Data Mining

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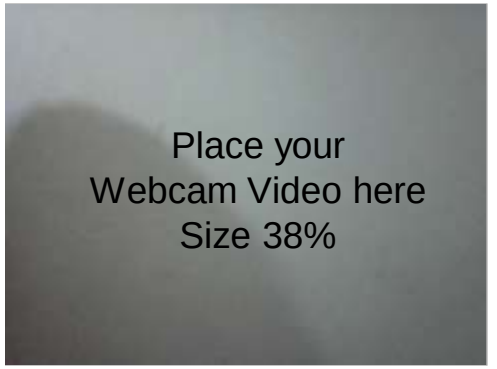
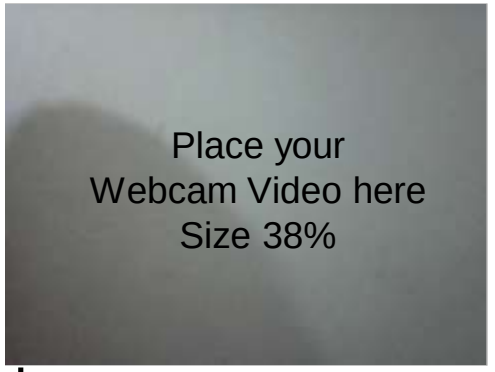
Why Data mining?



- The Explosive Growth of Data: from terabytes to petabytes
  - Data collection and data availability
    - Automated data collection tools, database systems, Web, computerized society
  - Major sources of abundant data
    - Business: Web, e-commerce, transactions, stocks, …
    - Science: Remote sensing, bioinformatics, scientific simulation, …

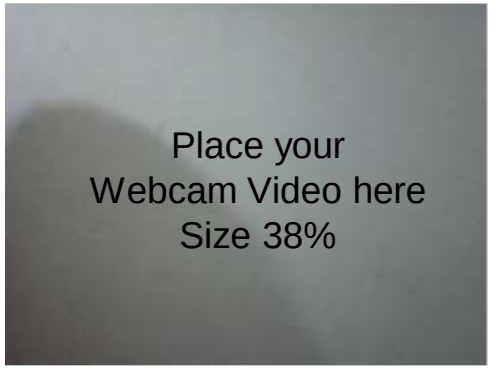


- Society and everyone: news, digital cameras, YouTube

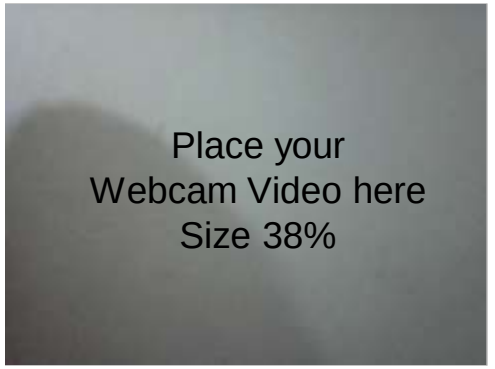
- We are drowning in data, but starving for knowledge!

- "Necessity is the mother of invention"–Data mining–Automated analysis of massive data sets

Evolution of Data science

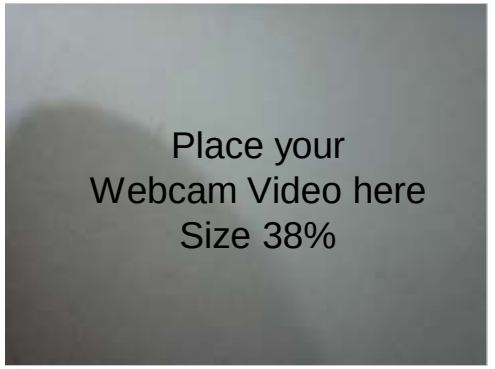


- Before 1600, **empirical science**
- 1600-1950s, **theoretical science**
  - Each discipline has grown a *theoretical* component. Theoretical models often motivate experiments and generalize our understanding.
- 1950s-1990s, **computational science**
  - Computational Science traditionally meant simulation. It grew out of our inability to find closed-form solutions for complex mathematical models.

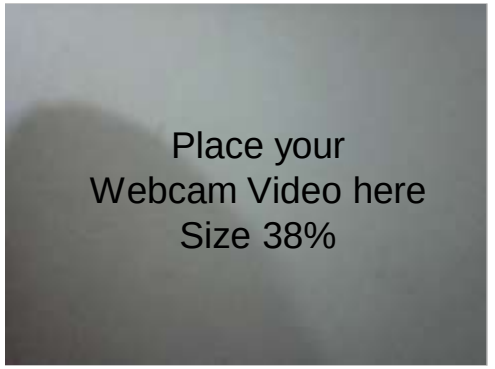


- 1990-now, **data science**
  - The flood of data from new scientific instruments and simulations
  - The ability to economically store and manage petabytes of data online
  - The Internet and computing Grid that makes all these archives universally accessible
  - Scientific info. management, acquisition, organization, query, and visualization tasks scale almost linearly with data volumes. Data mining is a major new challenge!

Evolution of Database Technology

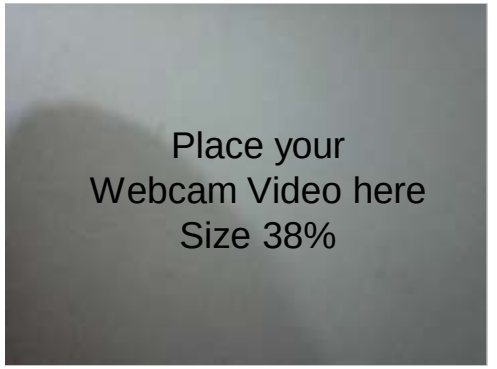


- 1960s:
  - Data collection, database creation, IMS and network DBMS
- 1970s:
  - Relational data model, relational DBMS implementation
- 1980s:
  - RDBMS, advanced data models



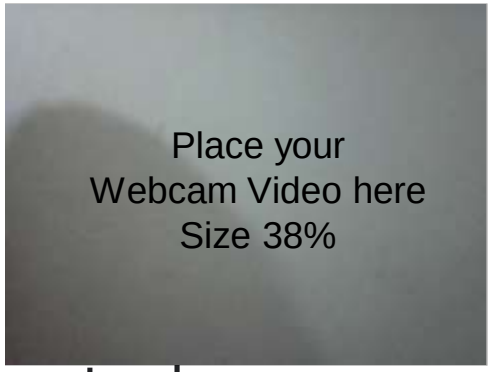
- 1990s:
  - Data mining, data warehousing, multimedia databases, and Web databases
- 2000s
  - Data mining and its applications
  - Web technology (XML, data integration) and global information systems

What is Data mining?



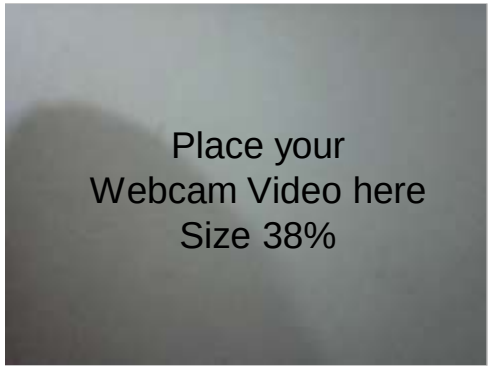
- Data mining (knowledge discovery from data)
- Extraction of interesting (non-trivial, implicit, previously unknown and potentially useful) patterns or knowledge from huge amount of data
- Alternative names
- Knowledge discovery (mining) in databases (KDD), knowledge extraction, data/pattern analysis, data archeology, data dredging, information harvesting, business intelligence, etc.

Characteristics of a data mining system



- Large quantities of data. The volume of data so great it has to be analyzed by automated techniques e.g. satellite information, credit card transactions etc.
- Noisy, incomplete data. ...
- Complex data structure. ...
- Heterogeneous data stored in legacy systems.

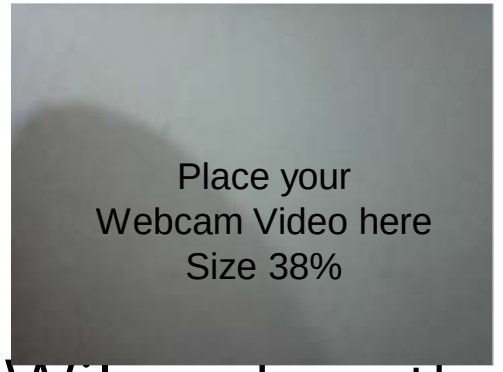
Benefits



Data mining benefits include:

- It helps companies gather reliable information.
- It's an efficient, cost-effective solution compared to other data applications.
- It helps businesses make profitable production and operational adjustments.
- Data mining uses both new and legacy systems.
- It helps businesses make informed decisions

References



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