

```

1 "E:\1 \ \ \ \ \3 \ \ \ \ \ \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=53841
2
3 import sys; print('Python %s on %s' % (sys.version, sys.platform))
4 sys.path.extend(['E:\1 \ \ \ \ \3 \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1_LW_ \ \ \ \ \2\6 \ \ \ \ \2 python code\
   01_My_Python_Code', 'E:/1 \ \ \ \ \3 \ \ \ \ \ \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_LW_ \ \ \ \ \2\6 \ \ \ \ \2 python code\01_My_Python_Code/
   main_BACASP_official_ENSGA-II.py', wdir='E:/1 \ \ \ \ \3 \ \ \ \ \ \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_2_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 = 6
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= 0.100000000000000009
32     gen = 0
33
34 Iteration begin:
35 Beging the No. 0 iteration:
36   obj[0] = 9.90   temp_best_value_gen = 9.90
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 9.90   temp_best_value_gen = 8.57
41   Yes, update solution and obj[gen] = 8.57
42   solution chromosome =
43     first level: [ [3.18 6.62]
44     second level: [3. 1.]
45     third level: [4. 4.] ]
46   The No. 1 iteration is finished!
47
48 Beging the No. 2 iteration:
49   obj[gen-1] = 8.57   temp_best_value_gen = 8.57
50   No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 1
51   solution chromosome =
52     first level: [ [3.18 6.62]
53     second level: [3. 1.]
54     third level: [4. 4.] ]
55   The No. 2 iteration is finished!
56
57 Beging the No. 3 iteration:
58   obj[gen-1] = 8.57   temp_best_value_gen = 8.57
59   No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 2
60   solution chromosome =
61     first level: [ [3.18 6.62]
62     second level: [3. 1.]
63     third level: [4. 4.] ]
64   The No. 3 iteration is finished!
65
66 Beging the No. 4 iteration:
67   obj[gen-1] = 8.57   temp_best_value_gen = 8.57
68   No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 3
69   solution chromosome =
70     first level: [ [3.18 6.62]
71     second level: [3. 1.]
72     third level: [4. 4.] ]
73   The No. 4 iteration is finished!
74
75 Beging the No. 5 iteration:
76   obj[gen-1] = 8.57   temp_best_value_gen = 8.57
77   No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 4
78   solution chromosome =
79     first level: [ [3.18 6.62]

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80     second level: [3. 1.]
81     third level: [4. 4.]
82     The No. 5 iteration is finished!
83
84     Beging the No. 6 iteration:
85     obj[gen-1] = 8.57    temp_best_value_gen = 8.57
86     No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 5
87     solution chromosome =
88     first level: [ [3.18 6.62]
89     second level: [3. 1.]
90     third level: [4. 4.] ]
91     The No. 6 iteration is finished!
92
93     Beging the No. 7 iteration:
94     obj[gen-1] = 8.57    temp_best_value_gen = 8.57
95     No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 6
96     solution chromosome =
97     first level: [ [3.18 6.62]
98     second level: [3. 1.]
99     third level: [4. 4.] ]
100    The No. 7 iteration is finished!
101
102    Beging the No. 8 iteration:
103    obj[gen-1] = 8.57    temp_best_value_gen = 8.57
104    No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 7
105    solution chromosome =
106    first level: [ [3.18 6.62]
107    second level: [3. 1.]
108    third level: [4. 4.] ]
109    The No. 8 iteration is finished!
110
111    Beging the No. 9 iteration:
112    obj[gen-1] = 8.57    temp_best_value_gen = 8.57
113    No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 8
114    solution chromosome =
115    first level: [ [3.18 6.62]
116    second level: [3. 1.]
117    third level: [4. 4.] ]
118    The No. 9 iteration is finished!
119
120    Beging the No. 10 iteration:
121    obj[gen-1] = 8.57    temp_best_value_gen = 8.57
122    No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 9
123    solution chromosome =
124    first level: [ [3.18 6.62]
125    second level: [3. 1.]
126    third level: [4. 4.] ]
127    The No. 10 iteration is finished!
128
129    Beging the No. 11 iteration:
130    obj[gen-1] = 8.57    temp_best_value_gen = 8.57
131    No, maintain solution and obj[gen] = 8.57 , and the tolerance_counter = 10
132    solution chromosome =
133    first level: [ [3.18 6.62]
134    second level: [3. 1.]
135    third level: [4. 4.] ]
136    The No. 11 iteration is finished!
137
138
139 -----
140    The iteration is terminated and then visulize the solution:
141    solution chromosome =
142    first level: [ [3.18 6.62]
143    second level: [3. 1.]
144    third level: [4. 4.] ]
145    Objective function values and some other indicators:
146    Obj0 = 4.00      Obj1 = 9.69      Obj0 + Obj1 = 13.69
147    Total movement of crane: 5.69
148    Total waiting time in berth position: 4.00
149    Total index of q during berthing: 49.00
150    Specific arrangement for each vessel:
151    V_id: 0          li: 4.0          xi: 3.2          bow of i: 1.2          tail of i: 5.2          gama_i0: 3.0          gama_i1: 5.0
152    duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
153    V_id: 1          li: 7.0          xi: 6.6          bow of i: 3.1          tail of i: 10.1          gama_i0: 1.0          gama_i1: 3.0
154    duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
155
156    Algorithm finished and the total CPU time: 270 s
157    End

```