```
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=5253
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_14_6 _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 = 42
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] = 74.30     temp_best_value_gen = 74.30
37    The No. 0  iteration is finished!
38
39 Beging the No. 1  iteration:
40    obj[gen-1] = 74.30   temp_best_value_gen = 74.30
41    No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 1
42    solution chromosome =
43       first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.   3.  2.  2.  2.  1.5 3.  2. ]
44       second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
45       third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
46    The No. 1  iteration is finished!
47
48 Beging the No. 2  iteration:
49    obj[gen-1] = 74.30   temp_best_value_gen = 74.30
50    No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 2
51    solution chromosome =
52       first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.   3.  2.  2.  2.  1.5 3.  2. ]
53       second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
54       third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
55    The No. 2  iteration is finished!
56
57 Beging the No. 3  iteration:
58    obj[gen-1] = 74.30   temp_best_value_gen = 74.30
59    No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 3
60    solution chromosome =
61       first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.   3.  2.  2.  2.  1.5 3.  2. ]
62       second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
63       third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
64    The No. 3  iteration is finished!
65
66 Beging the No. 4  iteration:
67    obj[gen-1] = 74.30   temp_best_value_gen = 74.30
68    No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 4
69    solution chromosome =
70       first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.   3.  2.  2.  2.  1.5 3.  2. ]
71       second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
72       third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
73    The No. 4  iteration is finished!
74
75 Beging the No. 5  iteration:
76    obj[gen-1] = 74.30   temp_best_value_gen = 74.30
77    No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 5
78    solution chromosome =
79       first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.   3.  2.  2.  2.  1.5 3.  2. ]
```

```
 80        second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
 81        third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
 82      The No. 5  iteration is finished!
 83
 84    Beging the No. 6  iteration:
 85      obj[gen-1] = 74.30   temp_best_value_gen = 74.30
 86      No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 6
 87      solution chromosome =
 88        first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.  3.  2.  2.  2.  1.5 3.  2. ]
 89        second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
 90        third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
 91      The No. 6  iteration is finished!
 92
 93    Beging the No. 7  iteration:
 94      obj[gen-1] = 74.30   temp_best_value_gen = 74.30
 95      No, maintain solution  and obj[gen] = 74.30 , and the tolerance_counter = 7
 96      solution chromosome =
 97        first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.  3.  2.  2.  2.  1.5 3.  2. ]
 98        second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
 99        third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
100      The No. 7  iteration is finished!
101
102
103    ------------------------------------------------------------------------------------
104    The iteration is terminated and then visulize the solution:
105      solution chromosome =
106        first level: [ [ 2.5  9.5 17.  24.  25.5 2.5 2.  3.  2.  2.  2.  1.5 3.  2. ]
107        second level: [ 8.  1.  5.  7.  8.  1. 13. 14. 23.  0.  5. 17. 20.  6.]
108        third level:  [5. 2. 6. 8. 9. 2. 4. 3. 3. 3. 4. 2. 2. 4.] ]
109      Objective function values and some other indicators:
110      Obj0 = 24.00          Obj1 = 287.00          Obj0 + Obj1 = 311.00
111      Total movement of crane: 36.00
112      Total waiting time in berth position: 128.00
113      Total index of q during berthing: 416.00
114      Specific arrangement for each vessel:
```

V_id	li	xi	bow of i	tail of i	gama_i0	gama_i1	duration_time_i	demand_i	work load_i	work load gap_i
0	5.0	2.5	0.0	5.0	8.0	10.0	2.0	160.0	160.0	0
1	9.0	9.5	5.0	14.0	1.0	3.0	2.0	80.0	80.0	0
2	6.0	17.0	14.0	20.0	5.0	7.0	2.0	160.0	160.0	0
3	8.0	24.0	20.0	28.0	7.0	8.0	1.0	120.0	120.0	0
4	9.0	25.5	21.0	30.0	8.0	9.0	1.0	100.0	100.0	0
5	5.0	2.5	0.0	5.0	1.0	5.0	4.0	140.0	140.0	0
6	4.0	2.0	0.0	4.0	13.0	14.0	1.0	60.0	60.0	0
7	6.0	3.0	0.0	6.0	14.0	17.0	3.0	160.0	160.0	0
8	4.0	2.0	0.0	4.0	23.0	25.0	2.0	100.0	100.0	0
9	4.0	2.0	0.0	4.0	0.0	1.0	1.0	60.0	60.0	0
10	4.0	2.0	0.0	4.0	5.0	6.0	1.0	60.0	60.0	0
11	3.0	1.5	0.0	3.0	17.0	20.0	3.0	100.0	100.0	0
12	6.0	3.0	0.0	6.0	20.0	23.0	3.0	100.0	100.0	0
13	4.0	2.0	0.0	4.0	6.0	8.0	2.0	140.0	140.0	0

```
129
130    Algorithm finished and the total CPU time: 1326 s
131    End
132
```