

```

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=5743
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 \_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 \_LW\_ \ \ \ \ \2\6 \ \ \ \ \2 python code\01_My_Python_Code/
   main_BACASP_official_ENSGA-II.py', wdir='E:/1 \ \ \ \ \3 \ \ \ \ \ \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_19_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 = 57
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] = 78.00   temp_best_value_gen = 78.00
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 78.00   temp_best_value_gen = 78.00
41   No, maintain solution and obj[gen] = 78.00 , and the tolerance_counter = 1
42   solution chromosome =
43     first level: [ [ 2. 6. 10. 15. 21. 25.5 26. 4. 2. 4. 3.5 3. 4.5 3.5
44 4. 2.5 1.5 1.5 1.5]
45     second level: [ 5. 2. 7. 5. 1. 1. 4. 8. 1. 10. 11. 13. 15. 16. 17. 19. 2. 23.
46 27.]
47     third level: [2. 2. 4. 2. 5. 2. 6. 2. 4. 8. 5. 5. 9. 4. 2. 2. 2. 2.] ]
48   The No. 1 iteration is finished!
49
50 Beging the No. 2 iteration:
51   obj[gen-1] = 78.00   temp_best_value_gen = 78.00
52   No, maintain solution and obj[gen] = 78.00 , and the tolerance_counter = 2
53   solution chromosome =
54     first level: [ [ 2. 6. 10. 15. 21. 25.5 26. 4. 2. 4. 3.5 3. 4.5 3.5
55 4. 2.5 1.5 1.5 1.5]
56     second level: [ 5. 2. 7. 5. 1. 1. 4. 8. 1. 10. 11. 13. 15. 16. 17. 19. 2. 23.
57 27.]
58     third level: [2. 2. 4. 2. 5. 2. 6. 2. 4. 8. 5. 5. 9. 4. 2. 2. 2. 2.] ]
59   The No. 2 iteration is finished!
60
61 Beging the No. 3 iteration:
62   obj[gen-1] = 78.00   temp_best_value_gen = 78.00
63   No, maintain solution and obj[gen] = 78.00 , and the tolerance_counter = 3
64   solution chromosome =
65     first level: [ [ 2. 6. 10. 15. 21. 25.5 26. 4. 2. 4. 3.5 3. 4.5 3.5
66 4. 2.5 1.5 1.5 1.5]
67     second level: [ 5. 2. 7. 5. 1. 1. 4. 8. 1. 10. 11. 13. 15. 16. 17. 19. 2. 23.
68 27.]
69     third level: [2. 2. 4. 2. 5. 2. 6. 2. 4. 8. 5. 5. 9. 4. 2. 2. 2. 2.] ]
70   The No. 3 iteration is finished!
71
72 Beging the No. 4 iteration:
73   obj[gen-1] = 78.00   temp_best_value_gen = 78.00
74   No, maintain solution and obj[gen] = 78.00 , and the tolerance_counter = 4
75   solution chromosome =
76     first level: [ [ 2. 6. 10. 15. 21. 25.5 26. 4. 2. 4. 3.5 3. 4.5 3.5
77 4. 2.5 1.5 1.5 1.5]
78     second level: [ 5. 2. 7. 5. 1. 1. 4. 8. 1. 10. 11. 13. 15. 16. 17. 19. 2. 23.
79 27.]

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80   third level: [2. 2. 4. 2. 5. 2. 6. 2. 4. 8. 5. 5. 9. 4. 2. 2. 2. 2.] ]
81   The No. 4 iteration is finished!
82
83   Beging the No. 5 iteration:
84   obj[gen-1] = 78.00   temp_best_value_gen = 78.00
85   No, maintain solution and obj[gen] = 78.00 , and the tolerance_counter = 5
86   solution chromosome =
87   first level: [ [ 2. 6. 10. 15. 21. 25.5 26. 4. 2. 4. 3.5 3. 4.5 3.5
88   4. 2.5 1.5 1.5 1.5]
89   second level: [ 5. 2. 7. 5. 1. 1. 4. 8. 1. 10. 11. 13. 15. 16. 17. 19. 2. 23.
90   27.]
91   third level: [2. 2. 4. 2. 5. 2. 6. 2. 4. 8. 5. 5. 9. 4. 2. 2. 2. 2.] ]
92   The No. 5 iteration is finished!
93
94
95   -----
96   The iteration is terminated and then visulize the solution:
97   solution chromosome =
98   first level: [ [ 2. 6. 10. 15. 21. 25.5 26. 4. 2. 4. 3.5 3. 4.5 3.5
99   4. 2.5 1.5 1.5 1.5]
100  second level: [ 5. 2. 7. 5. 1. 1. 4. 8. 1. 10. 11. 13. 15. 16. 17. 19. 2. 23.
101  27.]
102  third level: [2. 2. 4. 2. 5. 2. 6. 2. 4. 8. 5. 5. 9. 4. 2. 2. 2. 2.] ]
103  Objective function values and some other indicators:
104  Obj0 = 29.00      Obj1 = 229.00      Obj0 + Obj1 = 258.00
105  Total movement of crane: 42.00
106  Total waiting time in berth position: 187.00
107  Total index of q during berthing: 487.00
108  Specific arrangement for each vessel:
109  V_id: 0          li: 4.0          xi: 2.0          bow of i: 0.0          tail of i: 4.0          gama_i0: 5.0          gama_i1: 8.0
110          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
111  V_id: 1          li: 4.0          xi: 6.0          bow of i: 4.0          tail of i: 8.0          gama_i0: 2.0          gama_i1: 5.0
112          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
113  V_id: 2          li: 4.0          xi: 10.0          bow of i: 8.0          tail of i: 12.0          gama_i0: 7.0          gama_i1: 9
114          duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
115  V_id: 3          li: 6.0          xi: 15.0          bow of i: 12.0          tail of i: 18.0          gama_i0: 5.0          gama_i1: 9
116          duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
117  V_id: 4          li: 6.0          xi: 21.0          bow of i: 18.0          tail of i: 24.0          gama_i0: 1.0          gama_i1: 2
118          duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
119  V_id: 5          li: 3.0          xi: 25.5          bow of i: 24.0          tail of i: 27.0          gama_i0: 1.0          gama_i1: 3
120          duration_time_i: 2.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
121  V_id: 6          li: 8.0          xi: 26.0          bow of i: 22.0          tail of i: 30.0          gama_i0: 4.0          gama_i1: 5
122          duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
123  V_id: 7          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 8.0          gama_i1: 10.0
124          duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
125  V_id: 8          li: 4.0          xi: 2.0          bow of i: 0.0          tail of i: 4.0          gama_i0: 1.0          gama_i1: 2.0
126          duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
127  V_id: 9          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 10.0          gama_i1: 11.0
128          duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
129  V_id: 10         li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          gama_i0: 11.0          gama_i1: 13.
130          duration_time_i: 2.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
131  V_id: 11         li: 6.0          xi: 3.0          bow of i: 0.0          tail of i: 6.0          gama_i0: 13.0          gama_i1: 15.
132          duration_time_i: 2.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
133  V_id: 12         li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          gama_i0: 15.0          gama_i1: 16.
134          duration_time_i: 1.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
135  V_id: 13         li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          gama_i0: 16.0          gama_i1: 17.
136          duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
137  V_id: 14         li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 17.0          gama_i1: 19.
138          duration_time_i: 2.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
139  V_id: 15         li: 5.0          xi: 2.5          bow of i: 0.0          tail of i: 5.0          gama_i0: 19.0          gama_i1: 23.
140          duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
141  V_id: 16         li: 3.0          xi: 1.5          bow of i: 0.0          tail of i: 3.0          gama_i0: 2.0          gama_i1: 5.0
142          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
143  V_id: 17         li: 3.0          xi: 1.5          bow of i: 0.0          tail of i: 3.0          gama_i0: 23.0          gama_i1: 27.
144          duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
145  V_id: 18         li: 3.0          xi: 1.5          bow of i: 0.0          tail of i: 3.0          gama_i0: 27.0          gama_i1: 30.
146          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
147
148  129 Algorithm finished and the total CPU time: 1263 s
149  130 End
150  131

```