```
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=47825
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_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 = 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] = 175.38   temp_best_value_gen = 175.38
37    The No. 0  iteration is finished!
38
39 Beging the No. 1  iteration:
40    obj[gen-1] = 175.38    temp_best_value_gen = 175.38
41    No, maintain solution  and obj[gen] = 175.38 , and the tolerance_counter = 1
42    solution chromosome =
43       first level: [ [ 8.88  5.79  7.09  5.96 15.   2.57  5.82  2.55  2.99  3.07  5.67  2.15
44   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
45       second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
46   4.  7.]
47       third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
48    The No. 1  iteration is finished!
49
50 Beging the No. 2  iteration:
51    obj[gen-1] = 175.38    temp_best_value_gen = 175.38
52    No, maintain solution  and obj[gen] = 175.38 , and the tolerance_counter = 2
53    solution chromosome =
54       first level: [ [ 8.88  5.79  7.09  5.96 15.   2.57  5.82  2.55  2.99  3.07  5.67  2.15
55   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
56       second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
57   4.  7.]
58       third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
59    The No. 2  iteration is finished!
60
61 Beging the No. 3  iteration:
62    obj[gen-1] = 175.38    temp_best_value_gen = 175.38
63    No, maintain solution  and obj[gen] = 175.38 , and the tolerance_counter = 3
64    solution chromosome =
65       first level: [ [ 8.88  5.79  7.09  5.96 15.   2.57  5.82  2.55  2.99  3.07  5.67  2.15
66   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
67       second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
68   4.  7.]
69       third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
70    The No. 3  iteration is finished!
71
72 Beging the No. 4  iteration:
73    obj[gen-1] = 175.38    temp_best_value_gen = 175.38
74    No, maintain solution  and obj[gen] = 175.38 , and the tolerance_counter = 4
75    solution chromosome =
76       first level: [ [ 8.88  5.79  7.09  5.96 15.   2.57  5.82  2.55  2.99  3.07  5.67  2.15
77   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
78       second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
79   4.  7.]
```

```
80        third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
81     The No. 4  iteration is finished!
82
83   Beging the No. 5  iteration:
84     obj[gen-1] = 175.38     temp_best_value_gen = 175.38
85     No, maintain solution  and obj[gen] = 175.38 , and the tolerance_counter = 5
86     solution chromosome =
87        first level: [ [ 8.88  5.79  7.09  5.96 15.    2.57  5.82  2.55  2.99  3.07  5.67  2.15
88   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
89        second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
90   4.  7.]
91        third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
92     The No. 5  iteration is finished!
93
94   Beging the No. 6  iteration:
95     obj[gen-1] = 175.38     temp_best_value_gen = 175.38
96     No, maintain solution  and obj[gen] = 175.38 , and the tolerance_counter = 6
97     solution chromosome =
98        first level: [ [ 8.88  5.79  7.09  5.96 15.    2.57  5.82  2.55  2.99  3.07  5.67  2.15
99   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
100        second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
101   4.  7.]
102        third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
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: [ [ 8.88  5.79  7.09  5.96 15.    2.57  5.82  2.55  2.99  3.07  5.67  2.15
110   5.17  4.42  6.06  5.71  3.74 12.5   6.26 12.  ]
111        second level:  [ 6.  3.  1.  5.  4.  6.  8. 10. 14. 17. 21. 23. 27. 29. 31.  0. 33.  2.
112   4.  7.]
113        third level:  [8. 8. 4. 6. 2. 3. 5. 2. 2. 2. 7. 2. 2. 7. 3. 5. 3. 3. 7. 3.] ]
114     Objective function values and some other indicators:
115        Obj0 = 35.00           Obj1 = 1088.80          Obj0 + Obj1 = 1123.80
116        Total movement of crane: 65.80
117        Total waiting time in berth position: 251.00
118        Total index of q during berthing: 406.00
119     Specific arrangement for each vessel:
```

	V_id	li	xi	bow of i	tail of i	gama_i0	gama_i1
120	V_id: 0	li: 9.0	xi: 8.9	bow of i: 4.4	tail of i: 13.4	gama_i0: 6.0	gama_i1: 7.0
		duration_time_i: 1.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
121	V_id: 1	li: 9.0	xi: 5.8	bow of i: 1.3	tail of i: 10.3	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		
122	V_id: 2	li: 8.0	xi: 7.1	bow of i: 3.1	tail of i: 11.1	gama_i0: 1.0	gama_i1: 2.0
		duration_time_i: 1.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
123	V_id: 3	li: 7.0	xi: 6.0	bow of i: 2.5	tail of i: 9.5	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		
124	V_id: 4	li: 8.0	xi: 15.0	bow of i: 11.0	tail of i: 19.0	gama_i0: 4.0	gama_i1: 6.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
125	V_id: 5	li: 3.0	xi: 2.6	bow of i: 1.1	tail of i: 4.1	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		
126	V_id: 6	li: 7.0	xi: 5.8	bow of i: 2.3	tail of i: 9.3	gama_i0: 8.0	gama_i1: 10.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
127	V_id: 7	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 10.0	gama_i1: 14.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
128	V_id: 8	li: 4.0	xi: 3.0	bow of i: 1.0	tail of i: 5.0	gama_i0: 14.0	gama_i1: 17.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
129	V_id: 9	li: 4.0	xi: 3.1	bow of i: 1.1	tail of i: 5.1	gama_i0: 17.0	gama_i1: 21.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
130	V_id: 10	li: 8.0	xi: 5.7	bow of i: 1.7	tail of i: 9.7	gama_i0: 21.0	gama_i1: 23.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
131	V_id: 11	li: 3.0	xi: 2.2	bow of i: 0.7	tail of i: 3.7	gama_i0: 23.0	gama_i1: 27.0
		duration_time_i: 4.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
132	V_id: 12	li: 8.0	xi: 5.2	bow of i: 1.2	tail of i: 9.2	gama_i0: 27.0	gama_i1: 29.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
133	V_id: 13	li: 7.0	xi: 4.4	bow of i: 0.9	tail of i: 7.9	gama_i0: 29.0	gama_i1: 31.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
134	V_id: 14	li: 7.0	xi: 6.1	bow of i: 2.6	tail of i: 9.6	gama_i0: 31.0	gama_i1: 33.0
		duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
135	V_id: 15	li: 8.0	xi: 5.7	bow of i: 1.7	tail of i: 9.7	gama_i0: 0.0	gama_i1: 1.0
		duration_time_i: 1.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
136	V_id: 16	li: 5.0	xi: 3.7	bow of i: 1.2	tail of i: 6.2	gama_i0: 33.0	gama_i1: 36.0
		duration_time_i: 3.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
137	V_id: 17	li: 4.0	xi: 12.5	bow of i: 10.5	tail of i: 14.5	gama_i0: 2.0	gama_i1: 4.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
138	V_id: 18	li: 9.0	xi: 6.3	bow of i: 1.8	tail of i: 10.8	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		
139	V_id: 19	li: 3.0	xi: 12.0	bow of i: 10.5	tail of i: 13.5	gama_i0: 7.0	gama_i1: 9.0
		duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		

```
140
141   Algorithm finished and the total CPU time: 1360 s
142   End
143
```