# Property Demonstration on the Greedy Algorithm regarding Center Selection Problem with Various Examples

陈子蔚 Chen Ziwei

Department of Computer Science and Engineering

Recent Research Topic: Generative Model

Supervisor: 郑锋

# Task 5-1

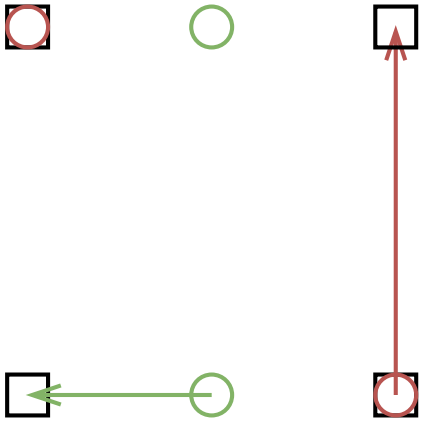
The centers obtained in red are from the greedy algorithm, and the centers in green are the optimal centers.

2 sites and 1 center to select.

$$\frac{r}{r^*} = 2$$

4 sites and 2 center to select.

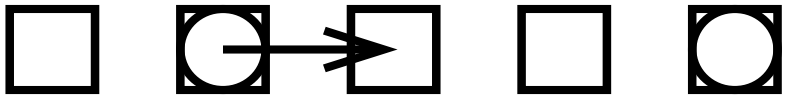
$$\frac{r}{r^*} = 2$$



The greedy algorithm could get the optimal solution in the following cases.

4 sites and 2 center to select.

5 sites and 2 center to select.



# Task 5-2

The centers obtained in red are from the greedy algorithm, and the centers in green are the optimal centers.

5 sites and 1 center to select.

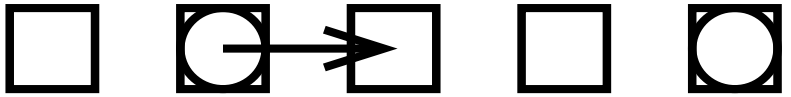
$$\frac{r}{r^*} = 2$$

4 sites and 1 center to select.

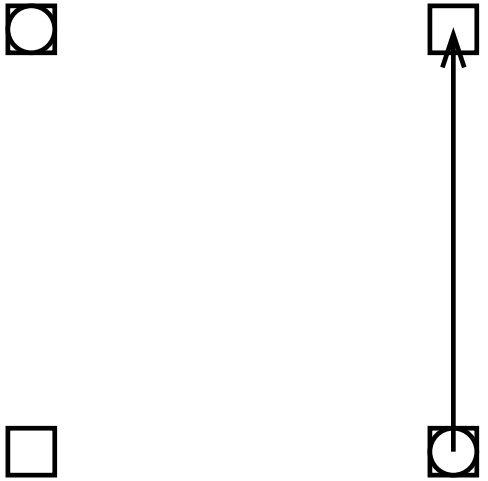
$$\frac{r}{r^*} = 2$$

The greedy algorithm could get the optimal solution in the following cases.

5 sites and 2 center to select.



4 sites and 2 center to select.



# Task 5-3

We could choose initial center from the centers obtained by K-Means algorithm since its optimization goal is

$$\min_{C} \sum_{s \in \mathcal{S}} w_s \cdot \|s, C\|_N$$

, which would be similar to optimization goal of CSP when $dist(\cdot) = \|\cdot\|_N$

$$\min_{C} \max_{s \in \mathcal{S}} \text{dist}(s, C)$$

Once we could predict the site that would have the greatest distance from centers and let

$$w_s \to \mathbf{1}\left\{s = \arg\max_{s \in \mathcal{S}} \text{dist}(s, C)\right\}$$

, then these two problems would be much more closer.