EMBA Program
MB-511

Data Science for Managerial Decisions (MB 511)
Introduction to Data Science

Instructor
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Data Science for Managerial Decisions (MB 511)

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Program Overview

- Introduction to Data Science
- Information Technology: An Overview
- Applications of Data Science in various fields
- MIS and Control Systems
- Data Collection and Data Pre-Processing
- Building Information Systems
- Support Systems for Management Decisions

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References/Literature

- Jojo Moolayil, “Smarter Decisions: The Intersection of IoT and Data Science”, PACKT, 2016.
- Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.
- David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013
- Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global
- Management Information System, W.S Jawadekar, Tata Mc Graw Hill Publication.
- Management Information System, David Kroenke, Tata Mc Graw Hill Publication.
- MIS: Management Perspective, D.P. Goyal, Macmillan Business Books.

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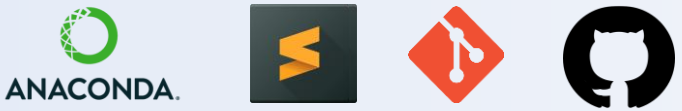
Online Resources

Software Resources



Introduction to Data Science

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- Overview of Data Science and its Importance
  - Data Science and its applications.
  - Role of data scientists in various industries.
  - Historical context and evolution of data science.

- Key Concepts in Data Science
  - Fundamental concepts: data, information, knowledge, and wisdom.
  - Data lifecycle: collection, cleaning, analysis, and visualization.

- Importance of Data in Decision Making
  - Impact of data-driven decision-making on businesses and society.
  - Case studies demonstrating successful data-driven strategies.

Introduction to Data Science

Fundamental concepts - data, information, knowledge, and wisdom

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The terms data, information, knowledge, and wisdom represent a hierarchy that reflects the increasing level of understanding and abstraction of insights derived from raw facts.

Data:

Definition: Data refers to raw, unorganized facts or symbols without any context or interpretation.

Characteristics: It is often in the form of numbers, text, or symbols. Data alone lacks meaning until it is processed or analyzed.

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The terms data, information, knowledge, and wisdom represent a hierarchy that reflects the increasing level of understanding and abstraction of insights derived from raw facts.

Information:

Definition: Information is data that has been processed or organized to provide context, relevance, and purpose.

Characteristics: Information adds meaning to data, making it useful and understandable. It answers the questions of who, what, where, and when.

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The terms data, information, knowledge, and wisdom represent a hierarchy that reflects the increasing level of understanding and abstraction of insights derived from raw facts.

Knowledge:

Definition: Knowledge is the result of organizing and interpreting information to understand patterns, relationships, and implications.

Characteristics: Knowledge involves the synthesis of information, enabling individuals to comprehend and apply concepts. It often includes insights, experiences, and contextual understanding.

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Fundamental concepts - data, information, knowledge, and wisdom

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The terms data, information, knowledge, and wisdom represent a hierarchy that reflects the increasing level of understanding and abstraction of insights derived from raw facts.

Wisdom:

Definition: Wisdom represents the highest level of understanding, involving the ability to make sound judgments and decisions based on knowledge and experience.

Characteristics: Wisdom goes beyond knowledge and involves the application of judgment, discernment, and ethical considerations. It reflects a deep understanding of the consequences and long-term implications of actions.

Introduction to Data Science

Fundamental concepts - data, information, knowledge, and wisdom

Example - Agriculture

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Phase	Example
Data	Temperature readings (e.g., 25°C, 30°C), wind speed (e.g., 15 km/h), and humidity levels (e.g., 70%) collected from various weather sensors.
Information	Organizing and processing the data to present a weather report stating, "Current temperature is 25°C with a wind speed of 15 km/h and humidity at 70%."
Knowledge	Understanding the patterns in historical weather data and combining it with the current information to predict that high humidity, rising temperatures, and strong winds may lead to thunderstorms in the region.
Wisdom	Applying the knowledge to make a decision, such as advising residents to take precautionary measures, businesses to secure outdoor equipment, and emergency services to be prepared for potential storm-related incidents.

In this example, raw data (temperature, wind speed, humidity) is transformed into information (a weather report). Knowledge is derived from understanding historical patterns and current conditions to make predictions about future weather events. Wisdom is demonstrated by using that knowledge to make informed decisions and take appropriate actions based on the forecasted weather conditions.

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Fundamental concepts - data, information, knowledge, and wisdom

Example - Banking

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Phase	Example
Data	Customer transaction data, including individual transactions such as deposit amounts, withdrawal amounts, and timestamps.
Information	Customer transaction data, including individual transactions such as deposit amounts, withdrawal amounts, and timestamps.
Knowledge	Analyzing the historical transaction patterns of a customer, identifying regular income and spending behaviors, and recognizing anomalies or unusual transactions.
Wisdom	Utilizing the knowledge of a customer's transaction history, combined with broader financial market trends, to provide personalized financial advice, suggest suitable investment options, or detect potential fraudulent activities. Additionally, using this information to make informed decisions about loan approvals or credit limit adjustments based on the customer's financial behavior.

In this banking example, raw data (individual transactions) is transformed into information (monthly bank statement). Knowledge is derived from analyzing transaction patterns and understanding a customer's financial behavior. Wisdom is demonstrated by using this knowledge to provide personalized financial advice, make informed decisions about financial products, and enhance overall customer satisfaction and security.

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Fundamental concepts - data, information, knowledge, and wisdom

Example - Manufacturing

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Phase	Example
Data	Raw data from production machines, such as measurements of temperature, pressure, and production speed collected at regular intervals during the manufacturing process.
Information	Organizing the raw data to generate a real-time dashboard displaying the current status of the production line, including temperature trends, pressure levels, and machine speeds.
Knowledge	Analyzing historical production data to identify correlations between specific machine parameters and product quality. Recognizing patterns that indicate optimal operating conditions and potential factors contributing to defects or inefficiencies.
Wisdom	Applying the knowledge gained to proactively adjust machine parameters in real-time to optimize production efficiency, minimize defects, and ensure product quality. Using predictive analytics to anticipate potential machine failures and schedule preventive maintenance, thereby minimizing downtime and reducing overall production costs.

In this manufacturing example, raw data (machine measurements) is transformed into information (real-time dashboard). Knowledge is derived from analyzing historical data to understand relationships between machine parameters and product quality. Wisdom is demonstrated by using this knowledge to make informed, proactive decisions that optimize production processes, improve product quality, and reduce operational risks.

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Fundamental concepts - data, information, knowledge, and wisdom

Example - Healthcare

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Phase	Example
Data	Patient health records containing raw data such as blood pressure readings, cholesterol levels, and medication history.
Information	Aggregating the patient data to create a comprehensive electronic health record (EHR) that includes a summary of medical history, current medications, and recent diagnostic test results.
Knowledge	Analyzing the patient's EHR to recognize patterns, trends, and potential risk factors. For instance, identifying a correlation between a patient's elevated blood pressure and recent changes in medication.
Wisdom	Applying the knowledge gained from analyzing the patient's health record to make informed decisions. This could involve adjusting the patient's medication, recommending lifestyle changes, or consulting with specialists based on the identified health trends. Additionally, using this information to predict and prevent potential health issues by providing proactive healthcare advice.

In this healthcare example, raw data (individual health metrics) is transformed into information (comprehensive electronic health record). Knowledge is derived from analyzing health patterns and understanding potential risks. Wisdom is demonstrated by using this knowledge to make informed decisions about patient care, taking preventive measures, and promoting overall health and well-being.

Introduction to Data Science

Data - A Quick Discussion

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Data comes in various forms, each serving a distinct purpose and requiring specific analytical approaches. Understanding the different types of data is essential for effective processing, analysis, and interpretation. Here are some common types of data:

Quantitative Data:

- Definition: Quantitative data represents measurable quantities and is expressed in numerical terms.
- Examples: Numeric data, such as age, income, temperature, or the number of products sold.
- Characteristics: Enables statistical analysis, including calculations of means, medians, and standard deviations.

Qualitative Data:

- Definition: Qualitative data describes qualities or characteristics and is typically non-numeric.
- Examples: Descriptive data, such as colors, emotions, or opinions collected from surveys or interviews.
- Characteristics: Often subjective and requires qualitative analysis methods, like thematic coding or content analysis.

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Primary Data:

- Definition: Primary data is original information collected firsthand directly from the source for a specific research purpose.
- Collection Methods: Surveys, interviews, observations, experiments, and direct measurements are common methods for gathering primary data.
- Characteristics: This data is specific to the research objective, recent, and tailored to the researcher's needs. It offers a high degree of control but may require more resources in terms of time and cost.

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Secondary Data:

- Definition: Secondary data refers to information that has been collected by someone else for a purpose other than the current research, and is repurposed for a new investigation.
- Sources: Published literature, government reports, databases, and previously conducted research studies are common sources of secondary data.
- Characteristics: Secondary data is readily available, cost-effective, and time-efficient. However, researchers have less control over the data collection process, and its relevance to the specific research question may be limited.

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Comparison and Considerations::

- Control: Primary data provides researchers with control over data collection methods, ensuring alignment with research objectives. Secondary data, being pre-existing, offers less control in this regard.
- Time and Cost: Primary data collection can be time-consuming and costly, particularly for large-scale studies. Secondary data is often more readily available, reducing both time and cost requirements.
- Accuracy: Primary data is collected for a specific research context, enhancing accuracy and relevance. Secondary data may lack precision if it was not originally collected with the current research question in mind.
- Applicability: Primary data is ideal when tailored, up-to-date information is required. Secondary data is beneficial for exploratory research, background information, or when primary data collection is impractical.

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Have a question?

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