

Garbage bins placing for maximum demand satisfaction

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Genetic Algorithms & DEAP

① Distributed Evolutionary Algorithms in Python

Genetic Algorithms & DEAP

- 1 Distributed Evolutionary Algorithms in Python
- 2 Evolutionary Framework

Genetic Algorithms & DEAP

- 1 Distributed Evolutionary Algorithms in Python
- 2 Evolutionary Framework
- 3 Fast prototyping and testing of ideas

The problem

The problem

- 1 Waste, waste everywhere

The problem

- ① Waste, waste everywhere
- ② Expensive

The Scenario

The Scenario

1 Demand

The Scenario

- 1 Demand
- 2 Distance

The Scenario

- 1 Demand
- 2 Distance
- 3 Budgeted

A solution?

A solution?

- 1 Many actually

A solution?

- 1 Many actually
- 2 Genetic Algorithms

A solution

1 Input

A solution

- ① Input
 - ① Map with historical data

A solution

① Input

- ① Map with historical data
- ② Number of bins

A solution

- ① Input
 - ① Map with historical data
 - ② Number of bins
- ② Output

A solution

① Input

- ① Map with historical data
- ② Number of bins

② Output

- ① Map with the location of the bins, also their minimum volume

A solution

① Input

- ① Map with historical data
- ② Number of bins

② Output

- ① Map with the location of the bins, also their minimum volume
- ② And something else

```

Start of evolution
  Evaluated 300 individuals
-- Generation 1 --
  Evaluated 191 individuals
Best individual is [4, 2, 17, 5, 13, 0, 9, 5, 9, 3, 5, 5, 7, 4, 13, 0, 12, 4, 13, 8, 9, 4, 16, 7, 11, 1, 2, 2, 12, 4, 17, 8, 4, 1, 1, 7,
17, 4, 17, 1, 7, 1, 8, 6, 0, 3, 4, 5, 5, 7, 11, 8, 17, 0, 15, 3, 10, 8, 14, 5, 8, 2, 8, 8, 1, 0, 0, 4, 1, 8, 2, 2, 9, 9, 16, 8] with score 97.4537%
0.00 -0.25 -0.50 -1.00 -1.00 0.00 0.00 0.00 0.00 0.25      0.00 0.00 0.00 4.75 2.50 0.00 0.00 0.00 0.00 0.00 0.00
-0.50 -0.75 -1.00 -1.00 -0.50 0.00 0.00 -0.50 -0.50 0.25      2.50 0.00 0.00 0.00 0.00 0.00 0.00 10.00 4.75 0.00
-0.50 -12.50 -2.25 -1.25 -0.50 0.00 -0.25 -0.25 0.00 0.25      0.00 0.00 0.25 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-0.50 -1.25 -1.25 -1.25 -0.50 -2.50 -0.50 -0.25 0.25 0.25      0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-0.25 -1.00 -1.00 -0.75 -0.75 -0.75 -0.50 0.00 0.50 0.75      0.00 6.25 11.25 0.00 0.00 9.00 0.00 0.00 0.00 0.00
0.00 -0.25 -0.50 -0.75 -0.50 -1.00 -0.75 -0.50 0.50 0.75      0.00 0.00 0.00 0.00 0.00 11.25 0.00 7.00 0.00 0.00
-0.25 -0.25 -0.50 -1.00 -1.00 -0.75 -1.00 -0.50 0.00 0.50      0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.25 -7.50 -0.75 -1.25 -1.50 -1.25 -1.00 -1.00 -0.25 0.00      0.00 11.25 0.00 0.00 5.50 0.00 0.00 0.00 0.00 0.00
0.25 -0.25 -1.50 -1.50 -1.50 -1.25 -1.50 -0.75 -1.00 -0.25      0.00 0.00 1.75 0.00 0.00 0.00 3.50 0.00 7.25 0.00
0.25 -0.25 -1.00 -2.00 -1.75 -1.50 -1.25 -1.25 -1.00 -1.25      0.00 0.00 0.00 10.75 2.25 9.00 0.00 0.00 0.00 2.75
0.25 0.00 -1.00 -1.25 -1.50 -1.00 -1.25 -1.00 -1.50 -0.75      0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2.75 0.00
0.00 -0.75 -1.00 -1.00 -0.75 -0.75 -0.75 -0.75 -1.00 -0.50      0.00 3.25 0.00 0.00 0.00 0.00 0.00 0.00 6.50 0.00
-0.50 -0.50 -0.50 -0.50 -1.25 -0.25 -0.50 -0.50 -0.25 -0.50      0.00 0.00 0.00 0.00 3.75 0.00 0.00 0.00 0.00 0.00
-1.25 -0.50 -0.50 -0.75 -0.75 -0.75 -0.50 0.00 -0.25 0.25      4.75 0.00 0.00 0.00 0.00 0.00 0.00 0.00 7.75 0.00
0.00 -0.25 -0.50 -0.25 -0.50 -1.00 -0.75 -0.25 0.00 0.00      0.00 0.00 0.00 0.00 0.00 0.50 0.00 0.00 0.00 0.00
0.00 -0.25 -0.75 -1.00 -0.50 -0.50 -1.25 -1.00 -0.50 -0.25      0.00 0.00 0.00 2.25 0.00 0.00 0.00 0.00 0.00 0.00
0.00 -0.25 -0.50 -0.75 -0.75 -1.00 -1.00 -1.50 -1.00 -0.25      0.00 0.00 0.00 0.00 0.00 0.00 0.00 7.25 1.25 0.00
-0.50 -0.75 -0.25 -0.25 -0.75 -1.00 -0.75 -0.75 -1.00 -0.25      2.50 5.00 0.00 0.00 3.75 5.75 0.00 0.00 2.75 0.00

```

Figure: An iteration

```
-- Generation 33 --
  Evaluated 157 individuals
Best individual is [10, 5, 6, 9, 11, 1, 7, 7, 10, 0, 5, 6, 8, 1, 0, 8, 4, 8, 15, 6, 13, 4, 16, 7, 11, 1, 2, 2, 12, 1, 16, 0, 1, 1, 1, 7, 17, 4, 10, 6, 8, 2, 1, 5, 17,
7, 15, 8, 4, 4, 6, 5, 0, 0, 16, 8, 15, 6, 5, 0, 8, 8, 15, 1, 2, 9, 12, 8, 4, 2, 2, 3, 15, 1, 11, 8] with score 100.0000%
-0.75 -0.50 -0.25 0.00 0.00 0.00 -0.25 -0.50 -0.75 0.00      1.25 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5.00 0.00
-0.25 -1.25 -0.75 -0.50 -0.25 -0.50 -0.25 -1.00 -0.50 -0.25      0.00 10.25 0.00 0.00 0.00 7.75 0.00 9.00 0.00 0.00
-0.25 -7.50 -1.75 -1.50 -0.75 -0.25 -0.75 -0.50 -0.50 -0.75      0.00 0.00 13.50 1.00 0.00 0.00 0.00 0.00 0.00 1.25
0.00 -0.75 -1.25 -1.50 -1.00 -5.00 -0.25 -0.50 -0.50 -0.25      0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 -0.50 -1.00 -0.75 -1.25 -0.50 -0.25 -0.75 -0.75 0.00      0.00 0.00 2.25 0.00 8.00 0.00 0.00 0.00 4.50 0.00
-0.25 0.00 0.00 -0.25 -0.50 -0.75 -1.25 -0.75 -0.50 -0.25      5.00 0.00 0.00 0.00 0.00 0.00 10.00 0.00 0.00 0.00
-0.25 -0.25 -0.25 -0.25 -0.50 -1.00 -1.25 -1.00 -0.75 -0.75      0.00 0.00 0.00 0.00 0.00 3.25 0.00 0.00 0.00 10.25
0.00 -2.50 -0.25 0.00 0.00 0.00 -0.50 -1.25 -0.75 -2.50      0.00 0.00 0.00 0.00 0.00 0.00 0.00 10.75 0.00 0.00
0.00 -0.75 -0.75 -0.25 0.00 0.00 -0.50 -1.00 -1.00 0.00      0.00 11.00 9.50 0.00 0.00 0.00 0.00 0.00 4.75 0.00
-0.75 -1.00 -0.75 -0.50 0.00 -0.25 -0.75 -0.75 -0.25 0.00      0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-1.75 -1.25 -1.00 -0.50 0.00 -0.50 -1.25 -0.75 -0.25 0.00      4.75 0.00 0.00 0.00 0.00 9.00 6.75 0.00 0.00 0.00
-1.00 -2.00 -1.00 -0.25 0.00 -0.25 -0.75 -0.75 -0.75 0.00      0.00 2.25 0.00 0.00 0.00 0.00 0.00 0.00 2.50 0.00
-0.75 -1.25 -1.00 -0.50 0.00 0.00 -0.25 -0.50 -0.75 0.00      0.00 2.25 0.00 0.00 0.00 0.00 0.00 0.00 4.75 0.00
-0.50 -0.50 -0.75 -0.75 -0.50 0.00 -0.50 -0.50 -0.50 0.00      0.00 0.00 0.00 0.00 8.50 0.00 0.00 0.00 0.00 0.00
-0.50 -0.50 -0.75 -0.25 0.00 -0.75 -1.25 -1.25 -0.75 -0.25      0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-0.50 -1.50 -0.75 0.00 0.00 -1.00 -2.75 -1.75 -1.75 -0.50      0.00 1.50 0.00 0.00 0.00 0.00 1.75 0.00 3.50 0.00
-1.00 -0.50 -0.50 0.00 0.00 -1.00 -1.75 -2.50 -2.00 -0.50      5.00 0.00 0.00 0.00 0.00 0.00 0.00 6.50 0.50 0.00
0.00 0.00 0.00 0.00 -0.50 -0.50 -1.25 -1.75 -1.25 -0.25      0.00 0.00 0.00 0.00 4.50 0.00 0.00 1.75 0.00 0.00
-- End of (successful) evolution --
```

Figure: A result

Thank you!