow of i: 9.5
                                                                                                        tail of i: 14.5
                                                                                                                                    gama_i0: 5.0
                                                                                                                                                                gama_i1
     : 6.0
                         duration time i: 1.0
                                                             demand_i: 80.0
                                                                                            work load_i: 80.0
                                                                                                                             work load gap_i: 0
139
          V_id: 19
                                                                            bow of i: 9.5
                                                                                                        tail of i: 12.5
                                 li: 3.0
                                                     xi: 11.0
                                                                                                                                    gama_i0: 8.0
                                                                                                                                                                gama_i1
                         duration_time_i: 4.0
                                                             demand i: 140.0
                                                                                            work load i: 140.0
                                                                                                                             work load gap_i: 0
140
141 Algorithm finished and the total CPU time: 1378 s
142 End
143
```