1.1 | What is Data Mining

In this topic, you will learn what data mining is, its evolution, applications, benefits, and challenges.

At the end of the session, you should be able to:

1. Articulate what data mining is within the context of its evolution, as an interdisciplinary subfield, and as an essential step of knowledge and pattern discovery;
2. Point out practical applications of data mining as a tool for solving real-life problems;
3. Synthesize the benefits of data mining in extracting knowledge from data; and
4. Relate the challenges of data mining to a specific discipline.

Data Mining as Evolution of Information Technology

Data mining is the result of the natural evolution of information technology, specifically through the utilization of data management systems. The demand for more advanced systems with increased storage capacities and processing power have contributed to the growth and availability of data. These developments have influenced more effective mechanisms for data storage, retrieval, and data processing, which resulted in the generation of voluminous data. These data eventually became a valuable resource that aids decision making. As an economic asset, it helps organizations improve operations, increase revenue, improve the quality of products and services, and remain competitive.

Data Mining as Essential Step of Knowledge Discovery in Data

Data mining is the process of digging through a collection of data to discover hidden connections and patterns for the prediction of future trends. It uses some techniques to perform the tasks of extracting knowledge from data. Hence, data mining is also referred to as knowledge discovery from data. However, data mining is viewed by others as an essential step in the process of knowledge discovery. The process will be discussed in greater detail in the next sessions.

Data Mining as Interdisciplinary Subfield

Data is typically mined from databases or data warehouses, explored using some statistical techniques, and analyzed using machine learning algorithms to find patterns and connections. Figure 1.1 shows that data mining in an intersection of the database, statistics, and machine learning.
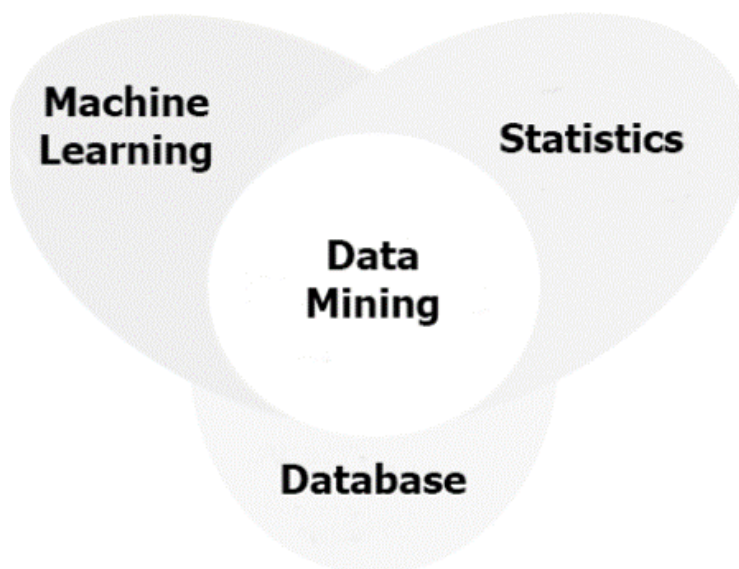

Figure 1.1 Intersection of Data Mining with Other Disciplines

Data Mining as Step of the Process of Pattern Discovery

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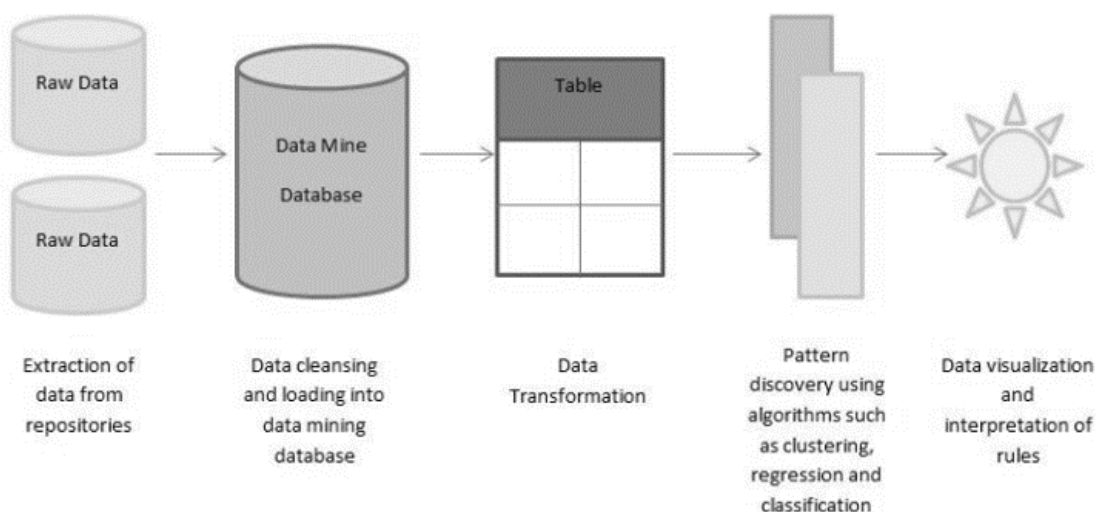

Figure 1.2 Process of Pattern Discovery

Applications of Data Mining

Data mining is applied in different fields. Among the typical applications are presented in the following table.

Table 1.2 Applications of Data Mining

Application	Description
Target Marketing	Data mining is used to understand customers better. It can be used for the segmentation of market groups for the customization of promotional campaigns.
Credit Risk Management	Data mining is used by financial institutions to create models to predict a borrower's ability to take on and repay debt. Using a variety of demographic and personal information, these models automatically select an interest rate based on the level of risk assigned to the client.
Fraud Detection	Financial institutions apply data mining models to detect and stop fraudulent transactions automatically. By tracking spending habits, these models will flag anomalous transactions and instantly withhold payments until customers verify the purchase.
Healthcare	Data mining is used to predict a patient's likelihood for different health conditions based on risk factors. Demographic, family, and genetic data can be modeled to help patients make changes to prevent or mediate the onset of unfavorable health conditions.
Sentiment Analysis	Data mining is utilized to gain an understanding of how a group of people feels towards a topic. Social media data is commonly used for this purpose.
Recommender Systems	Data mining is used in online systems to recommend products and services based on consumer behavior.
Spam Filtering	Data mining is also used to analyze the characteristics of malicious messages.
Education	Data mining is used in education to predict students' future learning behavior, and analyze student outcomes for improvement of teaching and learning strategies. Data mining can also be used by institutions to make accurate decisions for the development of the educational system.

Criminal Investigation	Data mining is used for exploring and detecting crimes and their relationships with criminals.

Benefits of Data Mining

The following are some of the benefits of data mining and their practical applications.

1. **Automated Decision-Making**

   Data Mining allows organizations to continually analyze data and automate both routine and critical decisions without the delay of human judgment.

   [Electronic Banking Fraud Detection using Data Mining Techniques (https://www.linkedin.com/pulse/electronic-banking-fraud-detection-using-data-mining-r-sayo-enoch/)](https://www.linkedin.com/pulse/electronic-banking-fraud-detection-using-data-mining-r-sayo-enoch/)

2. **Accurate Prediction and Forecasting**

   Data mining facilitates planning and provides managers with reliable forecasts based on past trends and current conditions.

   [Retail Goes Shopping Through Big Data (https://www.cnbc.com/id/100638141)](https://www.cnbc.com/id/100638141)

3. **Cost Reduction**

   Data mining allows for more efficient use and allocation of resources. Organizations can plan and make automated decisions with accurate forecasts that will result in maximum cost reduction.

   [Delta's Baggage Claim Digital Transformation (https://digital.hbs.edu/platform-rctom/submission/deltas-baggage-claim-digital-transformation/)](https://digital.hbs.edu/platform-rctom/submission/deltas-baggage-claim-digital-transformation/)

4. **Customer Insights**

   Firms deploy data mining models from customer data to uncover critical characteristics and differences among their customers. Data mining can be used to create personas and personalize each touchpoint to improve overall customer experience.

   [How Disney Creates Digital Magic with Big Data (https://theleadershipnetwork.com/article/disney-digital-magic-big-data)](https://theleadershipnetwork.com/article/disney-digital-magic-big-data)
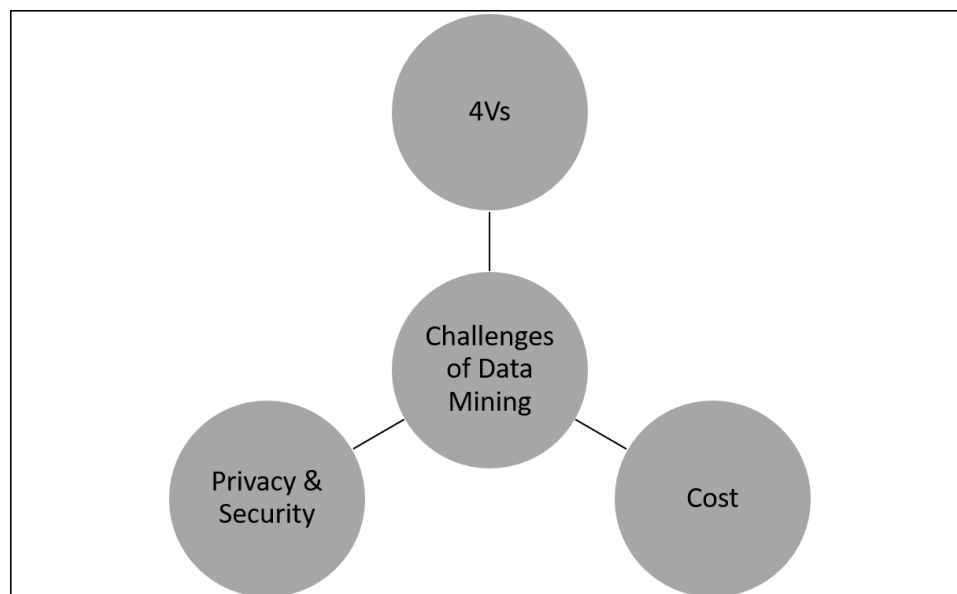
Challenges of Data Mining

Figure 1.3 Challenges of Data Mining

Tap the button to assess your understanding of the core concepts of data mining.

Assignment 📊 **[(https://tip.instructure.com/courses/9953/assignments/150454?](https://tip.instructure.com/courses/9953/assignments/150454?)**

[module_item_id=463463)](https://tip.instructure.com/courses/9953/assignments/150454?module_item_id=463463)

References:

1. Jiawei, Han. Data Mining Concepts and Techniques. 3rd ed., Morgan Kaufman - Elsevier