```
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=28235
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_9_8_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 =  58
21         Pop_size =  30
22         Tolerance_iteration_unchanged_number =  10
23         Chrom_size =  27
24         Iter_num_GA =  300
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
31         coefficient for Obj2=  0.10000000000000009
32         gen =  0
33
34  Iteration begin:
35  Beging the No. 0  iteration:
36     obj[0] = 24.30     temp_best_value_gen = 24.30
37     The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
41     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 1
42     solution chromosome =
43        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5 2. ]
44        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
45        third level:  [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
46     The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
50     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 2
51     solution chromosome =
52        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5 2. ]
53        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
54        third level:  [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
55     The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
59     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 3
60     solution chromosome =
61        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5 2. ]
62        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
63        third level:  [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
64     The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
68     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 4
69     solution chromosome =
70        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5 2. ]
71        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
72        third level:  [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
73     The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
77     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 5
78     solution chromosome =
79        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5 2. ]
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 80        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
 81        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
 82     The No. 5  iteration is finished!
 83
 84   Beging the No. 6  iteration:
 85     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
 86     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 6
 87     solution chromosome =
 88        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5  2. ]
 89        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
 90        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
 91     The No. 6  iteration is finished!
 92
 93   Beging the No. 7  iteration:
 94     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
 95     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 7
 96     solution chromosome =
 97        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5  2. ]
 98        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
 99        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
100     The No. 7  iteration is finished!
101
102   Beging the No. 8  iteration:
103     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
104     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 8
105     solution chromosome =
106        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5  2. ]
107        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
108        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
109     The No. 8  iteration is finished!
110
111   Beging the No. 9  iteration:
112     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
113     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 9
114     solution chromosome =
115        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5  2. ]
116        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
117        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
118     The No. 9  iteration is finished!
119
120   Beging the No. 10  iteration:
121     obj[gen-1] = 24.30   temp_best_value_gen = 24.30
122     No, maintain solution  and obj[gen] = 24.30 , and the tolerance_counter = 10
123     solution chromosome =
124        first level: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5  2. ]
125        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
126        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
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: [ [ 2.5  9.  15.5 20.5 26.   3.   2.5 2.5  2. ]
134        second level: [5. 1. 1. 1. 2. 0. 1. 8. 3.]
135        third level: [3. 2. 3. 3. 6. 4. 2. 2. 3.] ]
136     Objective function values and some other indicators:
137        Obj0 = 11.00          Obj1 = 34.00          Obj0 + Obj1 = 45.00
138        Total movement of crane: 12.00
139        Total waiting time in berth position: 22.00
140        Total index of q during berthing: 260.00
141     Specific arrangement for each vessel:
142        V_id: 0          li: 5.0          xi: 2.5          bow of i: 0.0          tail of i: 5.0          gama_i0: 5.0          gama_i1: 8.0
                             duration_time_i: 3.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
143        V_id: 1          li: 8.0          xi: 9.0          bow of i: 5.0          tail of i: 13.0          gama_i0: 1.0          gama_i1: 5.0
                             duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
144        V_id: 2          li: 5.0          xi: 15.5          bow of i: 13.0          tail of i: 18.0          gama_i0: 1.0          gama_i1: 3
    .0                      duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
145        V_id: 3          li: 5.0          xi: 20.5          bow of i: 18.0          tail of i: 23.0          gama_i0: 1.0          gama_i1: 2
    .0                      duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
146        V_id: 4          li: 8.0          xi: 26.0          bow of i: 22.0          tail of i: 30.0          gama_i0: 2.0          gama_i1: 3
    .0                      duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
147        V_id: 5          li: 6.0          xi: 3.0          bow of i: 0.0          tail of i: 6.0          gama_i0: 0.0          gama_i1: 1.0
                             duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
148        V_id: 6          li: 5.0          xi: 2.5          bow of i: 0.0          tail of i: 5.0          gama_i0: 1.0          gama_i1: 3.0
                             duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
149        V_id: 7          li: 5.0          xi: 2.5          bow of i: 0.0          tail of i: 5.0          gama_i0: 8.0          gama_i1: 12.0
                             duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
150        V_id: 8          li: 4.0          xi: 2.0          bow of i: 0.0          tail of i: 4.0          gama_i0: 3.0          gama_i1: 4.0
                             duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
151
152   Algorithm finished and the total CPU time: 1055 s
153   End
154
```