```
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=35420
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_3 _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] = 179.90   temp_best_value_gen = 179.90
37     The No. 0  iteration is finished!
38
39 Beging the No. 1  iteration:
40     obj[gen-1] = 179.90     temp_best_value_gen = 179.90
41     No, maintain solution  and obj[gen] = 179.90 , and the tolerance_counter = 1
42     solution chromosome =
43        first level: [ [ 2.5  4.  14.  20.5 27.  26.   4.   4.5 2.   2.5 2.   4.   2.   2.
44    1.5 4.   4.5 2.   8.5 3.5]
45        second level:  [ 3. 31.  8.  2.  1.  4. 12. 13. 16. 18. 22. 25. 26. 29.  4. 33. 30.  7.
46    5.  0.]
47        third level:  [3. 5. 2. 3. 3. 3. 6. 3. 2. 2. 2. 6. 3. 4. 2. 2. 8. 2. 3. 3.] ]
48     The No. 1  iteration is finished!
49
50 Beging the No. 2  iteration:
51     obj[gen-1] = 179.90     temp_best_value_gen = 159.94
52     Yes, update solution and obj[gen] = 159.94
53     solution chromosome =
54        first level: [ [11.5   4.86  3.96  5.21  2.32  7.46  7.49  6.24  3.18  5.74  3.91  5.06
55    2.04  2.94  2.15  4.6   5.67 10.5  18.   11.5 ]
56        second level:  [ 2.  3.  5.  0.  9. 11. 12. 13. 15. 33. 19. 17. 26. 23. 30.  1. 22.  3.
57    2.  6.]
58        third level:  [4. 6. 2. 7. 2. 6. 4. 5. 2. 3. 2. 2. 3. 2. 2. 4. 6. 3. 2. 2.] ]
59     The No. 2  iteration is finished!
60
61 Beging the No. 3  iteration:
62     obj[gen-1] = 159.94     temp_best_value_gen = 159.94
63     No, maintain solution  and obj[gen] = 159.94 , and the tolerance_counter = 1
64     solution chromosome =
65        first level: [ [11.5   4.86  3.96  5.21  2.32  7.46  7.49  6.24  3.18  5.74  3.91  5.06
66    2.04  2.94  2.15  4.6   5.67 10.5  18.   11.5 ]
67        second level:  [ 2.  3.  5.  0.  9. 11. 12. 13. 15. 33. 19. 17. 26. 23. 30.  1. 22.  3.
68    2.  6.]
69        third level:  [4. 6. 2. 7. 2. 6. 4. 5. 2. 3. 2. 2. 3. 2. 2. 4. 6. 3. 2. 2.] ]
70     The No. 3  iteration is finished!
71
72 Beging the No. 4  iteration:
73     obj[gen-1] = 159.94     temp_best_value_gen = 159.94
74     No, maintain solution  and obj[gen] = 159.94 , and the tolerance_counter = 2
75     solution chromosome =
76        first level: [ [11.5   4.86  3.96  5.21  2.32  7.46  7.49  6.24  3.18  5.74  3.91  5.06
77    2.04  2.94  2.15  4.6   5.67 10.5  18.   11.5 ]
78        second level:  [ 2.  3.  5.  0.  9. 11. 12. 13. 15. 33. 19. 17. 26. 23. 30.  1. 22.  3.
79    2.  6.]
```

```
80      third level:  [4. 6. 2. 7. 2. 6. 4. 5. 2. 3. 2. 2. 3. 2. 2. 4. 6. 3. 2. 2.] ]
81    The No. 4  iteration is finished!
82
83  Beging the No. 5  iteration:
84    obj[gen-1] = 159.94    temp_best_value_gen = 159.94
85    No, maintain solution  and obj[gen] = 159.94 , and the tolerance_counter = 3
86    solution chromosome =
87      first level: [ [11.5   4.86  3.96  5.21  2.32  7.46  7.49  6.24  3.18  5.74  3.91  5.06
88    2.04  2.94  2.15  4.6   5.67 10.5  18.   11.5 ]
89      second level:  [ 2.  3.  5.  0.  9. 11. 12. 13. 15. 33. 19. 17. 26. 23. 30.  1. 22.  3.
90    2.  6.]
91      third level:  [4. 6. 2. 7. 2. 6. 4. 5. 2. 3. 2. 2. 3. 2. 2. 4. 6. 3. 2. 2.] ]
92    The No. 5  iteration is finished!
93
94  Beging the No. 6  iteration:
95    obj[gen-1] = 159.94    temp_best_value_gen = 152.30
96    Yes, update solution and obj[gen] = 152.30
97    solution chromosome =
98      first level: [ [ 2.5  3.5 14.   4.5 27.  26.   4.   4.5 4.   2.5 2.   4.   2.5 2.5
99    1.5 4.   4.5 20.5  8.5  3.5]
100     second level:  [27. 15.  8. 34.  0.  6. 12. 13. 31.  1. 18. 21.  3. 23. 28.  6.  8.  2.
101   3. 10.]
102     third level:  [4. 4. 2. 4. 3. 3. 5. 5. 4. 5. 2. 2. 3. 2. 3. 3. 3. 3. 2. 4.] ]
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: [ [ 2.5  3.5 14.   4.5 27.  26.   4.   4.5 4.   2.5 2.   4.   2.5 2.5
110   1.5 4.   4.5 20.5  8.5  3.5]
111     second level:  [27. 15.  8. 34.  0.  6. 12. 13. 31.  1. 18. 21.  3. 23. 28.  6.  8.  2.
112   3. 10.]
113     third level:  [4. 4. 2. 4. 3. 3. 5. 5. 4. 5. 2. 2. 3. 2. 3. 3. 3. 3. 2. 4.] ]
114   Objective function values and some other indicators:
115     Obj0 = 35.00          Obj1 = 858.00          Obj0 + Obj1 = 893.00
116     Total movement of crane: 53.00
117     Total waiting time in berth position: 269.00
118     Total index of q during berthing: 510.00
119   Specific arrangement for each vessel:
```

120 V_id: 0	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 27.0	gama_i1: 28.0
	duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
121 V_id: 1	li: 7.0	xi: 3.5	bow of i: 0.0	tail of i: 7.0	gama_i0: 15.0	gama_i1: 17.0
	duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
122 V_id: 2	li: 4.0	xi: 14.0	bow of i: 12.0	tail of i: 16.0	gama_i0: 8.0	gama_i1: 12.0
	duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
123 V_id: 3	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 34.0	gama_i1: 36.0
	duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
124 V_id: 4	li: 4.0	xi: 27.0	bow of i: 25.0	tail of i: 29.0	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		
125 V_id: 5	li: 8.0	xi: 26.0	bow of i: 22.0	tail of i: 30.0	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		
126 V_id: 6	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 12.0	gama_i1: 13.0
	duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
127 V_id: 7	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 13.0	gama_i1: 15.0
	duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
128 V_id: 8	li: 4.0	xi: 4.0	bow of i: 2.0	tail of i: 6.0	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		
129 V_id: 9	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 1.0	gama_i1: 3.0
	duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
130 V_id: 10	li: 4.0	xi: 2.0	bow of i: 0.0	tail of i: 4.0	gama_i0: 18.0	gama_i1: 21.0
	duration_time_i: 3.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
131 V_id: 11	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 21.0	gama_i1: 23.0
	duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
132 V_id: 12	li: 4.0	xi: 2.5	bow of i: 0.5	tail of i: 4.5	gama_i0: 3.0	gama_i1: 6.0
	duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
133 V_id: 13	li: 4.0	xi: 2.5	bow of i: 0.5	tail of i: 4.5	gama_i0: 23.0	gama_i1: 25.0
	duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
134 V_id: 14	li: 3.0	xi: 1.5	bow of i: 0.0	tail of i: 3.0	gama_i0: 28.0	gama_i1: 30.0
	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: 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: 120.0	work load_i: 120.0	work load gap_i: 0		
136 V_id: 16	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 8.0	gama_i1: 10.0
	duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
137 V_id: 17	li: 4.0	xi: 20.5	bow of i: 18.5	tail of i: 22.5	gama_i0: 2.0	gama_i1: 5.0
	duration_time_i: 3.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
138 V_id: 18	li: 8.0	xi: 8.5	bow of i: 4.5	tail of i: 12.5	gama_i0: 3.0	gama_i1: 5.0
	duration_time_i: 2.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
139 V_id: 19	li: 6.0	xi: 3.5	bow of i: 0.5	tail of i: 6.5	gama_i0: 10.0	gama_i1: 12.0
	duration_time_i: 2.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		

```
140
141 Algorithm finished and the total CPU time: 1349 s
142 End
143
```