```
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=29619
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_15_7 _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 =  45
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] = 75.90     temp_best_value_gen = 75.90
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 75.90   temp_best_value_gen = 75.90
41      No, maintain solution  and obj[gen] = 75.90 , and the tolerance_counter = 1
42      solution chromosome =
43          first level: [ [ 3.5  8.5 14.  22.  25.5 2.   4.5 4.   4.5 2.5 1.5 4.5 2.   4.
44      1.5]
45          second level:  [ 2.  2.  0.  1.  0.  4.  1.  7.  9. 10. 12.  0. 16. 18. 19.]
46          third level:  [3. 3. 7. 5. 7. 3. 9. 2. 8. 2. 1. 8. 4. 7. 3.] ]
47      The No. 1  iteration is finished!
48
49  Beging the No. 2  iteration:
50      obj[gen-1] = 75.90   temp_best_value_gen = 65.50
51      Yes, update solution and obj[gen] = 65.50
52      solution chromosome =
53          first level: [ [ 3.5  8.5 14.  22.  25.5 2.   4.5 4.   4.5 2.5 1.5 4.5 2.   4.
54      1.5]
55          second level:  [ 2.  2.  0.  7.  9. 10. 13. 21.  9.  4. 16.  0.  6.  1.  8.]
56          third level:  [3. 3. 7. 3. 9. 3. 3. 3. 8. 2. 1. 8. 4. 7. 3.] ]
57      The No. 2  iteration is finished!
58
59  Beging the No. 3  iteration:
60      obj[gen-1] = 65.50   temp_best_value_gen = 65.50
61      No, maintain solution  and obj[gen] = 65.50 , and the tolerance_counter = 1
62      solution chromosome =
63          first level: [ [ 3.5  8.5 14.  22.  25.5 2.   4.5 4.   4.5 2.5 1.5 4.5 2.   4.
64      1.5]
65          second level:  [ 2.  2.  0.  7.  9. 10. 13. 21.  9.  4. 16.  0.  6.  1.  8.]
66          third level:  [3. 3. 7. 3. 9. 3. 3. 3. 8. 2. 1. 8. 4. 7. 3.] ]
67      The No. 3  iteration is finished!
68
69  Beging the No. 4  iteration:
70      obj[gen-1] = 65.50   temp_best_value_gen = 65.50
71      No, maintain solution  and obj[gen] = 65.50 , and the tolerance_counter = 2
72      solution chromosome =
73          first level: [ [ 3.5  8.5 14.  22.  25.5 2.   4.5 4.   4.5 2.5 1.5 4.5 2.   4.
74      1.5]
75          second level:  [ 2.  2.  0.  7.  9. 10. 13. 21.  9.  4. 16.  0.  6.  1.  8.]
76          third level:  [3. 3. 7. 3. 9. 3. 3. 3. 8. 2. 1. 8. 4. 7. 3.] ]
77      The No. 4  iteration is finished!
78
79  Beging the No. 5  iteration:
```

```
80    obj[gen-1] = 65.50   temp_best_value_gen = 64.10
81    Yes, update solution and obj[gen] = 64.10
82    solution chromosome =
83       first level: [ [ 3.5  8.5 14.  22.  25.5 2.   4.5 4.   4.5 2.5 3.5 4.5 2.   4.
84    1.5]
85       second level:  [16.  2.  0.  7.  9. 10. 13. 21.  9.  4.  2.  0.  6.  1.  8.]
86       third level:  [2. 3. 7. 3. 9. 3. 3. 3. 8. 2. 3. 8. 4. 7. 3.] ]
87    The No. 5  iteration is finished!
88
89  Beging the No. 6  iteration:
90    obj[gen-1] = 64.10   temp_best_value_gen = 63.40
91    Yes, update solution and obj[gen] = 63.40
92    solution chromosome =
93       first level: [ [ 3.5  8.5 14.  22.   4.5 2.   4.5 4.   4.5 25.5 3.5 4.5 2.   4.
94    1.5]
95       second level:  [16.  2.  0.  7.  9.  1. 13. 21.  5.  9.  6.  0. 11.  8.  4.]
96       third level:  [2. 3. 7. 3. 5. 3. 3. 3. 8. 5. 3. 8. 4. 7. 3.] ]
97    The No. 6  iteration is finished!
98
99  Beging the No. 7  iteration:
100   obj[gen-1] = 63.40   temp_best_value_gen = 63.40
101   No, maintain solution  and obj[gen] = 63.40 , and the tolerance_counter = 1
102   solution chromosome =
103      first level: [ [ 3.5  8.5 14.  22.   4.5 2.   4.5 4.   4.5 25.5 3.5 4.5 2.   4.
104   1.5]
105      second level:  [16.  2.  0.  7.  9.  1. 13. 21.  5.  9.  6.  0. 11.  8.  4.]
106      third level:  [2. 3. 7. 3. 5. 3. 3. 3. 8. 5. 3. 8. 4. 7. 3.] ]
107   The No. 7  iteration is finished!
108
109
110  ------------------------------------------------------------------------------------
111  The iteration is terminated and then visulize the solution:
112   solution chromosome =
113      first level: [ [ 3.5  8.5 14.  22.   4.5 2.   4.5 4.   4.5 25.5 3.5 4.5 2.   4.
114   1.5]
115      second level:  [16.  2.  0.  7.  9.  1. 13. 21.  5.  9.  6.  0. 11.  8.  4.]
116      third level:  [2. 3. 7. 3. 5. 3. 3. 3. 8. 5. 3. 8. 4. 7. 3.] ]
117   Objective function values and some other indicators:
118      Obj0 = 21.00         Obj1 = 235.00         Obj0 + Obj1 = 256.00
119      Total movement of crane: 32.00
120      Total waiting time in berth position: 112.00
121      Total index of q during berthing: 365.00
122   Specific arrangement for each vessel:
```

123 V_id: 0	li: 7.0	xi: 3.5	bow of i: 0.0	tail of i: 7.0	gama_i0: 16.0	gama_i1: 18.0
	duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
124 V_id: 1	li: 3.0	xi: 8.5	bow of i: 7.0	tail of i: 10.0	gama_i0: 2.0	gama_i1: 5.0
	duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
125 V_id: 2	li: 8.0	xi: 14.0	bow of i: 10.0	tail of i: 18.0	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		
126 V_id: 3	li: 8.0	xi: 22.0	bow of i: 18.0	tail of i: 26.0	gama_i0: 7.0	gama_i1: 9.0
	duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
127 V_id: 4	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 9.0	gama_i1: 11.0
	duration_time_i: 2.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
128 V_id: 5	li: 4.0	xi: 2.0	bow of i: 0.0	tail of i: 4.0	gama_i0: 1.0	gama_i1: 4.0
	duration_time_i: 3.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
129 V_id: 6	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 13.0	gama_i1: 16.0
	duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
130 V_id: 7	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 21.0	gama_i1: 22.0
	duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
131 V_id: 8	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 5.0	gama_i1: 6.0
	duration_time_i: 1.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
132 V_id: 9	li: 5.0	xi: 25.5	bow of i: 23.0	tail of i: 28.0	gama_i0: 9.0	gama_i1: 10.0
	duration_time_i: 1.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
133 V_id: 10	li: 3.0	xi: 3.5	bow of i: 2.0	tail of i: 5.0	gama_i0: 6.0	gama_i1: 8.0
	duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
134 V_id: 11	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: 60.0	work load_i: 60.0	work load gap_i: 0		
135 V_id: 12	li: 4.0	xi: 2.0	bow of i: 0.0	tail of i: 4.0	gama_i0: 11.0	gama_i1: 13.0
	duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
136 V_id: 13	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 8.0	gama_i1: 9.0
	duration_time_i: 1.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
137 V_id: 14	li: 3.0	xi: 1.5	bow of i: 0.0	tail of i: 3.0	gama_i0: 4.0	gama_i1: 5.0
	duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		

```
138
139  Algorithm finished and the total CPU time: 1266 s
140  End
141
```