The waiter problem

Computational Geometry
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The problem

- Let $S = \{p_1, \ldots, p_n\}$ be a set of n points in the plane
- Find a "good" ordering (permutation π) of adding points S, ($p_{\pi_1}, p_{\pi_2}, \ldots, p_{\pi_n}$), so that the center of mass of the first j points (j = 1, 2, . . . , n) in the order does not "move around" too much

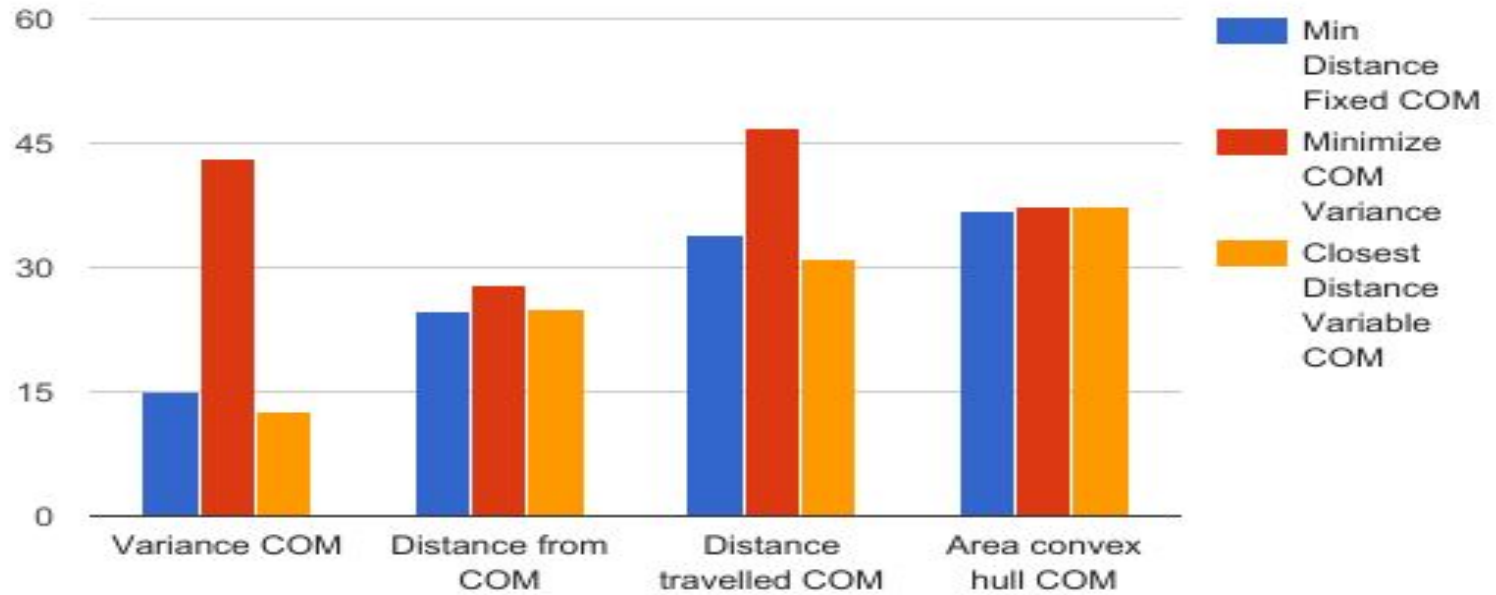## Heuristics

Which point to add next?

1. Minimum distance from the COM of all **n points**.
2. Minimum distance from the COM of added **j-1 points**.
3. Minimum distance between COM of j-1 points and COM of n points.

Scoring Metric

Which one performs better?

1. Variance in COM generated with mean as COM of n points.
2. Smallest radius which contains all generated COM centered at COM of n points.
3. Area of convex hull of new COM generated.
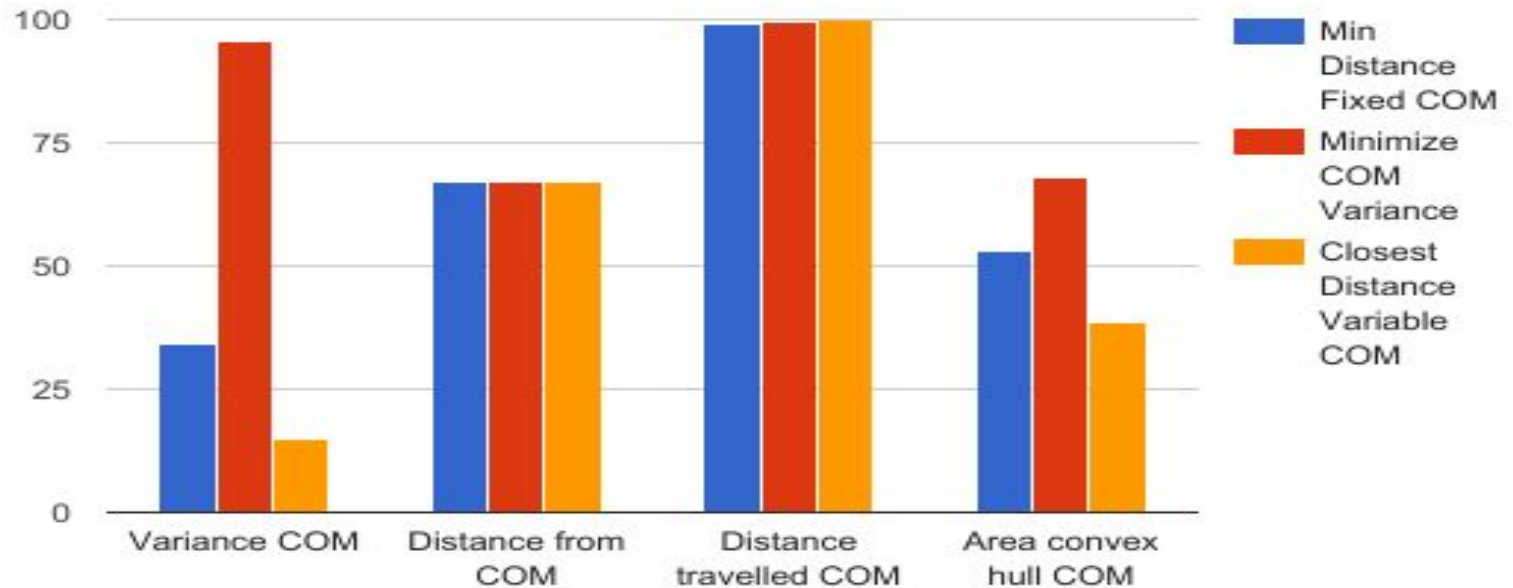4. Distance travelled by COM generated.

Placing 20 points when 100 points are given

Placing 50 points when 100 points are given
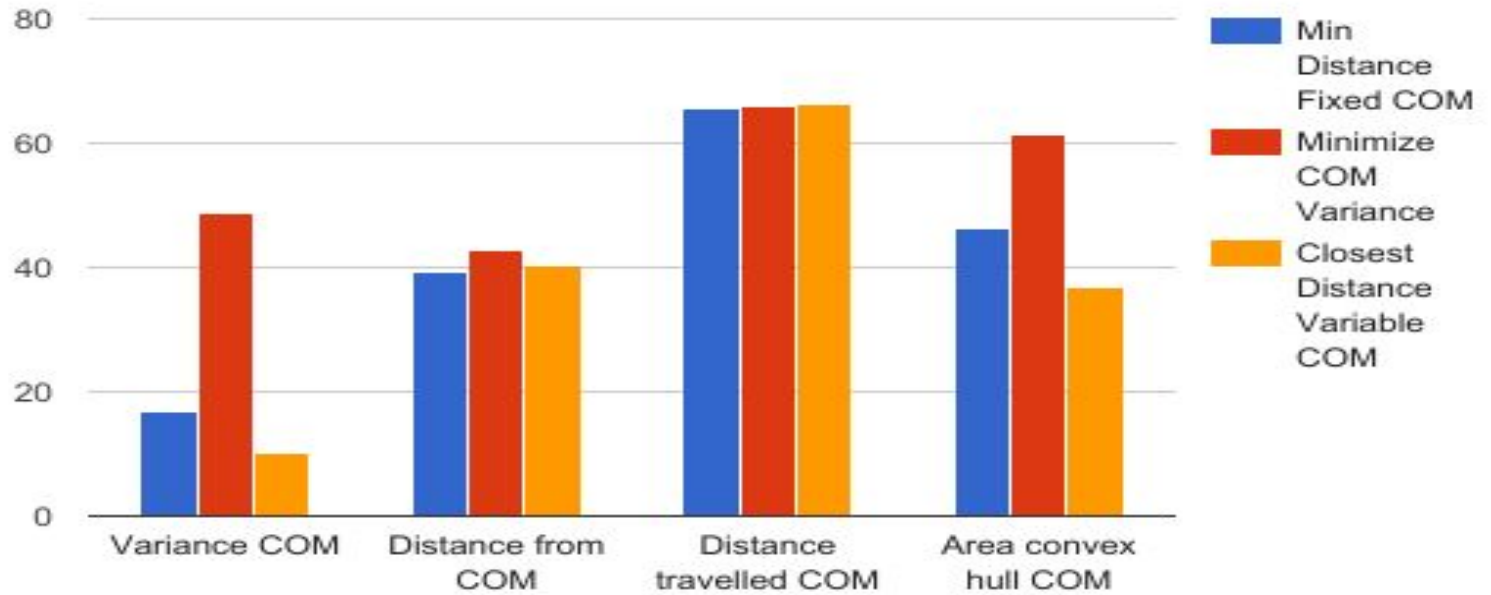
Placing all 100 points when 100 points are given

Demo & QA

http://localhost:8000/cs555.html

Appendix

API

Heuristic

public abstract Point getNextPoint(List<Point> points);

Score

public abstract float getScore();

public abstract void process(Point point);