```
1   "E:\1 □□□□\3 □□□□□\1 □□□□□□□\1 □□□□□□□□□\1_□□□□□□_□□□□\1_LW_□□□□2\6 □□□□□\2 python code\01_My_Python_Code\Scripts\python.
    exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=12495
2
3   import sys; print('Python %s on %s' % (sys.version, sys.platform))
4   sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□□\\1_□□□□□□_□□□□\\1_LW_□□□□2\\6 □□□□□\\2 python code\\
    01_My_Python_Code', 'E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□□/2 python code/
    01_My_Python_Code'])
5
6   PyDev console: starting.
7
8   Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
9   >>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□□/2 python code/01_My_Python_Code/
    main_BACASP_official_ENSGA-II.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□□/2
    python code/01_My_Python_Code')
10  Backend TkAgg is interactive backend. Turning interactive mode on.
11  Waiting 1s.....
12
13  This is the  R_2_1 _standerd_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 =  33
21          Pop_size =  10
22          Tolerance_iteration_unchanged_number =  8
23          Chrom_size =  6
24          Iter_num_GA =  300
25          Select_rate =  0.75
26          Crossover_rate =  0.85
27          Mutation rate =  0.8
28          Mu_oper_type =  2
29          vessel_move_way =  2
30          coefficient for Obj1=  1.5
31          coefficient for Obj2=  0.5
32          gen =  0
33
34  Iteration begin:
35  Beging the No. 0  iteration:
36      obj[0] = 8.89    temp_best_value_gen = 8.89
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 8.89     temp_best_value_gen = 8.89
41      No, maintain solution  and obj[gen] = 8.89 , and the tolerance_counter = 1
42      solution chromosome =
43          first level: [ [3.19 4.23]
44          second level:  [1. 0.]
45          third level:  [4. 7.] ]
46      The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49      obj[gen-1] = 8.89     temp_best_value_gen = 5.58
50      Yes, update solution and obj[gen] = 5.58
51      solution chromosome =
52          first level: [ [2.49 4.01]
53          second level:  [1. 0.]
54          third level:  [4. 7.] ]
55      The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58      obj[gen-1] = 5.58     temp_best_value_gen = 5.58
59      No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 1
60      solution chromosome =
61          first level: [ [2.49 4.01]
62          second level:  [1. 0.]
63          third level:  [4. 7.] ]
64      The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67      obj[gen-1] = 5.58     temp_best_value_gen = 5.58
68      No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 2
69      solution chromosome =
70          first level: [ [2.49 4.01]
71          second level:  [1. 0.]
72          third level:  [4. 7.] ]
73      The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76      obj[gen-1] = 5.58     temp_best_value_gen = 5.58
77      No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 3
78      solution chromosome =
79          first level: [ [2.49 4.01]
```

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 80        second level:  [1. 0.]
 81        third level:  [4. 7.] ]
 82     The No. 5  iteration is finished!
 83
 84  Beging the No. 6  iteration:
 85     obj[gen-1] = 5.58    temp_best_value_gen = 5.58
 86     No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 4
 87     solution chromosome =
 88        first level: [ [2.49 4.01]
 89        second level:  [1. 0.]
 90        third level:  [4. 7.] ]
 91     The No. 6  iteration is finished!
 92
 93  Beging the No. 7  iteration:
 94     obj[gen-1] = 5.58    temp_best_value_gen = 5.58
 95     No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 5
 96     solution chromosome =
 97        first level: [ [2.49 4.01]
 98        second level:  [1. 0.]
 99        third level:  [4. 7.] ]
100     The No. 7  iteration is finished!
101
102  Beging the No. 8  iteration:
103     obj[gen-1] = 5.58    temp_best_value_gen = 5.58
104     No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 6
105     solution chromosome =
106        first level: [ [2.49 4.01]
107        second level:  [1. 0.]
108        third level:  [4. 7.] ]
109     The No. 8  iteration is finished!
110
111  Beging the No. 9  iteration:
112     obj[gen-1] = 5.58    temp_best_value_gen = 5.58
113     No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 7
114     solution chromosome =
115        first level: [ [2.49 4.01]
116        second level:  [1. 0.]
117        third level:  [4. 7.] ]
118     The No. 9  iteration is finished!
119
120  Beging the No. 10  iteration:
121     obj[gen-1] = 5.58    temp_best_value_gen = 5.58
122     No, maintain solution  and obj[gen] = 5.58 , and the tolerance_counter = 8
123     solution chromosome =
124        first level: [ [2.49 4.01]
125        second level:  [1. 0.]
126        third level:  [4. 7.] ]
127     The No. 10  iteration is finished!
128
129
130  ---------------------------------------------------------------------------
131  The iteration is terminated and then visulize the solution:
132     solution chromosome =
133        first level: [ [2.49 4.01]
134        second level:  [1. 0.]
135        third level:  [4. 7.] ]
136     Objective function values and some other indicators:
137        Obj0 = 2.00           Obj1 = 5.16           Obj0 + Obj1 = 7.16
138        Total movement of crane: 4.16
139        Total waiting time in berth position: 1.00
140        Total index of q during berthing: 27.00
141     Specific arrangement for each vessel:
142        V_id:  0          li: 4.0          xi: 2.5          bow of i: 0.5          tail of i: 4.5          gama_i0: 1.0          gama_i1: 3.0
                 duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
143        V_id:  1          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 0.0          gama_i1: 1.0
                 duration_time_i: 1.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
144
145  Algorithm finished and the total CPU time: 98 s
146  End
147
```