```
 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=52446
 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_20_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 =  60
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] = 149.26   temp_best_value_gen = 149.26
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 149.26    temp_best_value_gen = 149.26
41      No, maintain solution  and obj[gen] = 149.26 , and the tolerance_counter = 1
42      solution chromosome =
43        first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
44   4.97  5.89  9.    6.5  8.    9.    8.   11. ]
45        second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
46   12.  3.]
47        third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
48      The No. 1  iteration is finished!
49
50  Beging the No. 2  iteration:
51      obj[gen-1] = 149.26    temp_best_value_gen = 149.26
52      No, maintain solution  and obj[gen] = 149.26 , and the tolerance_counter = 2
53      solution chromosome =
54        first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
55   4.97  5.89  9.    6.5  8.    9.    8.   11. ]
56        second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
57   12.  3.]
58        third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
59      The No. 2  iteration is finished!
60
61  Beging the No. 3  iteration:
62      obj[gen-1] = 149.26    temp_best_value_gen = 149.26
63      No, maintain solution  and obj[gen] = 149.26 , and the tolerance_counter = 3
64      solution chromosome =
65        first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
66   4.97  5.89  9.    6.5  8.    9.    8.   11. ]
67        second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
68   12.  3.]
69        third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
70      The No. 3  iteration is finished!
71
72  Beging the No. 4  iteration:
73      obj[gen-1] = 149.26    temp_best_value_gen = 149.26
74      No, maintain solution  and obj[gen] = 149.26 , and the tolerance_counter = 4
75      solution chromosome =
76        first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
77   4.97  5.89  9.    6.5  8.    9.    8.   11. ]
78        second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
79   12.  3.]
```

```
80      third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
81      The No. 4  iteration is finished!
82
83   Beging the No. 5  iteration:
84      obj[gen-1] = 149.26     temp_best_value_gen = 149.26
85      No, maintain solution  and obj[gen] = 149.26 , and the tolerance_counter = 5
86      solution chromosome =
87        first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
88   4.97  5.89  9.   6.5  8.    9.    8.   11. ]
89        second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
90   12.  3.]
91        third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
92      The No. 5  iteration is finished!
93
94   Beging the No. 6  iteration:
95      obj[gen-1] = 149.26     temp_best_value_gen = 149.26
96      No, maintain solution  and obj[gen] = 149.26 , and the tolerance_counter = 6
97      solution chromosome =
98        first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
99   4.97  5.89  9.   6.5  8.    9.    8.   11. ]
100       second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
101  12.  3.]
102       third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
103     The No. 6  iteration is finished!
104
105
106  ----------------------------------------------------------------------------------------
107  The iteration is terminated and then visulize the solution:
108     solution chromosome =
109       first level: [ [ 3.09  6.59  2.33  2.64  2.96  2.71  2.53  3.44  6.6   4.    5.44  2.65
110  4.97  5.89  9.   6.5  8.    9.    8.   11. ]
111       second level:  [ 7.  0.  2.  5. 11.  1. 13. 14. 18. 22. 25. 28. 31. 32.  1.  2.  4.  8.
112  12.  3.]
113       third level:  [2. 7. 2. 4. 3. 5. 3. 2. 2. 3. 2. 2. 4. 2. 7. 4. 2. 2. 2. 2.] ]
114     Objective function values and some other indicators:
115       Obj0 = 35.00           Obj1 = 827.65            Obj0 + Obj1 = 862.65
116       Total movement of crane: 39.65
117       Total waiting time in berth position: 239.00
118       Total index of q during berthing: 392.00
119     Specific arrangement for each vessel:
```

Line	V_id	li	xi	bow of i	tail of i	gama_i0	gama_i1
120	V_id: 0	li: 6.0	xi: 3.1	bow of i: 0.1	tail of i: 6.1	gama_i0: 7.0	gama_i1: 11.0
		duration_time_i: 4.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
121	V_id: 1	li: 7.0	xi: 6.6	bow of i: 3.1	tail of i: 10.1	gama_i0: 0.0	gama_i1: 1.0
		duration_time_i: 1.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
122	V_id: 2	li: 3.0	xi: 2.3	bow of i: 0.8	tail of i: 3.8	gama_i0: 2.0	gama_i1: 5.0
		duration_time_i: 3.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
123	V_id: 3	li: 4.0	xi: 2.6	bow of i: 0.6	tail of i: 4.6	gama_i0: 5.0	gama_i1: 7.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
124	V_id: 4	li: 4.0	xi: 3.0	bow of i: 1.0	tail of i: 5.0	gama_i0: 11.0	gama_i1: 13.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
125	V_id: 5	li: 5.0	xi: 2.7	bow of i: 0.2	tail of i: 5.2	gama_i0: 1.0	gama_i1: 2.0
		duration_time_i: 1.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
126	V_id: 6	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 13.0	gama_i1: 14.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
127	V_id: 7	li: 6.0	xi: 3.4	bow of i: 0.4	tail of i: 6.4	gama_i0: 14.0	gama_i1: 18.0
		duration_time_i: 4.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
128	V_id: 8	li: 9.0	xi: 6.6	bow of i: 2.1	tail of i: 11.1	gama_i0: 18.0	gama_i1: 22.0
		duration_time_i: 4.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
129	V_id: 9	li: 5.0	xi: 4.0	bow of i: 1.5	tail of i: 6.5	gama_i0: 22.0	gama_i1: 25.0
		duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
130	V_id: 10	li: 9.0	xi: 5.4	bow of i: 0.9	tail of i: 9.9	gama_i0: 25.0	gama_i1: 28.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
131	V_id: 11	li: 5.0	xi: 2.7	bow of i: 0.2	tail of i: 5.2	gama_i0: 28.0	gama_i1: 31.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
132	V_id: 12	li: 5.0	xi: 5.0	bow of i: 2.5	tail of i: 7.5	gama_i0: 31.0	gama_i1: 32.0
		duration_time_i: 1.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
133	V_id: 13	li: 8.0	xi: 5.9	bow of i: 1.9	tail of i: 9.9	gama_i0: 32.0	gama_i1: 36.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
134	V_id: 14	li: 7.0	xi: 9.0	bow of i: 5.5	tail of i: 12.5	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		
135	V_id: 15	li: 5.0	xi: 6.5	bow of i: 4.0	tail of i: 9.0	gama_i0: 2.0	gama_i1: 4.0
		duration_time_i: 2.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
136	V_id: 16	li: 3.0	xi: 8.0	bow of i: 6.5	tail of i: 9.5	gama_i0: 4.0	gama_i1: 8.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
137	V_id: 17	li: 5.0	xi: 9.0	bow of i: 6.5	tail of i: 11.5	gama_i0: 8.0	gama_i1: 12.0
		duration_time_i: 4.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
138	V_id: 18	li: 3.0	xi: 8.0	bow of i: 6.5	tail of i: 9.5	gama_i0: 12.0	gama_i1: 16.0
		duration_time_i: 4.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
139	V_id: 19	li: 3.0	xi: 11.0	bow of i: 9.5	tail of i: 12.5	gama_i0: 3.0	gama_i1: 6.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		

```
140
141  Algorithm finished and the total CPU time: 1372 s
142  End
143
```