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

Instructor
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Data Science for Managerial Decisions (MB 511)

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

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- Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
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- 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

- 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
Overview of Data Science and its Importance

Define Data Science and its applications.

- Data Science involves extracting insights and knowledge from vast datasets. It spans various domains, including finance, healthcare, marketing, and technology. Employing statistical analysis and machine learning, Data Science enables informed decision-making, predictive modeling, fraud detection, personalized recommendations, and overall optimization of processes in diverse industries, revolutionizing the way we derive value from data.

Why Data Science is important?

- Informed Decision-Making: Data Science empowers organizations to make informed decisions by analyzing and interpreting complex datasets, enabling strategic planning and mitigating risks.

- Predictive Analytics: Through machine learning algorithms, Data Science predicts future trends and outcomes, aiding businesses in forecasting demand, optimizing processes, and identifying potential issues.

- Personalization: Data Science facilitates personalized experiences in fields like marketing and e-commerce, enhancing customer satisfaction by tailoring products, services, and recommendations based on individual preferences and behavior.

- Efficiency and Optimization: Organizations leverage Data Science to streamline operations, optimize resource allocation, and improve efficiency, ultimately reducing costs and increasing productivity.

- Innovation and Research: Data Science drives innovation by uncovering insights, patterns, and correlations, fostering advancements in technology, healthcare, and various industries, contributing to continuous improvement and discovery.

Introduction to Data Science
Overview of Data Science and its Importance

Data Science use cases (Finance):

Fraud Detection: Data Science is utilized to detect anomalous patterns in financial transactions, helping banks and financial institutions identify and prevent fraudulent activities in real-time.

Credit Scoring: Data Science models assess customer creditworthiness by analyzing historical financial data, enabling more accurate and efficient credit scoring for loan approvals.

Algorithmic Trading: Data Science algorithms analyze market data, historical trends, and other relevant factors to optimize trading strategies, improving decision-making in the dynamic financial markets.

Customer Segmentation: Financial institutions use Data Science to segment customers based on their behavior, preferences, and financial habits, allowing for targeted marketing campaigns and personalized services.

Risk Management: Data Science models assess and quantify risks by analyzing vast datasets, helping financial organizations manage and mitigate potential threats to their portfolios and investments.

Introduction to Data Science
Overview of Data Science and its Importance

Data Science use cases (Agriculture):

Precision Farming: Data Science helps farmers optimize crop yields by analyzing data from sensors, satellites, and other sources to make informed decisions on irrigation, fertilization, and pest control.

Crop Disease Prediction: Using historical and real-time data, Data Science models predict and identify potential crop diseases, allowing farmers to take preventive measures and protect their harvests.

Weather Forecasting for Agriculture: Data Science is employed to analyze weather patterns and provide accurate forecasts, assisting farmers in planning planting and harvesting schedules and mitigating weather-related risks.

Supply Chain Optimization: Data Science optimizes agricultural supply chains by analyzing data on demand, logistics, and storage, ensuring efficient distribution of produce from farms to markets.

Soil Health Monitoring: Data Science applications monitor soil conditions, providing insights into nutrient levels and soil health, assisting farmers in making informed decisions about crop rotation and soil management practices.

Introduction to Data Science
Overview of Data Science and its Importance

Data Science use cases (Manufacturing):

Predictive Maintenance: Data Science predicts equipment failures by analyzing sensor data, reducing

downtime and improving overall efficiency in manufacturing processes.

Quality Control: Data Science is employed to analyze production data and identify defects or

deviations, ensuring high-quality products and minimizing waste in the manufacturing process.

Supply Chain Optimization: Data Science optimizes manufacturing supply chains by analyzing data on

inventory levels, demand forecasts, and logistics, improving overall efficiency and reducing costs.

Energy Consumption Optimization: Data Science models analyze energy usage patterns to identify

opportunities for optimization, helping manufacturing facilities reduce energy costs and improve

sustainability.

Process Optimization: Data Science is used to analyze production processes, identifying bottlenecks

and inefficiencies, and optimizing workflows to enhance overall manufacturing efficiency.

Introduction to Data Science
Overview of Data Science and its Importance

Data Science use cases (Education):

Personalized Learning: Data Science algorithms analyze student performance data to provide personalized learning recommendations, adapting educational content to individual learning styles.

Predictive Analytics for Student Success: Data Science predicts students at risk of academic challenges by analyzing historical data, allowing educators to intervene and provide necessary support.

Admission and Enrollment Forecasting: Data Science is employed to analyze historical enrollment data and predict future admissions trends, aiding educational institutions in planning resources effectively.

Learning Analytics: Data Science models analyze student engagement and learning patterns, providing insights to educators on how to enhance teaching methods and curriculum.

Educational Resource Allocation: Data Science helps educational institutions optimize resource allocation by analyzing data on facility usage, class schedules, and student needs, improving overall efficiency and cost-effectiveness.

Introduction to Data Science
Role of data scientists in various industries

Data scientists are integral to leveraging data-driven insights, fostering innovation, and solving complex challenges across diverse industries. Their role continues to evolve as the importance of data in decision-making becomes increasingly prominent.

Healthcare:

- Data scientists analyze patient records, clinical trials, and medical research to enhance treatment protocols.

- Data scientists develop predictive models for disease outbreaks, patient outcomes, and personalized medicine.

Finance:

- In the financial sector, data scientists work on fraud detection, risk assessment, and algorithmic trading.

- Data scientists use predictive analytics to forecast market trends, optimize investment portfolios, and improve customer experiences in banking.

Introduction to Data Science
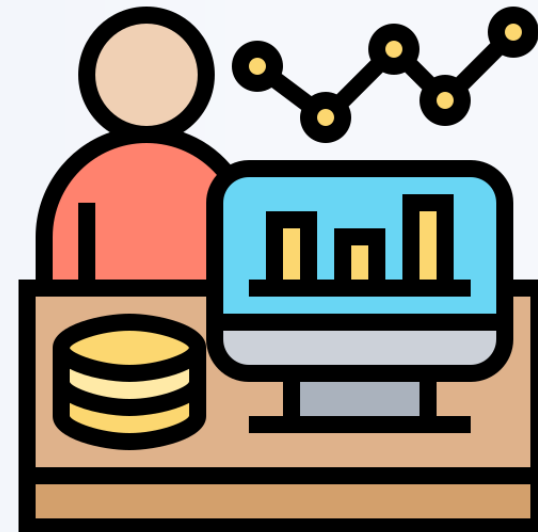Role of data scientists in various industries

Retail and E-Commerce:

- Data scientists analyze customer behavior to optimize pricing, inventory management, and supply chain logistics.

- Data scientists develop recommendation systems for personalized shopping experiences and targeted marketing strategies.

Technology:

- In the tech industry, data scientists contribute to product development, user experience optimization, and cybersecurity.

- Data scientists analyze user data to improve software performance, enhance user interfaces, and address security threats.

Manufacturing:

- Data scientists in manufacturing focus on process optimization, quality control, and predictive maintenance.

- Data scientists use data to improve production efficiency, reduce downtime, and enhance overall operational performance.

Introduction to Data Science
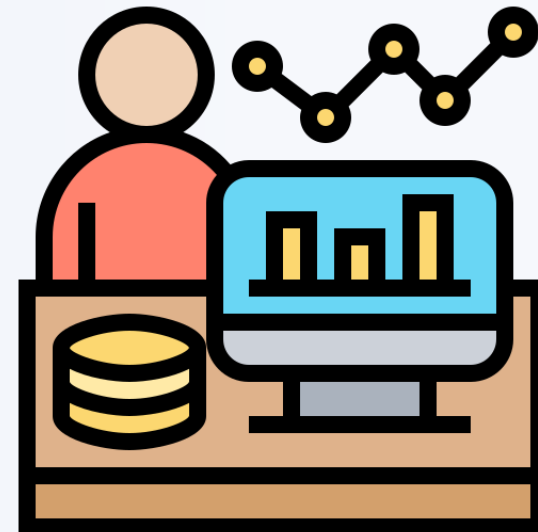Role of data scientists in various industries

Telecommunications:

- Data scientists analyze network data to optimize infrastructure, improve connectivity, and enhance user experiences.

- Data scientists work on predictive maintenance of network equipment and customer churn prediction.

Marketing and Advertising:

- Data scientists use consumer data for targeted advertising, customer segmentation, and campaign optimization.

- Data scientists analyze social media trends, sentiment analysis, and customer feedback to shape marketing strategies.

Energy:

- Data scientists contribute to the optimization of energy production, distribution, and consumption.

- Data scientists work on predictive maintenance for equipment, energy demand forecasting, and optimizing renewable energy sources.

Introduction to Data Science
## Role of data scientists in various industries

Education:

- In education, data scientists analyze student performance data to improve teaching methods and enhance educational outcomes.

- Data scientists develop personalized learning algorithms and assist in administrative decision-making.

Government and Public Policy:

- Data scientists support evidence-based decision-making in public policy, analyzing data to inform governance strategies.

- Data scientists contribute to areas such as crime prediction, resource allocation, and healthcare policy formulation.
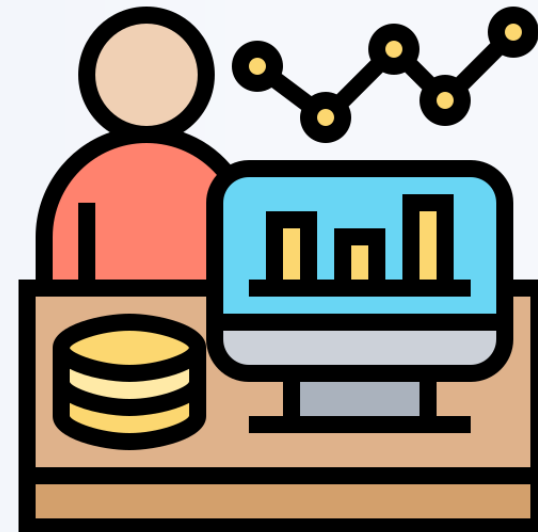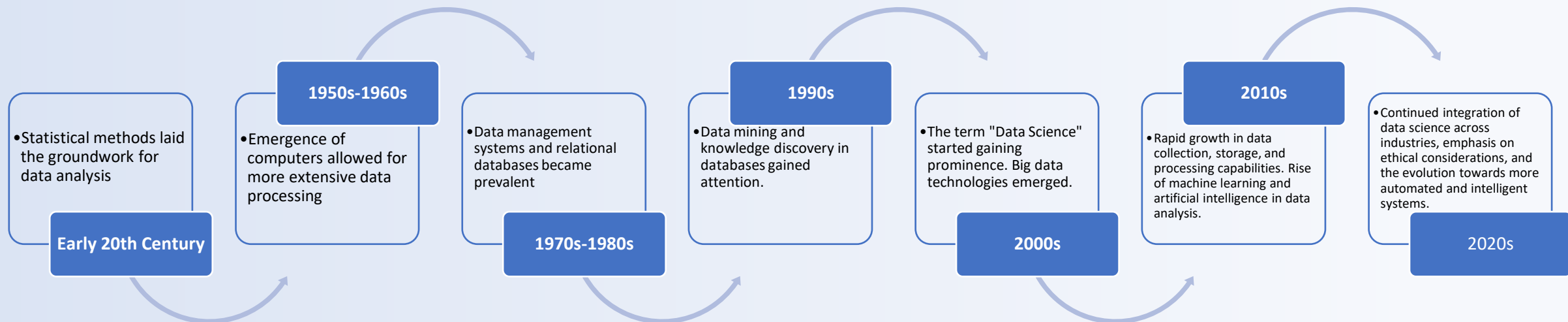
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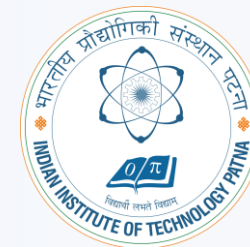
Data Science has evolved from statistics and computer science roots. In the early 20th century, statisticians laid the groundwork. The emergence of computers in the mid-20th century allowed for more extensive data analysis. However, the term "Data Science" gained prominence in the 21st century as technology advanced, big data emerged, and the need for extracting meaningful insights grew. The evolution accelerated with the rise of machine learning and artificial intelligence, transforming data science into a multidisciplinary field. Today, it plays a pivotal role in decision-making across industries, reflecting a continuous journey from statistical methods to sophisticated analytics and machine learning algorithms.

1950s-1960s

1990s

2010s

- Statistical methods laid the groundwork for data analysis

Early 20th Century

- Emergence of computers allowed for more extensive data processing

- Data management systems and relational databases became prevalent

1970s-1980s

- Data mining and knowledge discovery in databases gained attention.

- The term "Data Science" started gaining prominence. Big data technologies emerged.

2000s

- Rapid growth in data collection, storage, and processing capabilities. Rise of machine learning and artificial intelligence in data analysis.

- Continued integration of data science across industries, emphasis on ethical considerations, and the evolution towards more automated and intelligent systems.

2020s

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Have a question?
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