

Cutting-edge research

centre

Multi-Dimensional View of

Data Mining

Market Analysis and

Management

Why Data Mining?—

Potential Applications

WHAT IS DATA MINING?

WHY DATA MINING?

# DATA MINING



# WHY DATA MINING?

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WHAT IS 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,

## •We are drowning in data, but starving for knowledge!

- “Necessity is the mother of invention”—Data mining—Automated analysis of massive data sets



WHY DATA MINING?

# WHAT IS DATA MINING?

## •What Is Data Mining?

- Data mining (knowledge discovery in databases):
- Extraction of interesting (non-trivial, implicit, previously unknown and potentially useful) information or patterns from data in large databases

## •Alternative names :

- Knowledge discovery(mining) in databases (KDD), knowledge extraction, data/pattern analysis, data archeology, data dredging, information harvesting, business intelligence, etc.

## • What is not data mining?

- (Deductive) query processing.
- Expert systems or statistical programs



# WHAT IS (NOT) DATA MINING?

## •What is not Data Mining?

- – Look up phone number in phone directory
- – Query a Web search engine for information about  
– Amazon

## •What is Data Mining?

- – Certain names are more prevalent in certain US locations (O'Brien, O'Rourke, O'Reilly... in Boston area)
- – Group together similar documents returned by search engine according to their context (e.g. Amazon rainforest, Amazon.com,)



WHAT IS DATA MINING?

WHY DATA MINING?

# WHY DATA MINING? POTENTIAL APPLICATIONS

- Data analysis and decision support
  - Market analysis and management
    - Target marketing, customer relationship management (CRM), market basket analysis, market segmentation
  - Risk analysis and management
    - Forecasting, customer retention, quality control, competitive analysis
- Fraud detection and detection of unusual patterns (outliers)



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# WHY DATA MINING? POTENTIAL APPLICATIONS

## Other Applications

Text mining (news group, email, documents) and Web mining

Stream data mining

Bioinformatics and bio-data analysis

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# MARKET ANALYSIS AND MANAGEMENT

## Where does the data come from?

Credit card transactions, discount coupons, customer complaint calls

## Target marketing

Find clusters of “model” customers who share the same characteristics: interest, income level, spending habits, etc.

Determine customer purchasing patterns over time



# MARKET ANALYSIS AND MANAGEMENT

## Cross-market analysis

Associations/co-relations between product sales, & prediction based on such association

## Customer profiling

What types of customers buy what products

## Customer requirement analysis

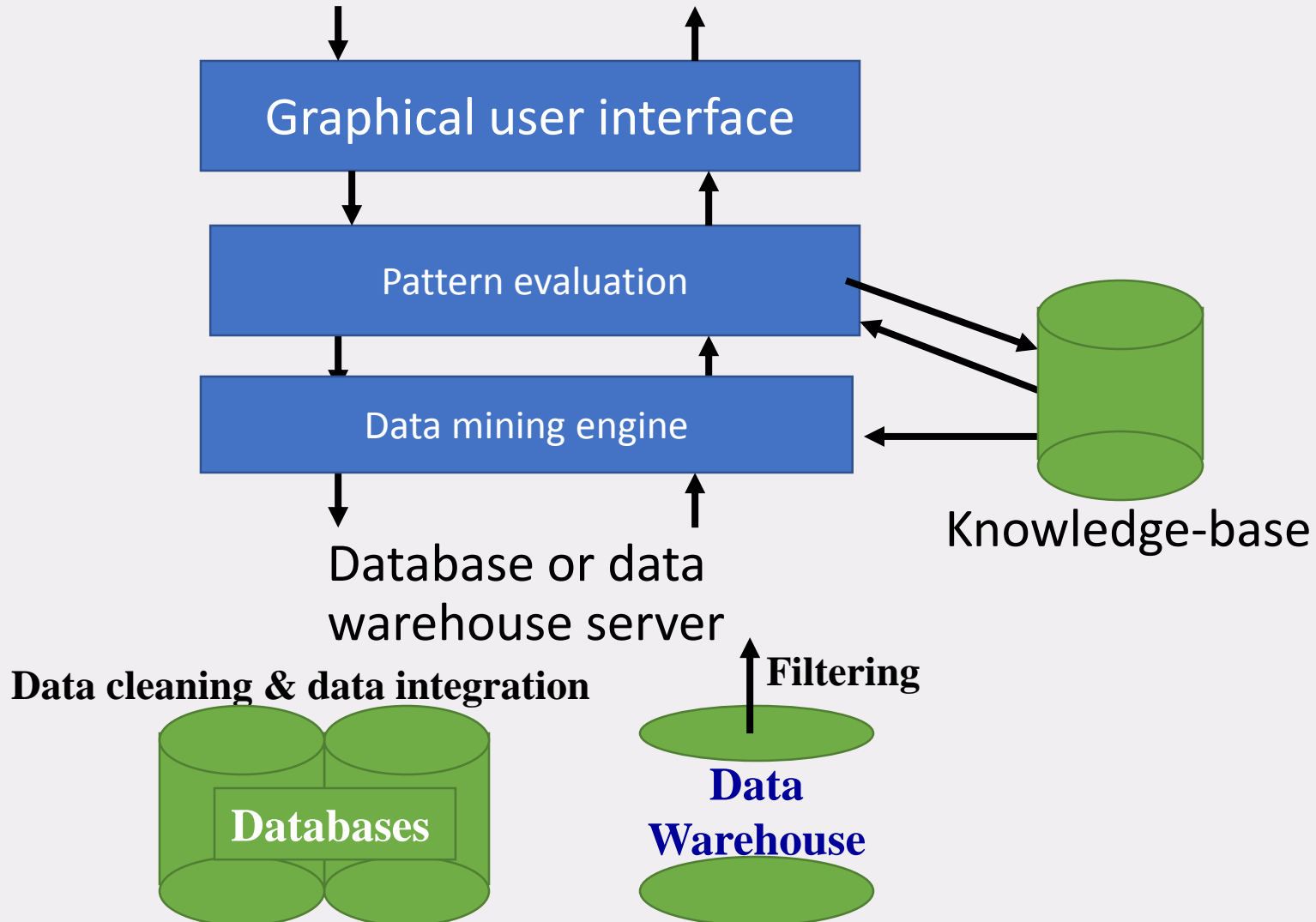
Identifying the best products for different customers

Predict what factors will attract new customers





# ARCHITECTURE: TYPICAL DATA MINING SYSTEM



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ARCHITECTURE: TYPICAL DATA  
MINING SYSTEM

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# DATA MINING: ON WHAT KINDS OF DATA?

- Relational database
- Data warehouse
- Transactional database
- Advanced database and information repository
  - Spatial and temporal data
  - Time-series data
  - Stream data
  - Multimedia database
  - Text databases & WWW



DATA MINING: ON  
WHAT KINDS OF DATA?

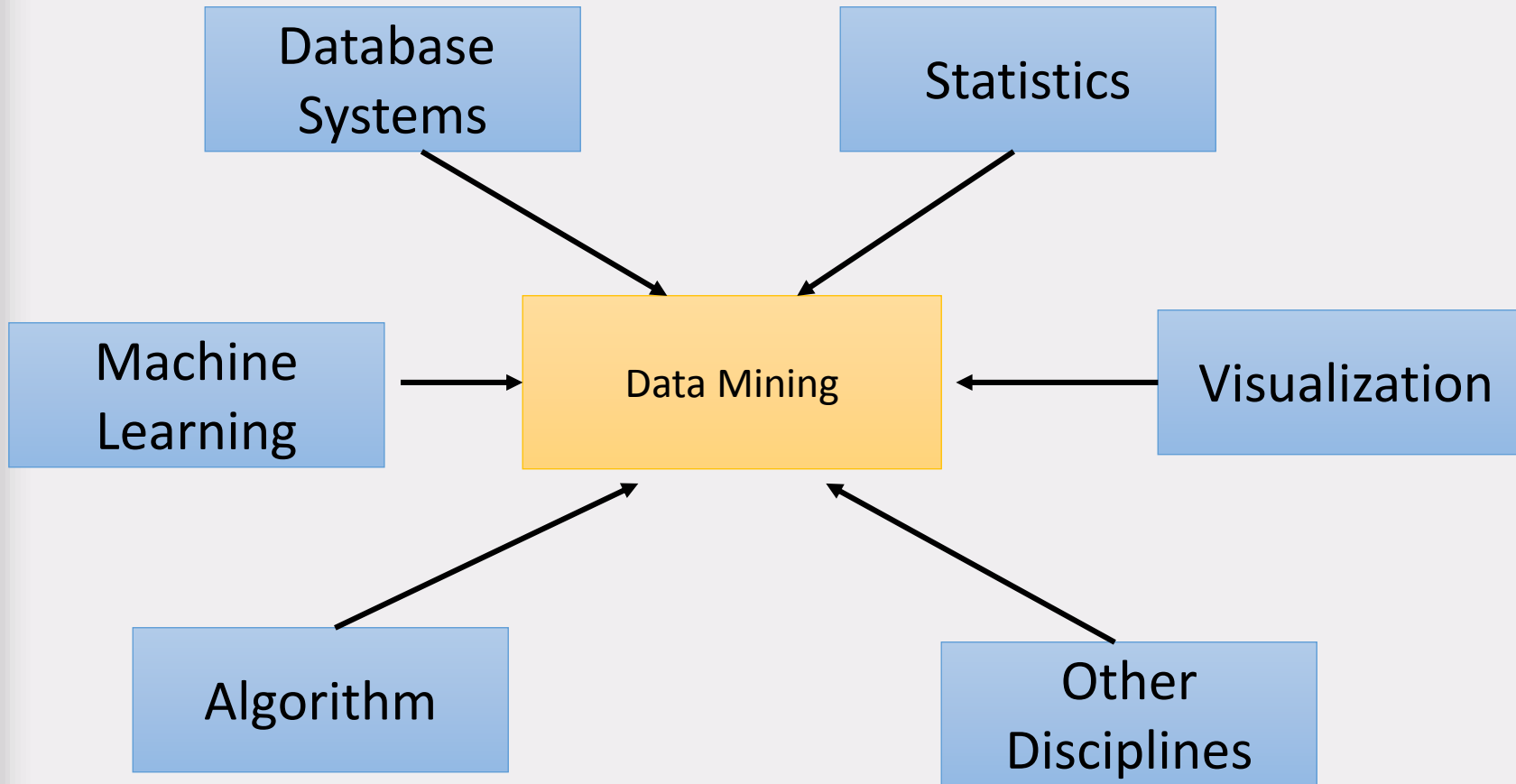
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# DATA MINING: CONFLUENCE OF MULTIPLE DISCIPLINES



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DATA MINING: ON  
WHAT KINDS OF DATA?  
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# MULTI-DIMENSIONAL VIEW OF DATA MINING

## Data to be mined

Relational, data warehouse, transactional, stream, object-oriented/relational, active, spatial, time-series, text, multimedia, heterogeneous, WWW

## Knowledge to be mined

Characterization, discrimination, association, classification, clustering, trend/deviation, outlier analysis, etc.  
Multiple/integrated functions and mining at multiple levels



# MULTI-DIMENSIONAL VIEW OF DATA MINING

## Techniques utilized

Database-oriented, data warehouse (OLAP), machine learning, statistics, visualization, etc.

## Applications adapted

Retail, telecommunication, banking, fraud analysis, bio-data mining, stock market analysis, Web mining, etc.



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# CUTTING-EDGE RESEARCH CENTRE

**Location:** Cutting-edge research centre in Košice, Slovakia

**City:** Košice

**Region:** Central Europe

**Country:** Slovakia

## Objectives:

The project has brought advanced technologies and laboratory equipment to the Technical University of Košice. This has enabled both the university and Slovakia to engage more fully in research into artificial intelligence, informatics and telecommunications at the European level.



# CUTTING-EDGE RESEARCH CENTRE

## Target area:

Data-mining

## Problems addressed:

**Artificial Intelligence** and **Data Mining** is very poor developed in Europe.

We don't have much research labs for **AI** and **data mining** in Europe. European Governments are spending a lot of money for foreign **AI** technologies which they buy from USA or China mostly.

## General description of the solution:

ERDF funding was provided for a scientific research centre in Košice, Slovakia.

The Centre of Information and Communication Technologies for Knowledge Systems performs scientific research on a range of topics including artificial intelligence, informatics and telecommunications.

Each year, some 30 national and international projects are run at the centre, on subjects ranging from virtualisation to data mining.

## Solutions used:

The idea is to build a research lab to research and develop new **AI** and data mining technologies. These technologies can be used by any European Government / Companies, or simple European citizens.



# CUTTING-EDGE RESEARCH CENTRE

## Benefits gained from the solutions used:

- This will enable universities, professors and young students to work towards this promising technology.
- A research lab will be built where ideas are put into reality
- We will be able to create our own intelligent systems depending on our own needs

## Community/ies where the smart change is used:

This can be used and built anywhere in Europe. The important thing is here that it will need **AI** and **Data Mining** experts, universities and also students to work on it. The outcomes of this research lab can be used anywhere in the world.

## •Cost (optional):

EUR 1 252 007

## -Link to the project website

[https://ec.europa.eu/budget/euprojects/cutting-edge-research-centre-ko%C5%A1ice-slovakia\\_en?language=en](https://ec.europa.eu/budget/euprojects/cutting-edge-research-centre-ko%C5%A1ice-slovakia_en?language=en)

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