```
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=51933
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_6_10 _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 =  18
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] = 14.50     temp_best_value_gen = 14.50
37     The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40     obj[gen-1] = 14.50   temp_best_value_gen = 14.50
41     No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 1
42     solution chromosome =
43         first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
44         second level:  [0. 2. 0. 5. 1. 3.]
45         third level:  [4. 2. 2. 3. 4. 5.] ]
46     The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49     obj[gen-1] = 14.50   temp_best_value_gen = 14.50
50     No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 2
51     solution chromosome =
52         first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
53         second level:  [0. 2. 0. 5. 1. 3.]
54         third level:  [4. 2. 2. 3. 4. 5.] ]
55     The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58     obj[gen-1] = 14.50   temp_best_value_gen = 14.50
59     No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 3
60     solution chromosome =
61         first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
62         second level:  [0. 2. 0. 5. 1. 3.]
63         third level:  [4. 2. 2. 3. 4. 5.] ]
64     The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67     obj[gen-1] = 14.50   temp_best_value_gen = 14.50
68     No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 4
69     solution chromosome =
70         first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
71         second level:  [0. 2. 0. 5. 1. 3.]
72         third level:  [4. 2. 2. 3. 4. 5.] ]
73     The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76     obj[gen-1] = 14.50   temp_best_value_gen = 14.50
77     No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 5
78     solution chromosome =
79         first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
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 80        second level:  [0. 2. 0. 5. 1. 3.]
 81        third level:  [4. 2. 2. 3. 4. 5.] ]
 82     The No. 5  iteration is finished!
 83
 84   Beging the No. 6  iteration:
 85      obj[gen-1] = 14.50   temp_best_value_gen = 14.50
 86      No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 6
 87      solution chromosome =
 88        first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
 89        second level:  [0. 2. 0. 5. 1. 3.]
 90        third level:  [4. 2. 2. 3. 4. 5.] ]
 91     The No. 6  iteration is finished!
 92
 93   Beging the No. 7  iteration:
 94      obj[gen-1] = 14.50   temp_best_value_gen = 14.50
 95      No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 7
 96      solution chromosome =
 97        first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
 98        second level:  [0. 2. 0. 5. 1. 3.]
 99        third level:  [4. 2. 2. 3. 4. 5.] ]
100     The No. 7  iteration is finished!
101
102   Beging the No. 8  iteration:
103      obj[gen-1] = 14.50   temp_best_value_gen = 14.50
104      No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 8
105      solution chromosome =
106        first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
107        second level:  [0. 2. 0. 5. 1. 3.]
108        third level:  [4. 2. 2. 3. 4. 5.] ]
109     The No. 8  iteration is finished!
110
111   Beging the No. 9  iteration:
112      obj[gen-1] = 14.50   temp_best_value_gen = 14.50
113      No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 9
114      solution chromosome =
115        first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
116        second level:  [0. 2. 0. 5. 1. 3.]
117        third level:  [4. 2. 2. 3. 4. 5.] ]
118     The No. 9  iteration is finished!
119
120   Beging the No. 10  iteration:
121      obj[gen-1] = 14.50   temp_best_value_gen = 14.50
122      No, maintain solution  and obj[gen] = 14.50 , and the tolerance_counter = 10
123      solution chromosome =
124        first level: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
125        second level:  [0. 2. 0. 5. 1. 3.]
126        third level:  [4. 2. 2. 3. 4. 5.] ]
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: [ [ 4.5 13.5 19.5 23.5 25.5  4.5]
134        second level:  [0. 2. 0. 5. 1. 3.]
135        third level:  [4. 2. 2. 3. 4. 5.] ]
136      Objective function values and some other indicators:
137      Obj0 = 6.00          Obj1 = 31.00        Obj0 + Obj1 = 37.00
138      Total movement of crane: 20.00
139      Total waiting time in berth position: 11.00
140      Total index of q during berthing: 428.00
141      Specific arrangement for each vessel:
142      V_id: 0         li: 9.0         xi: 4.5        bow of i: 0.0        tail of i: 9.0        gama_i0: 0.0        gama_i1: 1.0
                duration_time_i: 1.0        demand_i: 80.0        work load_i: 80.0        work load gap_i: 0
143      V_id: 1         li: 9.0         xi: 13.5       bow of i: 9.0        tail of i: 18.0        gama_i0: 2.0        gama_i1: 6
        .0        duration_time_i: 4.0        demand_i: 160.0        work load_i: 160.0        work load gap_i: 0
144      V_id: 2         li: 3.0         xi: 19.5       bow of i: 18.0        tail of i: 21.0        gama_i0: 0.0        gama_i1: 3
        .0        duration_time_i: 3.0        demand_i: 120.0        work load_i: 120.0        work load gap_i: 0
145      V_id: 3         li: 5.0         xi: 23.5       bow of i: 21.0        tail of i: 26.0        gama_i0: 5.0        gama_i1: 7
        .0        duration_time_i: 2.0        demand_i: 100.0        work load_i: 100.0        work load gap_i: 0
146      V_id: 4         li: 9.0         xi: 25.5       bow of i: 21.0        tail of i: 30.0        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
147      V_id: 5         li: 9.0         xi: 4.5        bow of i: 0.0        tail of i: 9.0        gama_i0: 3.0        gama_i1: 4.0
                duration_time_i: 1.0        demand_i: 80.0        work load_i: 80.0        work load gap_i: 0
148
149   Algorithm finished and the total CPU time: 734 s
150   End
151
```