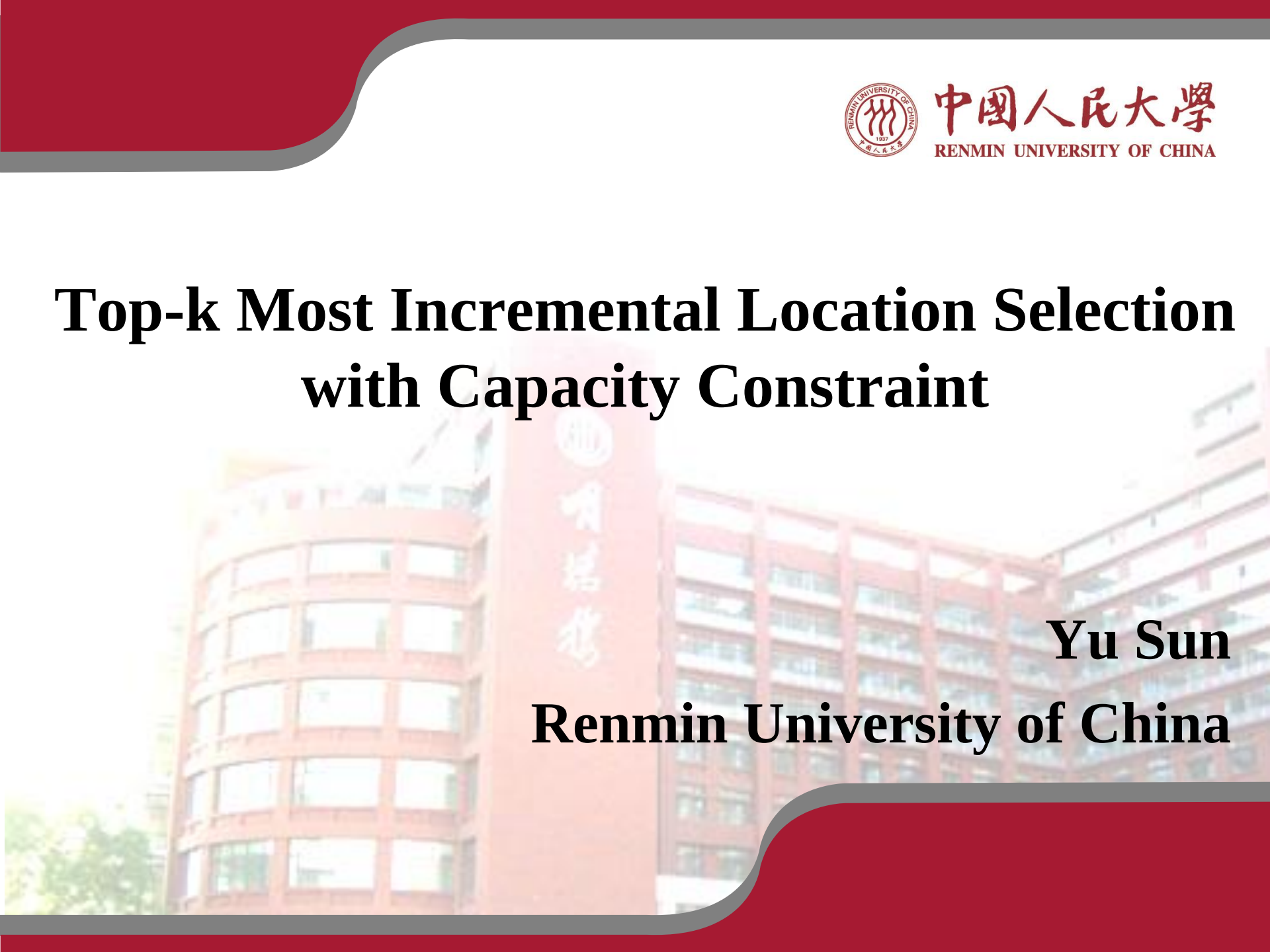


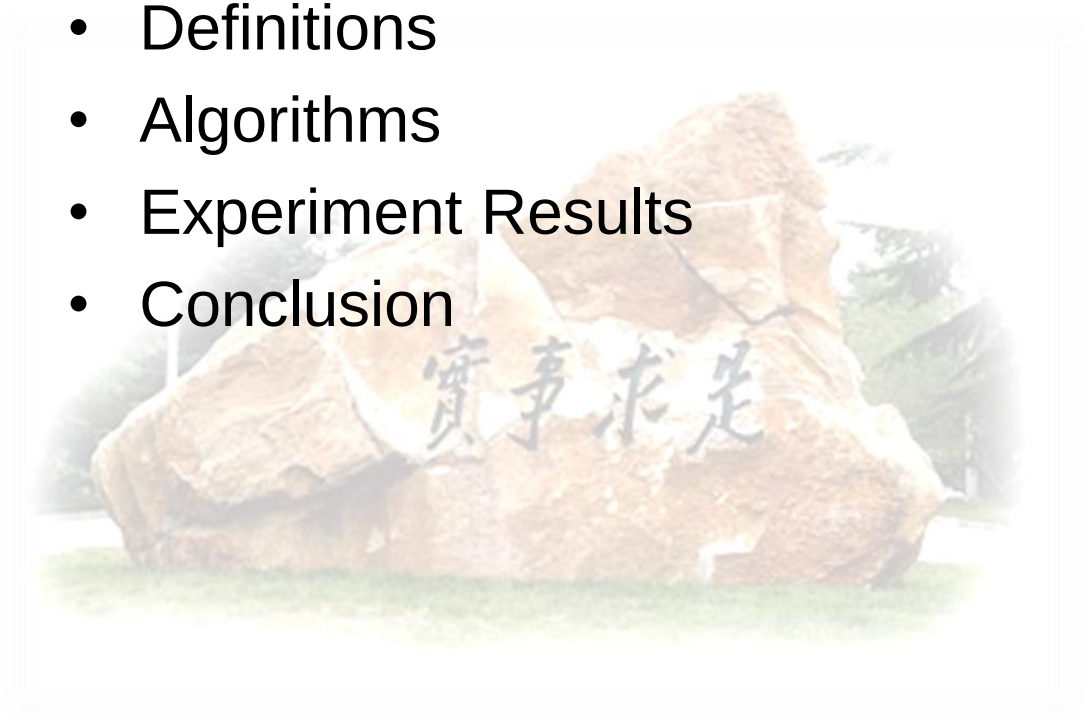
Top-k Most Incremental Location Selection with Capacity Constraint

Yu Sun

Renmin University of China

Outline

- Motivation and Introduction
- Related Work
- Definitions
- Algorithms
- Experiment Results
- Conclusion



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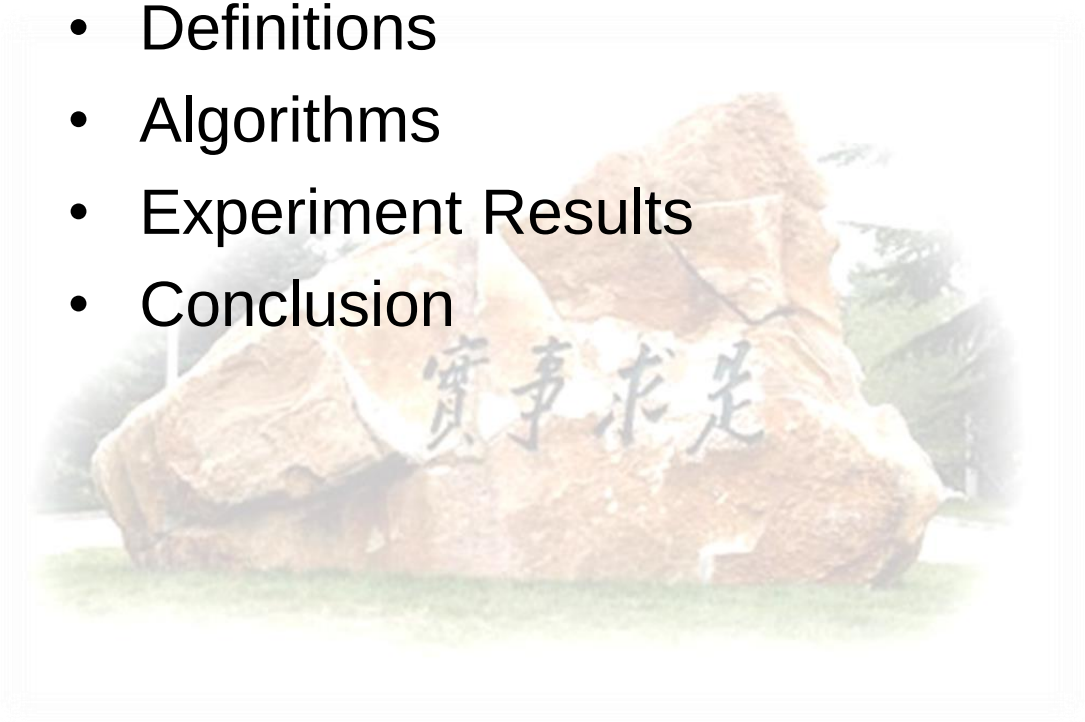
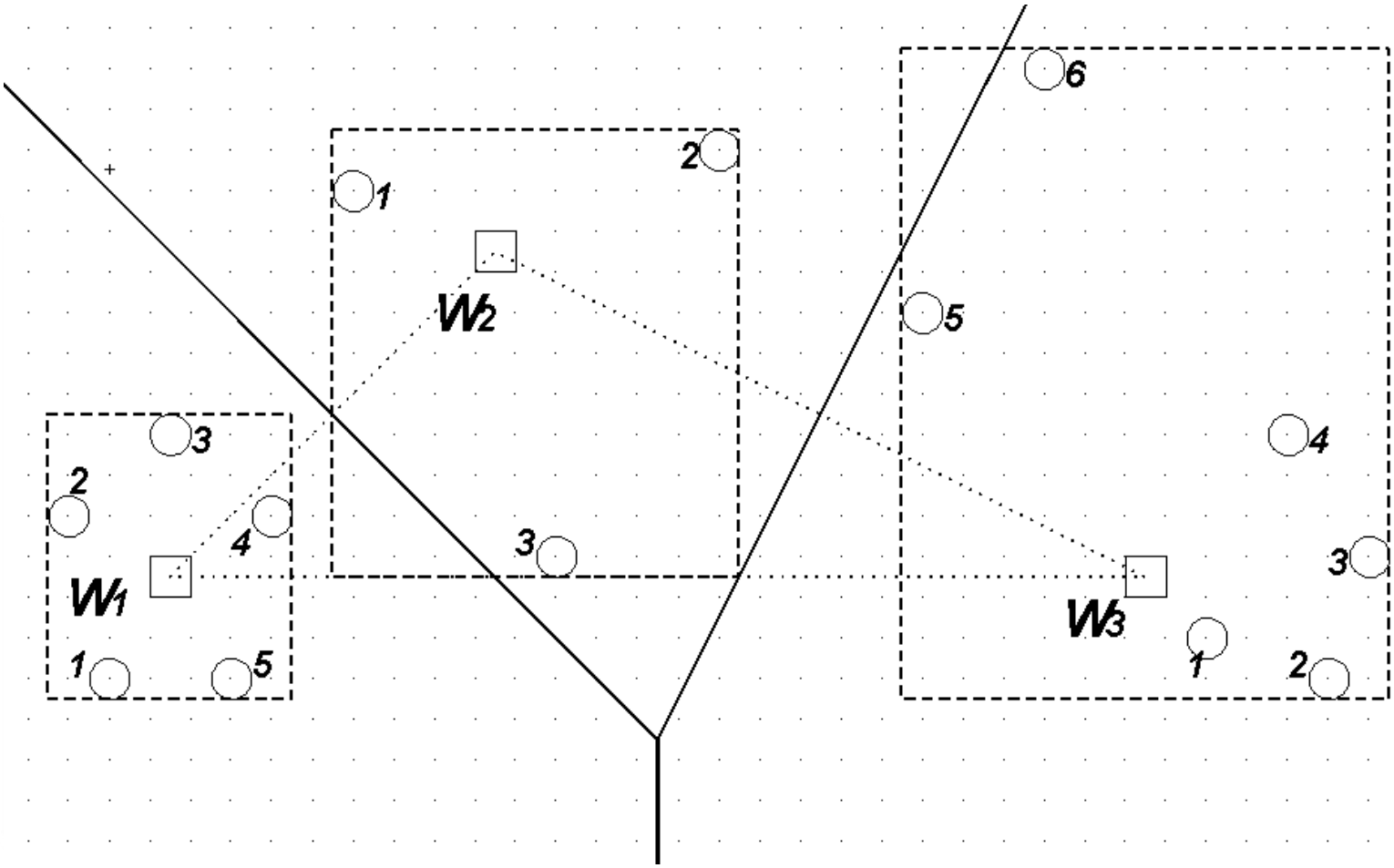


Motivation and Introduction

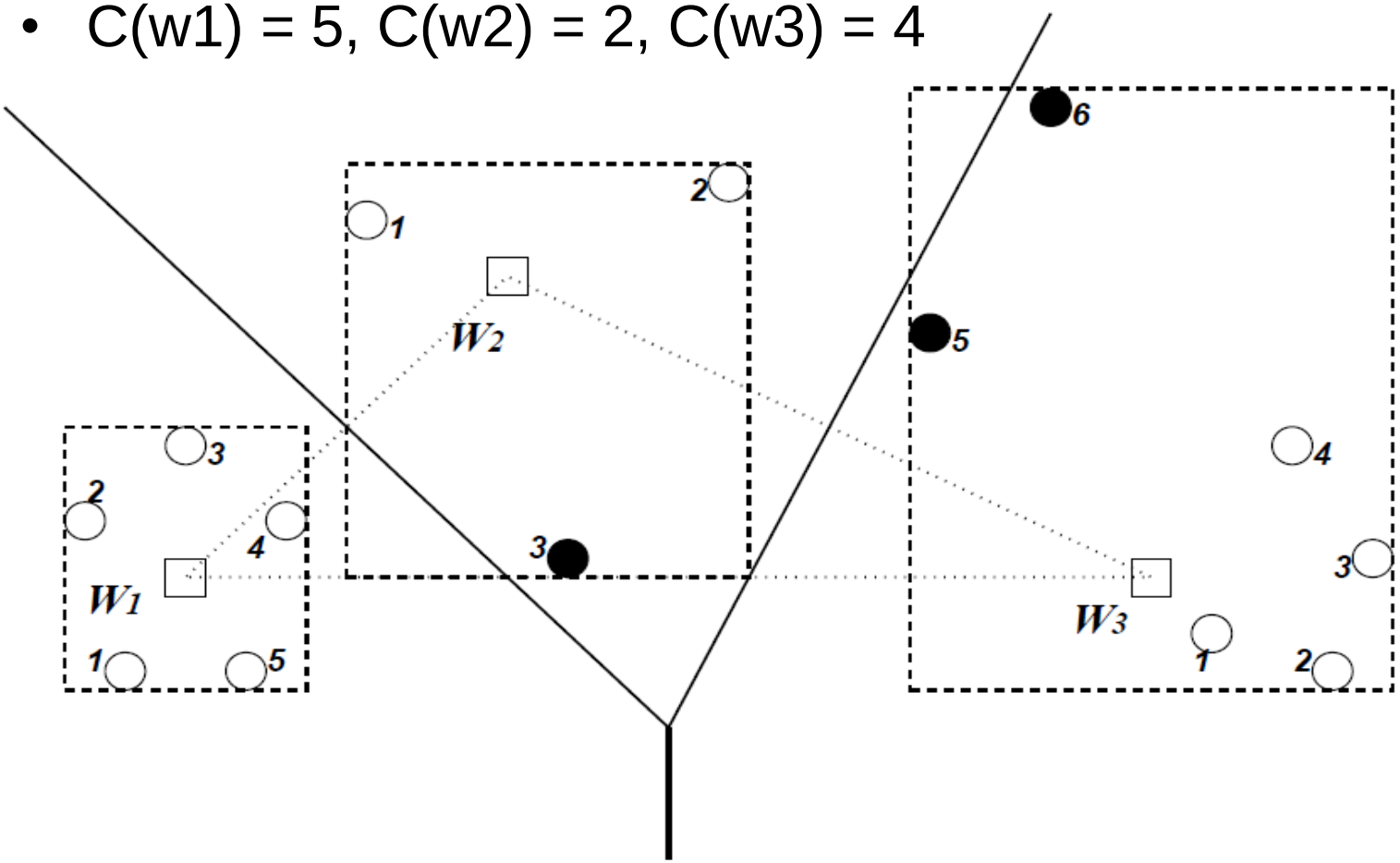
- **Question**: location selection for facilities that bear capacity constraint
- A facility set of **W**, a customer set of **R**. W provides service for R.
- When the number of customers increases, more facilities are needed.
- **P** is a set of candidate locations, then how to get the most promising candidates?

Motivation and Introduction



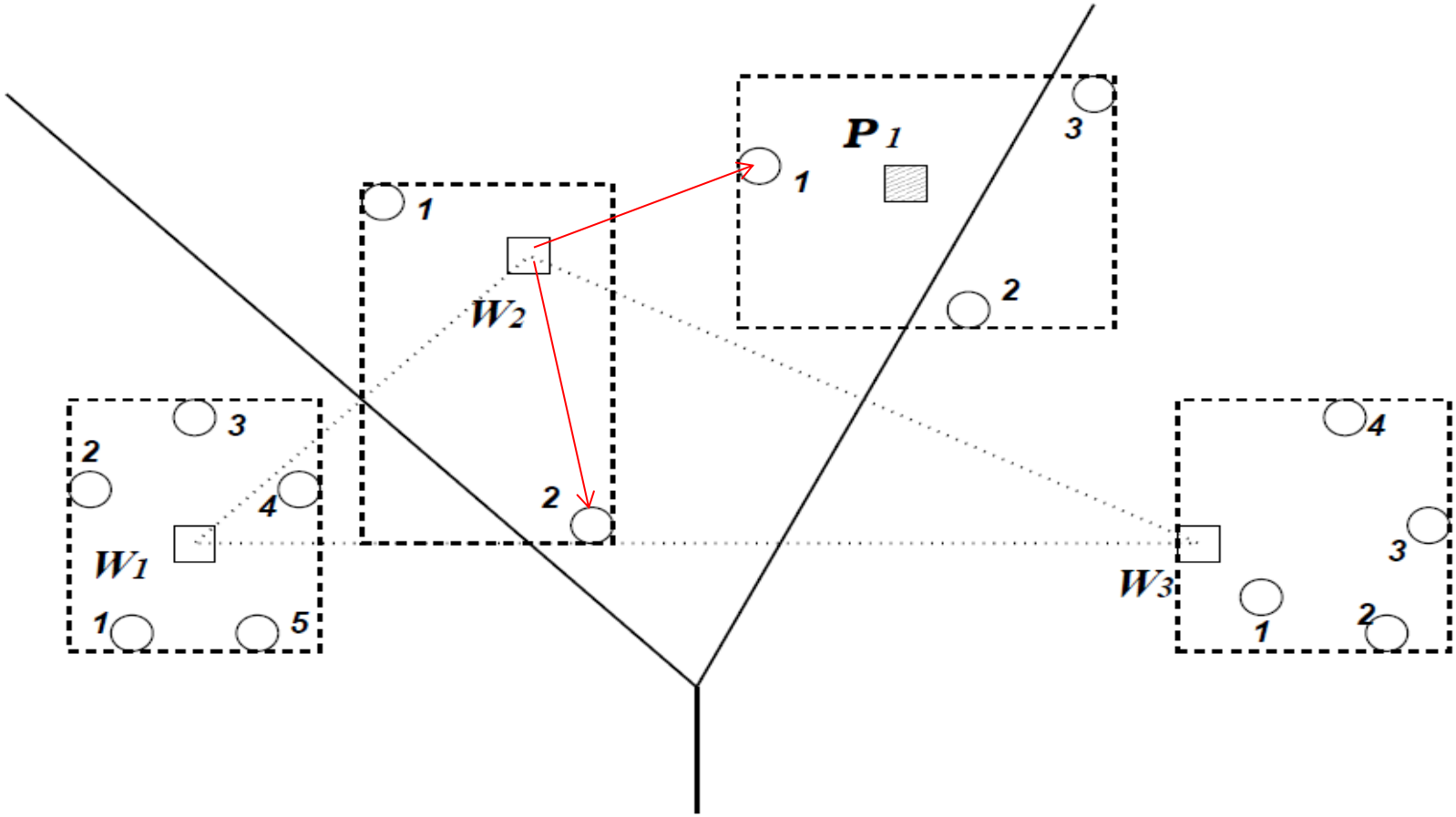
Motivation and Introduction

- C(w1) = 5, C(w2) = 2, C(w3) = 4



Motivation and Introduction

- After p1 is added, here C(p1) = 4



Motivation and Introduction

- **Challenging:**
- (1) New influence set
  - not only related to **customer locations**, but also related to **locations of facility**
- (2) Dealing a large amount of input data
  - NE contains **123,593** points of postal addresses
  - We generate |R|=200,000,|W|=20,000 and **|P|=10,000**

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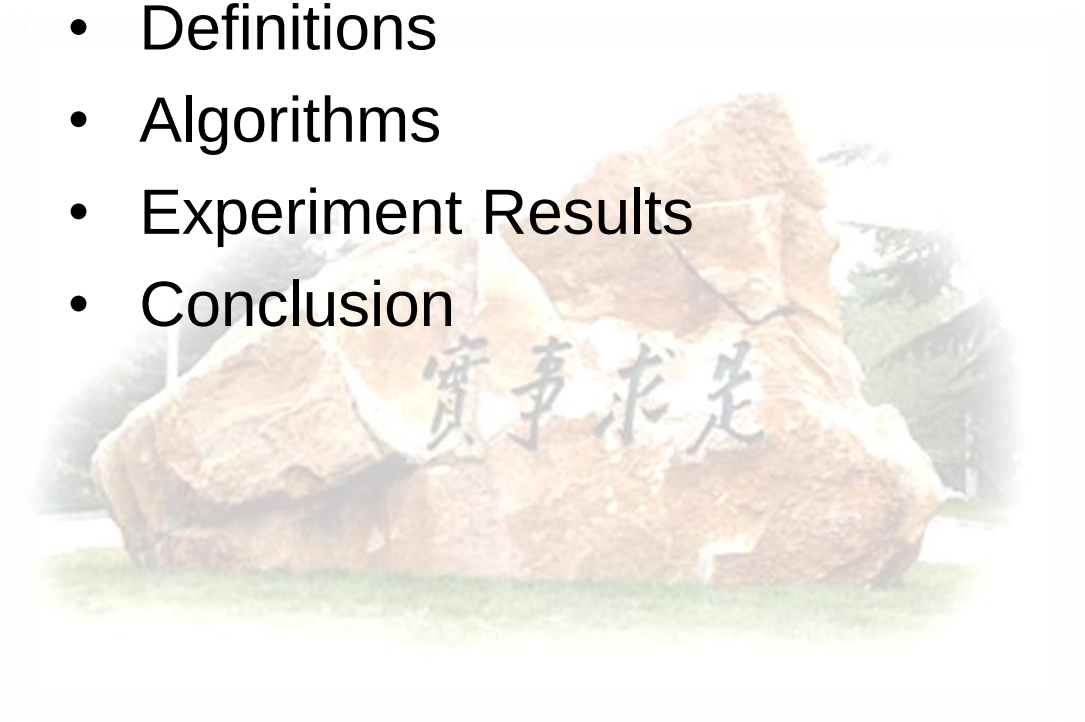

Related Work

- Korn et. al. *Influence sets based on reverse nearest neighbor queries*. *SIGMOD*'00.
- Wong et.al. *Efficient method for maximizing bichromatic reverse nearest neighbor*. *VLDB*'09.
- Qi et.al. *The min-dist location selection query*. *ICDE'*12.
- Xia et.al. *On computing top-t most influential spatial sites*. *VLDB*'05.
- However, they **fail to** take capacity constraint into consideration

- Wong et.al. *On efficient spatial matching. VLDB'07.*
- Though capacity is considered, it is designed for profile-matching applications and **not applicable**

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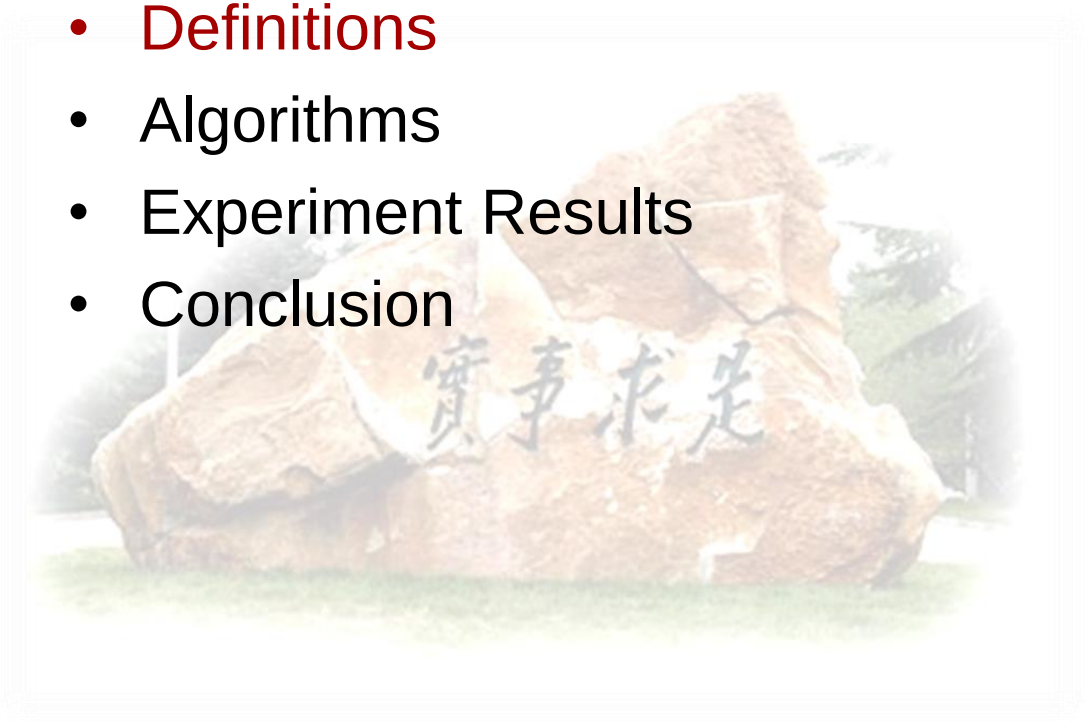
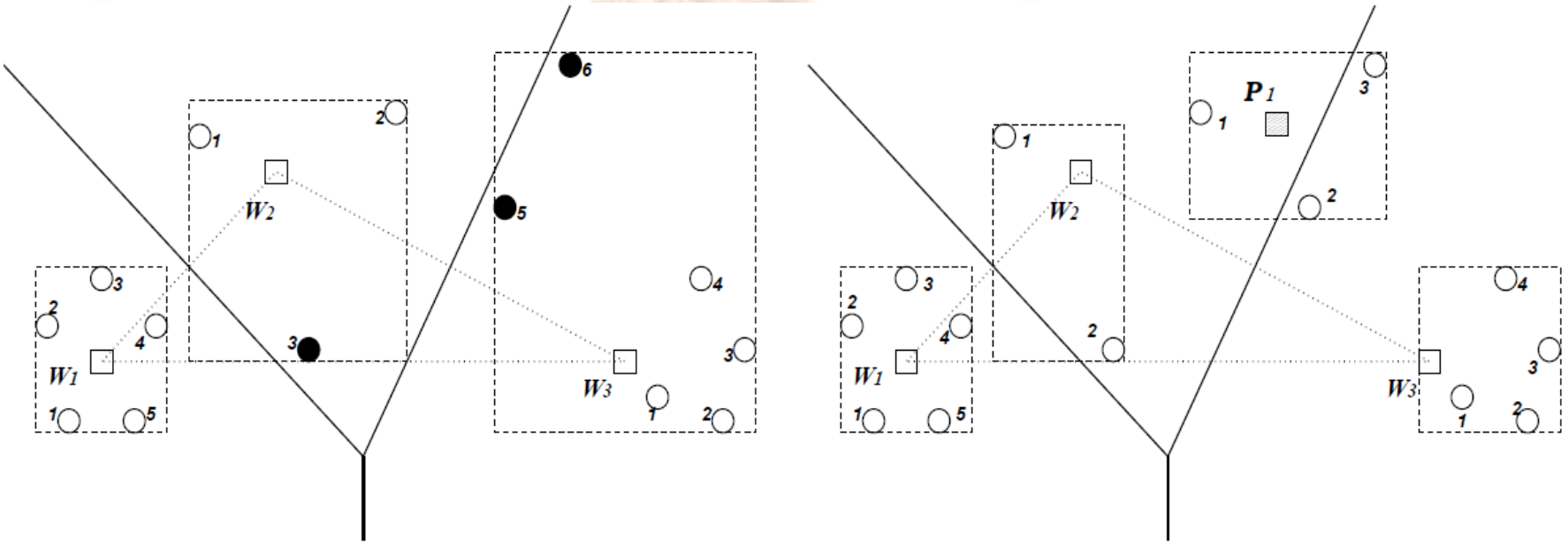


Definitions

- The **service quality** is the total number of customers who are provided reliable service
- The **candidate's increment** equals
  new service quality – old service quality



Definitions -- Basic Solution

- The definition gives a basic solution
- Suppose we can calculate the service quality
- Scan the candidate set, add each candidate to the facility set
- Calculate the new service quality
- Pick out candidates with top k increments
- BUT IT IS TOO SLOW!

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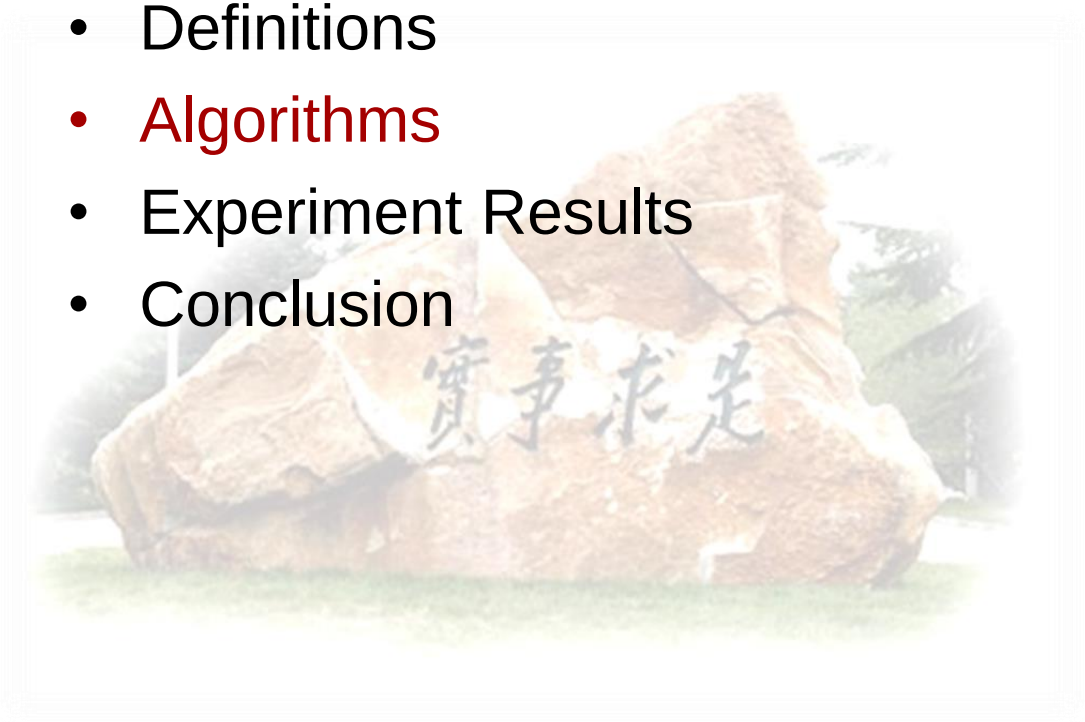
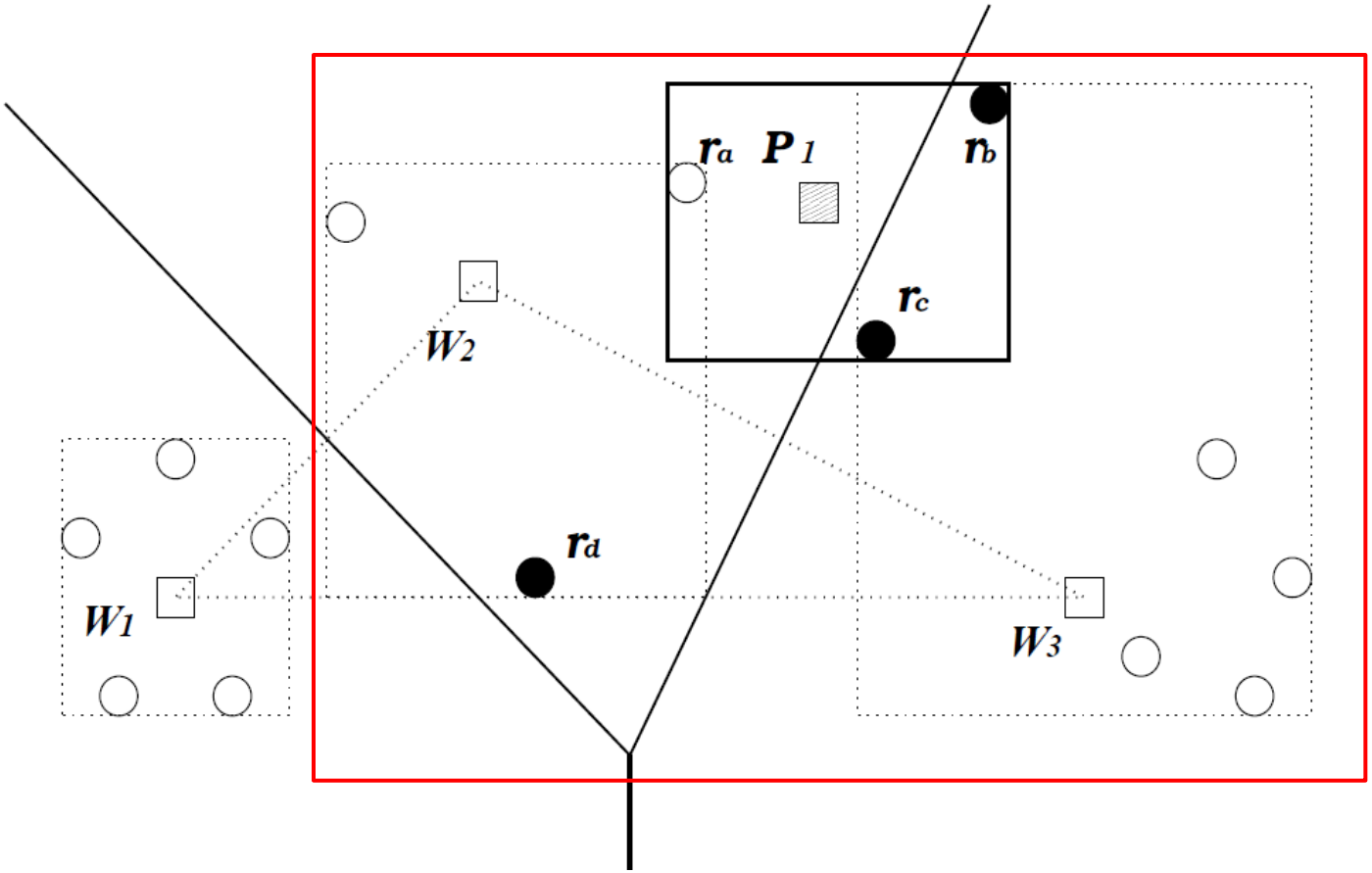


Algorithms

- Our proposed algorithms improve the basic solution from the following aspects:
- (1) Redefine the Influence Set，which contains only those affected customers and facilities, to effectively prune the search space
- (2) Make use of Nearest Facility Circles and spatial indices to efficiently get influence sets

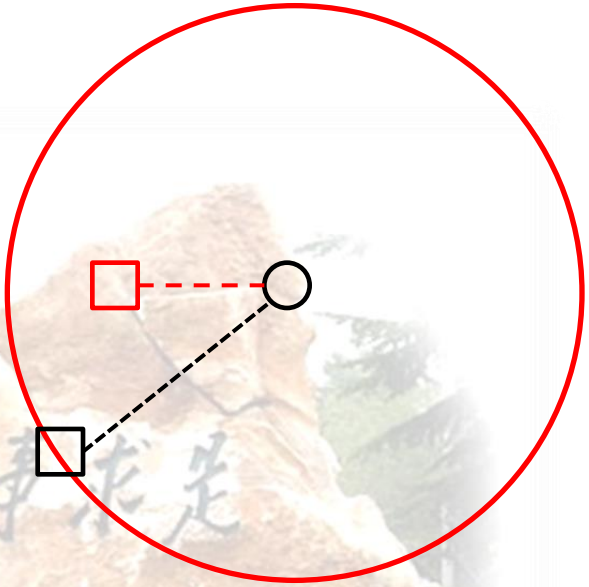
Algorithms

- example of an influence set



Algorithms

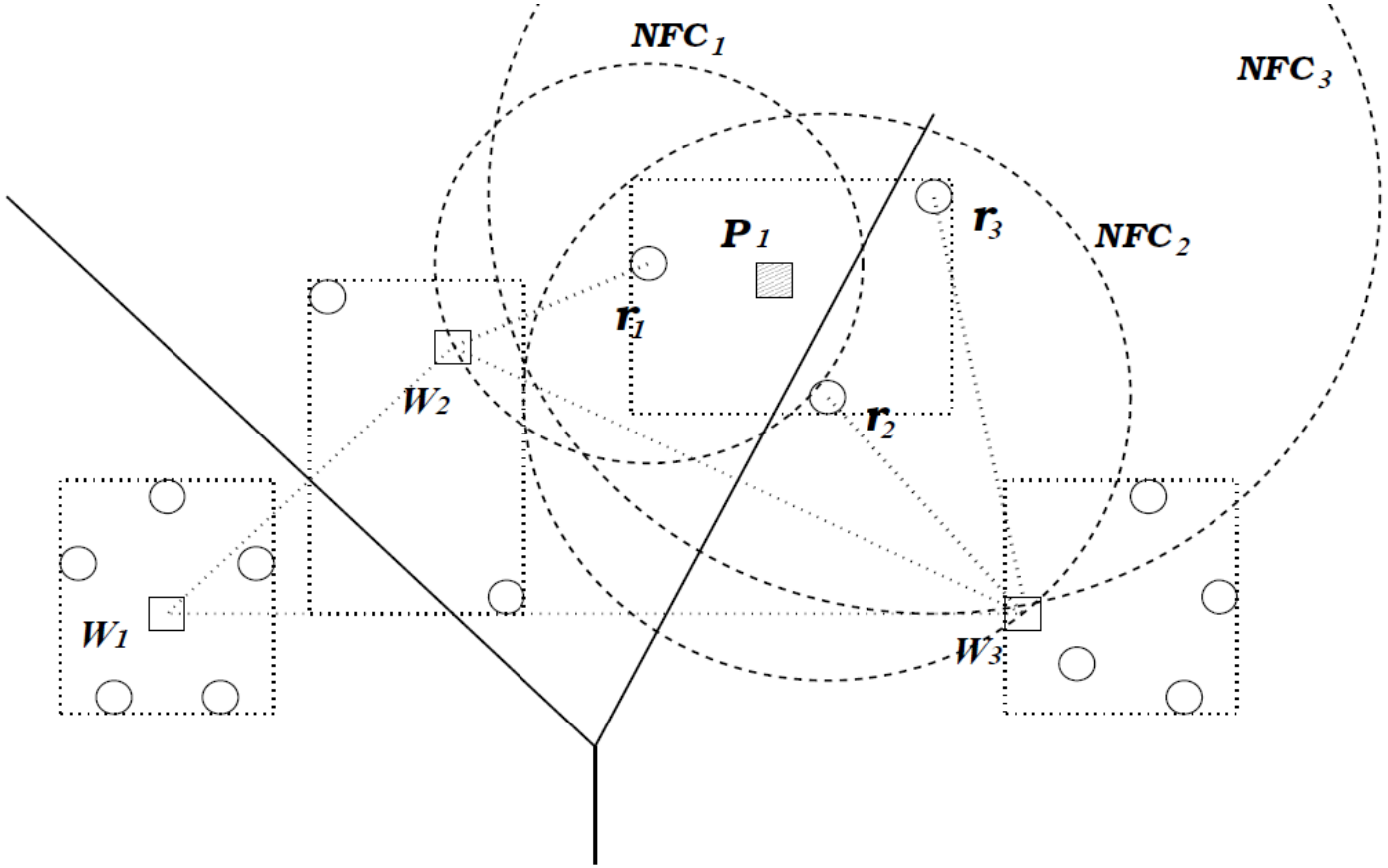
- example of a nearest facility circle (NFC)



- NFC helps to get influence sets without NN queries

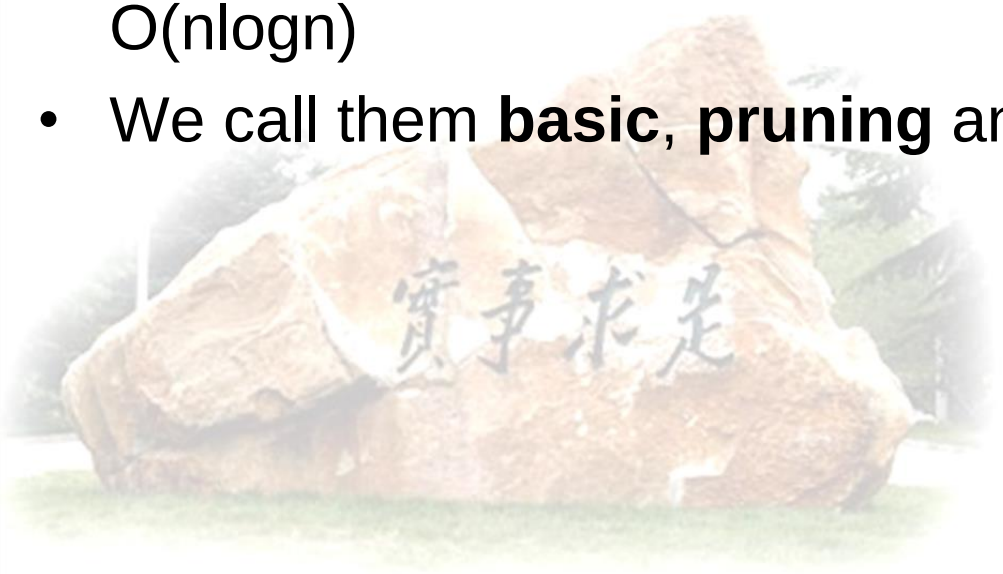
Algorithms

- example of finding influence set with NFC



Algorithms

- The time complexity of the basic solution is O(n^3)
- The influence sets reduce the complexity to O(n^2)
- The NFCs further decrease the complexity to O(nlogn)
- We call them **basic**, **pruning** and **index** respectively.



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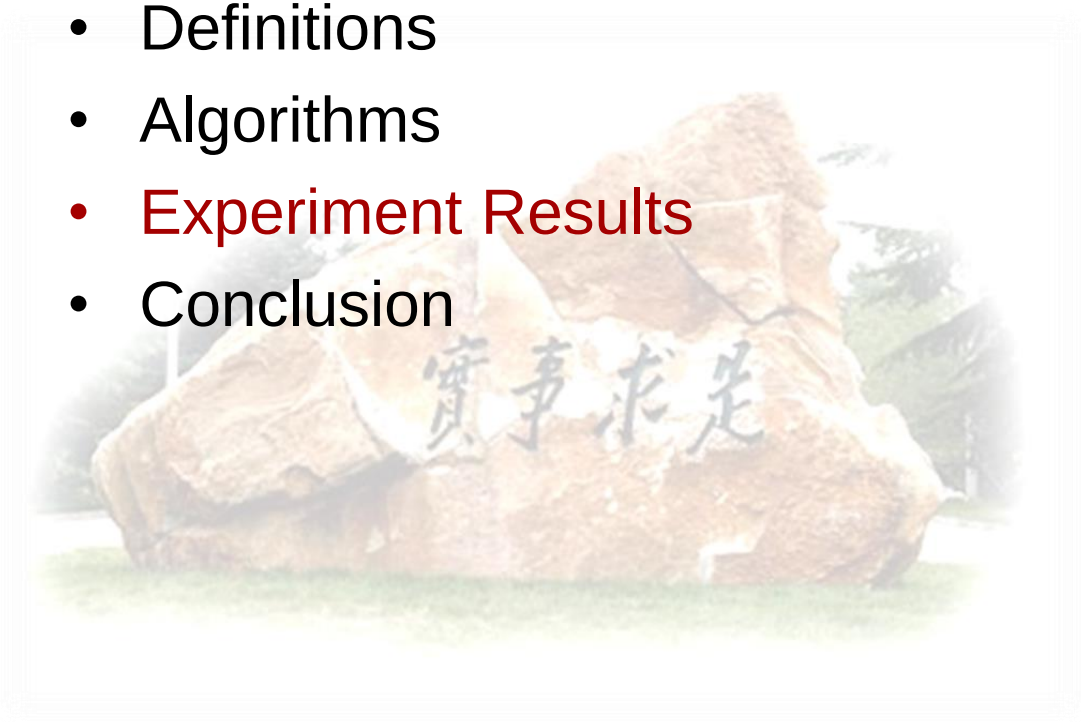
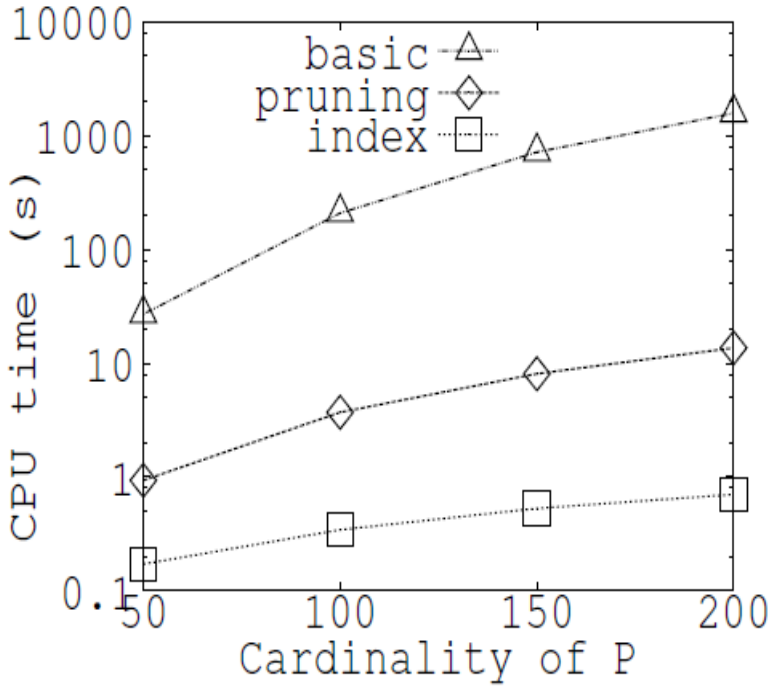
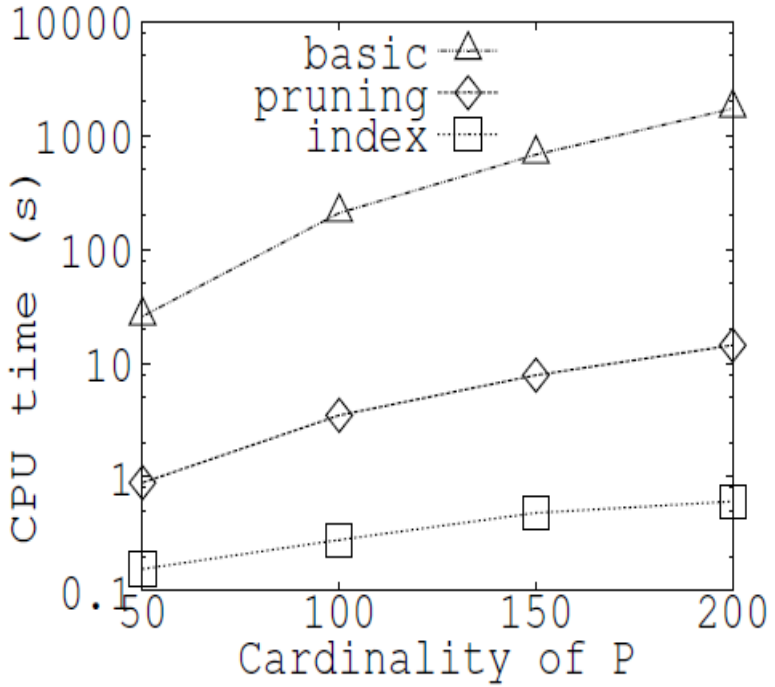


Experiment results

- Comparison



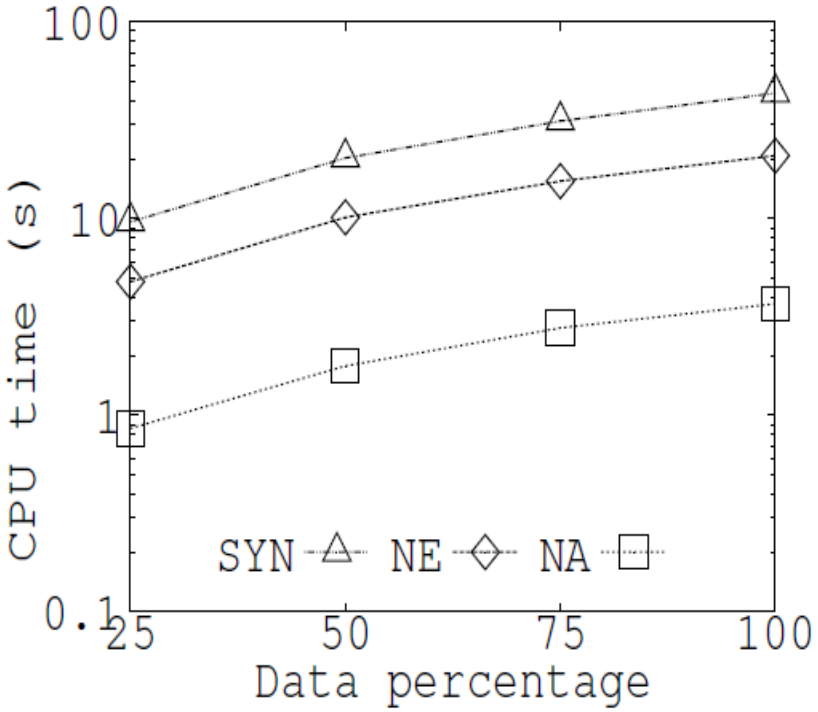


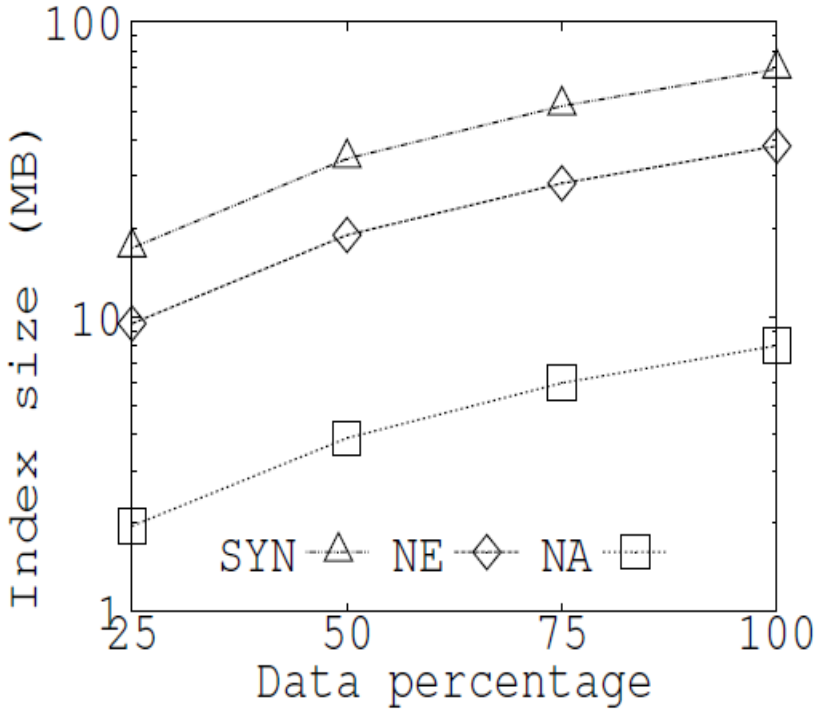
- Real Dataset

Synthetic Dataset

Experiment results

- Scalability





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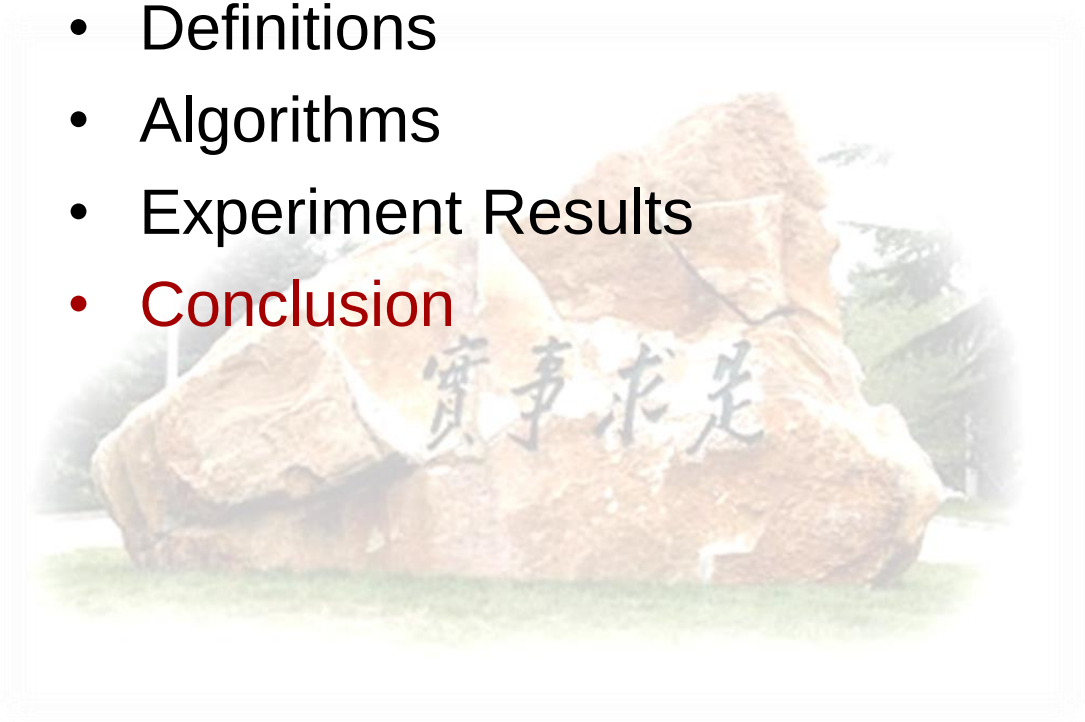
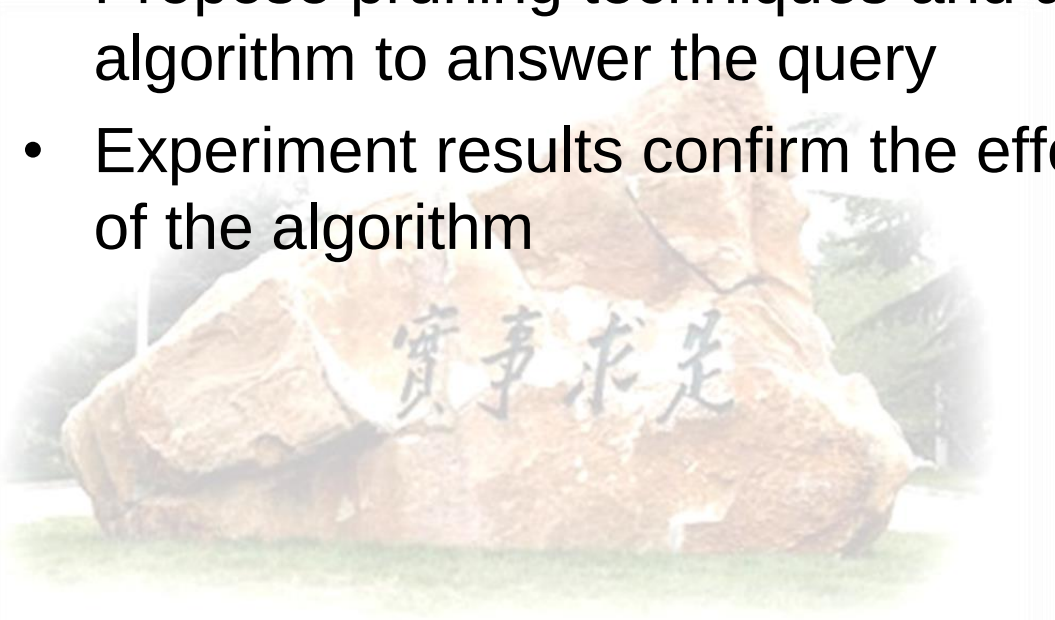


Conclusion

- Formulate the top-k most incremental location selection query
- Propose pruning techniques and an efficient algorithm to answer the query
- Experiment results confirm the effectiveness of the algorithm



Q&A

- Questions?

- Thank you for your time!