# AI in management

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## Introduction:

Artificial Intelligence encompasses a wide range of techniques and tools, including machine learning, natural language processing, data analytics, and robotics, among others. These technologies are enabling businesses to gain deeper insights from data, automate routine tasks, optimize processes, and make more informed strategic decisions. From predictive analytics that enhance demand forecasting to chatbots that improve customer service, AI is proving to be a game-changer in various management domains. The course will cover the most commonly used supervised and unsupervised learning algorithms, regression, classification, and clustering techniques. Students will gain hands-on experience with popular machine learning tools and libraries such as Scikit-Learn and Yelp's datasets. Additionally, the course will introduce the basics of big data and its relevance in machine learning.

We will explore case studies, discuss ethical considerations, and equip you with the knowledge and skills necessary to harness the power of AI for effective management in the digital age. Whether you are a business professional looking to stay competitive or a student eager to explore the frontier of management, this module offers a valuable foundation in the exciting world of Artificial Intelligence.

Objectives:

- ✓ Understanding AI Fundamentals: The module should aim to provide students with a solid understanding of the fundamental concepts and technologies that underpin Artificial Intelligence. This includes topics like machine learning, neural networks, natural language processing, and data analytics.
- ✓ Applications in Management: Enable students to recognize and appreciate the various applications of AI in the field of management. This involves exploring real-world use cases across different management functions, such as marketing, finance, supply chain, and human resources.
- ✓ Data-Driven Decision-Making: Equip students with the skills to collect, preprocess, and analyze data for informed decision-making. Emphasize the role of AI in extracting actionable insights from large datasets to support managerial choices.

- ✓ Ethical and Legal Considerations: Highlight the ethical and legal implications of AI in management. Foster discussions on responsible AI use, data privacy, bias mitigation, and compliance with relevant regulations.

✓ Practical Implementation: Provide hands-on experience or projects that allow students to implement AI solutions in management contexts. This objective should encourage students to apply their knowledge to solve real-world business challenges.

and also

- Understand the basic principles and applications of machine learning

- Develop the ability to choose appropriate learning algorithms for different types of problems

- Develop hands-on experience in building and evaluating machine learning models

- Develop critical thinking and problem-solving skills related to machine learning

- Understand the role of big data in machine learning

**Contents**

- Week 1 and 2: AI concepts
- Week 3:        AI paradigms
- Week 4, 5:        Expert systems
- Week 6, 7, 8, 9     Artificial neural networks
- Week 10, 11:        Genetic algorithm
- Week 12, 13:        Deep learning
- Week 14:        Deep learning; part2
- Week  15:        BI Modeling
- Week 16, 17:        Agent based Analysis
- Week 18, 19:     data mining techniques


**Discussion for the weeks:**

Week 1, 2: Introduction to Machine Learning and

- Theme: What is Machine Learning and why use it?

- Course materials:

    ○ Article: "What is Machine Learning and how do we use it?" (Medium)

    ○ Article: "Supervised vs. Unsupervised" (Towards Data Science)

    ○ Article: "Scikit-Learn Cheatsheet" (DataCamp)

Week 3, 4: Regression Techniques

- Theme: Predicting continuous variables using regression techniques

- Course materials:
  - Lesson: "Linear Regression" (Kaggle)
  - Article: "StreetEasy Dataset" (Kaggle)
  - Project: "Honey Production" (Kaggle)

Week 5, 6: Multiple Regression Techniques

- Theme: Predicting multiple variables using regression techniques
- Course materials:
  - Lesson: "Multiple Linear Regression" (Kaggle)
  - Project: "Yelp Rating Predictor Cumulative Project" (Kaggle)

Week 7, 8: Classification Techniques

- Theme: Predicting categorical variables using classification techniques
- Course materials:
  - Article: "Regression vs. Classification" (DataCamp)
  - Lesson: "K-Nearest Neighbors" (Kaggle)
  - Project: "Breast Cancer Classifier" (Kaggle)

Week 9, 10: Logistic Regression

- Theme: Predicting binary variables using logistic regression
- Course materials:
  - Lesson: "Logistic Regression" (Kaggle)
  - Project: "Predict Titanic Survival" (Kaggle)

Week 11, 12: Decision Trees

- Theme: Predicting variables using decision trees
- Course materials:
  - Lesson: "Decision Trees" (Kaggle)
  - Project: "Find the Flag" (Kaggle)

Week 13, 14: Random Forests

- Theme: Predicting variables using random forests

- Course materials:
    - Lesson: "Random Forests" (Kaggle)
    - Project: "Predicting Income with Random Forests" (Kaggle)

Week 15, 16: Clustering and Big Data

- Theme: Unsupervised learning and the role of big data
- Course materials:
    - Lesson: "K-Means Clustering" (Kaggle)
    - Lesson: "K-Means++ Clustering" (Towards Data Science)
    - Project: "Handwriting Recognition using K-Means" (Kaggle)
    - Informational: "What is Big Data?" (SAS)

✓ Journal Club:

- paper Title: "Artificial Intelligence and the End of Work"

Authors: Brynjolfsson, E., & McAfee, A.

Published In: Foreign Affairs, 2017

Summary: This paper explores the impact of AI on the future of work and its implications for business and management.

- Paper Title: "Using Machine Learning to Improve Decision Making: A Review"

Authors: Cios, K. J., Pedrycz, W., Swiniarski, R. W., & Kurgan, L. A.

Published In: IEEE Transactions on Systems, Man, and Cybernetics, 2007

Summary: The paper discusses the use of machine learning techniques to enhance decision-making processes in business.

- Paper Title: "The Promise and Peril of Our Gene Editing Powers"

Authors: Davenport, T. H., & Kalakota, R.

Published In: Harvard Business Review, 2019

Summary: This paper explores the ethical considerations of AI and gene editing technologies in the context of business and management.

- Paper Title: "How Companies Can Learn from GE's Use of AI"

Authors: Davenport, T. H., Harris, J., & Shapiro, J.

Published In: Harvard Business Review, 2018

Summary: The paper provides insights into how businesses can leverage AI based on General Electric's experiences and lessons.

- Paper Title: "Artificial Intelligence in Health Care: Anticipating Challenges to Ethics"

Authors: Topol, E. J.

Published In: JAMA, 2019

Summary: This paper discusses the ethical challenges of implementing AI in healthcare, a critical domain of business management.

- Paper Title: "AI and Machine Learning in the Oil and Gas Industry: A Path to Success"

Authors: Khatua, A., Patel, A., & Banerjee, S.

Published In: Journal of Petroleum Science and Engineering, 2020

Summary: The paper focuses on the applications of AI and machine learning in the oil and gas industry, offering insights for management in this sector.

- Paper Title: "The Impact of Artificial Intelligence on Business Models: A Conceptual Framework"

Authors: Fountaine, T., McCarthy, B., & Saleh, T.

Published In: MIT Sloan Management Review, 2019

Summary: This paper presents a framework for understanding how AI can impact business models and strategies.

- Paper Title: "Reinforcement Learning in Finance"

Authors: Arulkumaran, K., Deisenroth, M. P., Brundage, M., & Bharath, A. A.

Published In: IEEE Computational Intelligence Magazine, 2017

Summary: The paper explores the use of reinforcement learning techniques in financial applications, which is of high relevance to business and management.

- Paper Title: "The Ethics of Artificial Intelligence"

Authors: Bostrom, N., & Yudkowsky, E.

Published In: Cambridge Handbook of Artificial Intelligence, 2014

Summary: This paper delves into the ethical considerations surrounding AI development and use in various industries, including business.

- Paper Title: "AI and Big Data in Business: Understanding the Progress and Prospects"

Authors: Li, H., Wu, J., & Wang, X.

Published In: Decision Support Systems, 2018

Summary: The paper discusses the integration of AI and big data in business decision support systems and analytics.

# References :

"Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig (2020): This book offers a comprehensive introduction to artificial intelligence, covering various AI techniques and their applications in business.

"Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy (2012): An excellent resource for understanding machine learning from a probabilistic perspective, with relevance to business applications.

"AI Superpowers: China, Silicon Valley, and the New World Order" by Kai-Fu Lee (2018): This book provides insights into the business implications of AI, including its impact on global economies and industries.

"Prediction Machines: The Simple Economics of Artificial Intelligence" by Ajay Agrawal, Joshua Gans, and Avi Goldfarb (2018): This book explores the economic aspects of AI, focusing on how it affects business strategy, decision-making, and competition.

"Deep Learning for Business" by Adam Gibson and Joshua Patterson (2019): This practical guide introduces deep learning techniques and their applications in business contexts, with a focus on real-world use cases.

The other references are :

- Book Title: "Artificial Intelligence: A Modern Approach"

Authors: Stuart Russell and Peter Norvig

Summary: This comprehensive textbook provides a thorough introduction to AI, covering a wide range of topics, including machine learning, neural networks, natural language processing, and robotics. It offers insights into how AI can be applied in various management contexts.

- Book Title: "Artificial Intelligence for Business: A Roadmap for Getting Started with AI"

Authors: Andrew Burgess

Summary: This book focuses on the practical aspects of AI implementation in business and management. It offers a roadmap for organizations looking to leverage AI for strategic advantage, with real-world case studies and actionable insights.

- Book Title: "Prediction Machines: The Simple Economics of Artificial Intelligence"

Authors: Ajay Agrawal, Joshua Gans, and Avi Goldfarb

Summary: This book explores the economic implications of AI and how it affects decision-making in businesses. It provides a clear framework for understanding the impact of AI on management strategies and practices.

- Book Title: "Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World"

Authors: Marco Iansiti and Karim R. Lakhani

Summary: The book discusses how AI is reshaping industries and offers guidance for leaders and managers on how to navigate this new era. It emphasizes the importance of adapting business strategies in response to AI advancements.

APPENDIX:۱

الگوریتم های داده کاوی که مورد توجه هستند

# انواع الگوریتم های داده کاوی

بطور کلی الگوریتم های داده کاوی یادگیری تحت نظارت و بدون نظارت را می‌توان در ۷ دسته زیر قرار داد:

۱. الگوریتم‌های دسته‌بندی(Classification algorithms)

۲. الگوریتم‌های رگرسیون(Regression algorithms)

۳. الگوریتم‌های بخش‌بندی(Segmentation algorithms)

٤. الگوریتم‌های وابستگی(Association algorithms)

٥. الگوریتم‌های تحلیل ترتیبی( Sequence analysis algorithms)

٦. الگوریتم‌های سری زمانی(Time series algorithms)

۷. الگوریتم‌های کاهش ابعاد(Dimensional Reduction algorithms)

## الگوریتم‌های دسته‌بندی Classification Algorithms

الگوریتم C 4.5  طبقه بندی درخت تصمیم

الگوریتم SVM ماشین بردار پشتیبان یا Support-Vector Machines

الگوریتم K  KNN همسایه نزدیک K Nearest Neighbor

الگوریتم NB الگوریتم Naive Bayes

الگوریتم CART این الگوریتم مخفف Classification and Regression Tree

الگوریتم ANN الگوریتم‌های شبکه عصبی مصنوعی Artificial Neural Network

## الگوریتم‌های رگرسیون Regression Algorithms

الگوریتم رگرسیون خطی Linear Regression

الگوریتم رگرسیون مرزبندی شده Ridge Regression

الگویتم شبکه عصبی رگرسیونی Neural Network Regression

الگوریتم رگرسیون کمند Lasso Regression

الگوریتم رگرسیونی درخت تصمیم Decision Tree Regression

الگوریتم جنگل تصادفی Random Forest

الگوریتم KNN Model

الگوریتم Support Vector Machines (SVM)

## الگوریتم‌های بخش بندی Segmentation Algorithms

الگوریتم خوشه‌بندی K-Means

الگوریتم خوشه‌بندی Mean-Shift

الگوریتم خوشه‌بندی DBSCAN

Expectation–Maximization (EM) الگوریتم

Agglomerative Hierarchical الگوریتم

## الگوریتم‌های وابستگی Association Algorithms

Apriori الگوریتم

Page Rank الگوریتم

## الگوریتم‌های تحلیل ترتیبی Sequence analysis Algorithms

الگوریتم برنامه نویسی پویا Dynamic programming

الگوریتم شبکه عصبی Artificial Neural Network

مدل های مخفی مارکوف Hidden Markov Model

الگوریتم ماشین بردار پشتیبان Support Vector Machine

الگوریتم شبکه بیزین Bayesian Network

## الگوریتم‌های کاهش ابعاد Dimensional Reduction Algorithms

الگوریتم Principal Component Analysis (PCA)

الگوریتم Linear Discriminant Analysis (LDA)

الگوریتم Factor Analysis (FA)

الگوریتم Multidimensional Scaling (MDS)

الگوریتم Isometric mapping (Isomap)

الگوریتم Backward Elimination (BE)

## الگوریتم‌های سری زمانی Time series Algorithms

الگوریتم Autoregressive (AR)

الگوریتم Moving Average (MA)

الگوریتم Autoregressive Moving Average (ARMA)

الگوریتم Autoregressive Integrated Moving Average (ARIMA)

الگوریتم Exponential Smoothing (ES)