

# CS685: DATA MINING

## WHAT IS (NOT) DATA MINING

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- Data mining is supported by three major technologies
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- It is in the confluence of
  - Machine learning
  - Statistics
  - Databases
  - Information retrieval
  - Visualization techniques

# Data Mining Challenges I

- Scalability
- High dimensionality
- Heterogeneous and complex data
  - Web
  - Unstructured text
  - Graph
- Distributed data
- Data ownership and privacy
  - How to access knowledge without violating privacy
- Classification
  - Predicting the class of a data object
- Clustering
  - Finding groups in data
- Association
  - Finding co-occurring and related itemsets

# Data Mining Challenges II

- **Visualization**
  - Facilitating human discovery of patterns
- **Summarization**
  - Succinctly describing a group
- **Anomaly detection**
  - Identifying abnormal behavior
- **Estimation**
  - Predicting values of a data object
- **Link analysis**
  - Finding relationships among data objects

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- Conclusion was one should not inform people that they have ESP

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- Deductions
  - A person stays in hotel for 10 days
  - Each day,  $10^7$  people stay in a hotel

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- Expected number of suspicions, i.e., probability that any pair of people meet twice on any pair of days is  $2.5 \times 10^5$ 
  - $5 \times 10^{-13} \times 5 \times 10^{17}$

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- She finds out that since vanilla is the most popular favor, ordering vanilla induces a significantly longer waiting time
- Car stalls when the man waits longer and not otherwise

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- Moral: When deducting rules, look at correct attributes, i.e., those that explain the phenomenon