```
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=17237
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_8_5 _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 =  24
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] = 19.70     temp_best_value_gen = 19.70
37    The No. 0  iteration is finished!
38
39 Beging the No. 1  iteration:
40    obj[gen-1] = 19.70   temp_best_value_gen = 19.70
41    No, maintain solution  and obj[gen] = 19.70 , and the tolerance_counter = 1
42    solution chromosome =
43       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
44       second level:  [1. 5. 1. 3. 6. 3. 4. 6.]
45       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
46    The No. 1  iteration is finished!
47
48 Beging the No. 2  iteration:
49    obj[gen-1] = 19.70   temp_best_value_gen = 19.70
50    No, maintain solution  and obj[gen] = 19.70 , and the tolerance_counter = 2
51    solution chromosome =
52       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
53       second level:  [1. 5. 1. 3. 6. 3. 4. 6.]
54       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
55    The No. 2  iteration is finished!
56
57 Beging the No. 3  iteration:
58    obj[gen-1] = 19.70   temp_best_value_gen = 19.50
59    Yes, update solution and obj[gen] = 19.50
60    solution chromosome =
61       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
62       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
63       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
64    The No. 3  iteration is finished!
65
66 Beging the No. 4  iteration:
67    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
68    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 1
69    solution chromosome =
70       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
71       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
72       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
73    The No. 4  iteration is finished!
74
75 Beging the No. 5  iteration:
76    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
77    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 2
78    solution chromosome =
79       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
```

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 80       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
 81       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
 82    The No. 5  iteration is finished!
 83
 84  Beging the No. 6  iteration:
 85    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
 86    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 3
 87    solution chromosome =
 88       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
 89       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
 90       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
 91    The No. 6  iteration is finished!
 92
 93  Beging the No. 7  iteration:
 94    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
 95    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 4
 96    solution chromosome =
 97       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
 98       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
 99       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
100    The No. 7  iteration is finished!
101
102  Beging the No. 8  iteration:
103    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
104    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 5
105    solution chromosome =
106       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
107       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
108       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
109    The No. 8  iteration is finished!
110
111  Beging the No. 9  iteration:
112    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
113    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 6
114    solution chromosome =
115       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
116       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
117       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
118    The No. 9  iteration is finished!
119
120  Beging the No. 10  iteration:
121    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
122    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 7
123    solution chromosome =
124       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
125       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
126       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
127    The No. 10  iteration is finished!
128
129  Beging the No. 11  iteration:
130    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
131    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 8
132    solution chromosome =
133       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
134       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
135       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
136    The No. 11  iteration is finished!
137
138  Beging the No. 12  iteration:
139    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
140    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 9
141    solution chromosome =
142       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
143       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
144       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
145    The No. 12  iteration is finished!
146
147  Beging the No. 13  iteration:
148    obj[gen-1] = 19.50   temp_best_value_gen = 19.50
149    No, maintain solution  and obj[gen] = 19.50 , and the tolerance_counter = 10
150    solution chromosome =
151       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
152       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
153       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
154    The No. 13  iteration is finished!
155
156
157  -------------------------------------------------------------------------------
158  The iteration is terminated and then visulize the solution:
159    solution chromosome =
160       first level: [ [ 4.5 13.  19.5 24.  27.5  2.5  3.   4. ]
161       second level:  [1. 5. 1. 6. 1. 3. 4. 6.]
162       third level:  [6. 2. 5. 2. 2. 4. 4. 4.] ]
163    Objective function values and some other indicators:
```

164	Obj0 = 8.00	Obj1 = 43.00	Obj0 + Obj1 = 51.00			
165	Total movement of crane: 16.00					
166	Total waiting time in berth position: 27.00					
167	Total index of q during berthing: 403.00					
168	Specific arrangement for each vessel:					
169	V_id: 0	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	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	
170	V_id: 1	li: 8.0	xi: 13.0	bow of i: 9.0	tail of i: 17.0	gama_i0: 5.0	gama_i1: 8
	.0	duration_time_i: 3.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0	
171	V_id: 2	li: 5.0	xi: 19.5	bow of i: 17.0	tail of i: 22.0	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	
172	V_id: 3	li: 4.0	xi: 24.0	bow of i: 22.0	tail of i: 26.0	gama_i0: 6.0	gama_i1: 9
	.0	duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
173	V_id: 4	li: 5.0	xi: 27.5	bow of i: 25.0	tail of i: 30.0	gama_i0: 1.0	gama_i1: 4
	.0	duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
174	V_id: 5	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	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	
175	V_id: 6	li: 6.0	xi: 3.0	bow of i: 0.0	tail of i: 6.0	gama_i0: 4.0	gama_i1: 6.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
176	V_id: 7	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 6.0	gama_i1: 8.0
		duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0	
177						
178	Algorithm finished and the total CPU time: 1176 s					
179	End					
180						