

```

1 "E:\1 0000\3 0000\1 0000\1 0000\1 0000\1_LW_0000\2\6 0000\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=51365
2
3 import sys; print('Python %s on %s' % (sys.version, sys.platform))
4 sys.path.extend(['E:\1 0000\3 0000\1 0000\1 0000\1 0000\1_LW_0000\2\6 0000\2 python code\
  01_My_Python_Code', 'E:\1 0000\3 0000\1 0000\1 0000\1_LW_0000\2\6 0000\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 0000\3 0000\1 0000\1 0000\1_LW_0000\2\6 0000\2 python code\01_My_Python_Code\
  main_BACASP_official_ENSGA-II.py', wdir='E:\1 0000\3 0000\1 0000\1 0000\1_LW_0000\2\6 0000\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_6_9_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 = 18
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] = 20.66   temp_best_value_gen = 20.66
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 20.66   temp_best_value_gen = 18.10
41   Yes, update solution and obj[gen] = 18.10
42   solution chromosome =
43     first level: [ [ 3. 7.5 13. 25.5 19. 26. ]
44     second level: [ 2. 3. 3. 6. 4. 1. ]
45     third level: [ 5. 2. 5. 2. 2. 4. ] ]
46   The No. 1 iteration is finished!
47
48 Beging the No. 2 iteration:
49   obj[gen-1] = 18.10   temp_best_value_gen = 18.10
50   No, maintain solution and obj[gen] = 18.10 , and the tolerance_counter = 1
51   solution chromosome =
52     first level: [ [ 3. 7.5 13. 25.5 19. 26. ]
53     second level: [ 2. 3. 3. 6. 4. 1. ]
54     third level: [ 5. 2. 5. 2. 2. 4. ] ]
55   The No. 2 iteration is finished!
56
57 Beging the No. 3 iteration:
58   obj[gen-1] = 18.10   temp_best_value_gen = 18.10
59   No, maintain solution and obj[gen] = 18.10 , and the tolerance_counter = 2
60   solution chromosome =
61     first level: [ [ 3. 7.5 13. 25.5 19. 26. ]
62     second level: [ 2. 3. 3. 6. 4. 1. ]
63     third level: [ 5. 2. 5. 2. 2. 4. ] ]
64   The No. 3 iteration is finished!
65
66 Beging the No. 4 iteration:
67   obj[gen-1] = 18.10   temp_best_value_gen = 18.10
68   No, maintain solution and obj[gen] = 18.10 , and the tolerance_counter = 3
69   solution chromosome =
70     first level: [ [ 3. 7.5 13. 25.5 19. 26. ]
71     second level: [ 2. 3. 3. 6. 4. 1. ]
72     third level: [ 5. 2. 5. 2. 2. 4. ] ]
73   The No. 4 iteration is finished!
74
75 Beging the No. 5 iteration:
76   obj[gen-1] = 18.10   temp_best_value_gen = 17.90
77   Yes, update solution and obj[gen] = 17.90
78   solution chromosome =
79     first level: [ [ 3. 19. 13. 25.5 7.5 26. ]

```

```

80     second level: [2. 4. 3. 6. 4. 1.]
81     third level: [5. 2. 5. 2. 2. 4.]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
86     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 1
87     solution chromosome =
88         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
89         second level: [2. 4. 3. 6. 4. 1.]
90         third level: [5. 2. 5. 2. 2. 4.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
95     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 2
96     solution chromosome =
97         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
98         second level: [2. 4. 3. 6. 4. 1.]
99         third level: [5. 2. 5. 2. 2. 4.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
104     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 3
105     solution chromosome =
106         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
107         second level: [2. 4. 3. 6. 4. 1.]
108         third level: [5. 2. 5. 2. 2. 4.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
113     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 4
114     solution chromosome =
115         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
116         second level: [2. 4. 3. 6. 4. 1.]
117         third level: [5. 2. 5. 2. 2. 4.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
122     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 5
123     solution chromosome =
124         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
125         second level: [2. 4. 3. 6. 4. 1.]
126         third level: [5. 2. 5. 2. 2. 4.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
131     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 6
132     solution chromosome =
133         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
134         second level: [2. 4. 3. 6. 4. 1.]
135         third level: [5. 2. 5. 2. 2. 4.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
140     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 7
141     solution chromosome =
142         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
143         second level: [2. 4. 3. 6. 4. 1.]
144         third level: [5. 2. 5. 2. 2. 4.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
149     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 8
150     solution chromosome =
151         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
152         second level: [2. 4. 3. 6. 4. 1.]
153         third level: [5. 2. 5. 2. 2. 4.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 17.90 temp_best_value_gen = 17.90
158     No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 9
159     solution chromosome =
160         first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
161         second level: [2. 4. 3. 6. 4. 1.]
162         third level: [5. 2. 5. 2. 2. 4.] ]
163    The No. 14 iteration is finished!

```

```

164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 17.90 temp_best_value_gen = 17.90
167 No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 10
168 solution chromosome =
169 first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
170 second level: [2. 4. 3. 6. 4. 1.]
171 third level: [5. 2. 5. 2. 2. 4.]
172 The No. 15 iteration is finished!
173
174
175 -----
176 The iteration is terminated and then visulize the solution:
177 solution chromosome =
178 first level: [ [ 3. 19. 13. 25.5 7.5 26. ]
179 second level: [2. 4. 3. 6. 4. 1.]
180 third level: [5. 2. 5. 2. 2. 4.]
181 Objective function values and some other indicators:
182 Obj0 = 7.00 Obj1 = 46.00 Obj0 + Obj1 = 53.00
183 Total movement of crane: 26.00
184 Total waiting time in berth position: 20.00
185 Total index of q during berthing: 352.00
186 Specific arrangement for each vessel:
187 V_id: 0 li: 6.0 xi: 3.0 bow of i: 0.0 tail of i: 6.0 gama_i0: 2.0 gama_i1: 4.0
duration_time_i: 2.0 demand_i: 160.0 work load_i: 160.0 work load gap_i: 0
188 V_id: 1 li: 3.0 xi: 19.0 bow of i: 17.5 tail of i: 20.5 gama_i0: 4.0 gama_i1: 7
.0 duration_time_i: 3.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0
189 V_id: 2 li: 8.0 xi: 13.0 bow of i: 9.0 tail of i: 17.0 gama_i0: 3.0 gama_i1: 4
.0 duration_time_i: 1.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0
190 V_id: 3 li: 4.0 xi: 25.5 bow of i: 23.5 tail of i: 27.5 gama_i0: 6.0 gama_i1: 8
.0 duration_time_i: 2.0 demand_i: 60.0 work load_i: 60.0 work load gap_i: 0
191 V_id: 4 li: 9.0 xi: 7.5 bow of i: 3.0 tail of i: 12.0 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
192 V_id: 5 li: 8.0 xi: 26.0 bow of i: 22.0 tail of i: 30.0 gama_i0: 1.0 gama_i1: 3
.0 duration_time_i: 2.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0
193
194 Algorithm finished and the total CPU time: 1060 s
195 End
196

```