



APEX INSTITUTE OF TECHNOLOGY DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING



MACHINE LEARNING (21CSH-286)

Faculty: Prof. (Dr.) Vineet Mehan (E13038)

Lecture - 2
Introduction to Machine Learning

DISCOVER . LEARN . EMPOWER



DBMS: Course Objectives

COURSE OBJECTIVES

The Course aims to:

1. Understand and apply various data handling and visualization techniques.
2. Understand about some basic learning algorithms and techniques and their applications, as well as general questions related to analysing and handling large data sets.
3. To develop skills of supervised and unsupervised learning techniques and implementation of these to solve real life problems.
4. To develop basic knowledge on the machine techniques to build an intellectual machine for making decisions behalf of humans.
5. To develop skills for selecting suitable model parameters and apply them for designing optimized machine learning applications.



COURSE OUTCOMES

On completion of this course, the students shall be able to:-

CO1	Understand machine learning techniques and computing environment that are suitable for the applications under consideration.
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Unit-1 Syllabus

Unit-1	Introduction to Machine Learning
Introduction to Machine Learning	Definition of Machine Learning, Working principles of Machine Learning; Classification of Machine Learning algorithms: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Semi-Supervised Learning; Applications of Machine Learning.
Data Pre-Processing and Feature Extraction	Data Sourcing and Cleaning, Handling Missing data, Encoding Categorical data, Feature Scaling, Handling Time Series data; Feature Selection techniques, Data Transformation, Normalization, Dimensionality reduction
Data Visualization	Data Frame Basics, Different types of analysis, Different types of plots, Plotting fundamentals using Matplotlib, Plotting Data Distributions using Seaborn.



SUGGESTIVE READINGS

TEXT BOOKS:

- There is no single textbook covering the material presented in this course. Here is a list of books recommended for further reading in connection with the material presented:
- T1: Tom.M.Mitchell, "Machine Learning, McGraw Hill International Edition".
- T2: Elhern Alpaydm, "Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005".
- T3: Andreas C. Miller, Sarah Guido, Introduction to Machine Learning with Python, O'REILLY (2001).

REFERENCE BOOKS:

- R1 Sebastian Raschka, Vahid Mirjalili, Python Machine Learning, (2014)
- R2 Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification, Wiley, 2nd Edition".
- R3 Christopher Bishop, "Pattern Recognition and Machine Learning, Illustrated Edition, Springer, 2006".



Introduction to Machine Learning

- Humans learn from experiences.
- Whatever we learn from experiences(Good or Bad) we try to implement/perform action correspondingly.
- Example: Driving a Car
 - Initially we learn how to drive
 - Then we drive
 - & then we become expert



Introduction to Machine Learning

- Similarly machines also learn
- From where machines learn?
- Machines learn from data.
- More the data → better will be the model → higher will be the accuracy. (Just like the more you drive → the more better you become a driver)

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Introduction to Machine Learning

- ML is a branch of AI.
- Learning means
 - Acquiring Knowledge
 - Behavior Skills
 - Understanding
 - Synthesizing different information
- Ability to learn is possessed by humans, animals etc. and now this ability to learn is extended to machines.

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Definition

ML is a scientific discipline that is concerned with design and development of algorithms that allows computers to change behaviors based on data.

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Introduction to Machine Learning

- Major focus of ML → to automatically learn to recognize complex patterns
- And to make intelligent decisions based on the data.
- It is for the above reason that ML is closely related to the following areas:
- 1. Statistics

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Introduction to Machine Learning

- Probability Theory
- AI
- Theoretical Computer Science
- Data Mining
- Pattern Recognition

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Types of Machine Learning

1. Supervised Learning
2. Unsupervised Learning
3. Semi-Supervised Learning
4. Reinforcement Learning

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So when new weight is entered in to the model,
machine can predict the currency

1. Supervised Learning

Such a model where labeled data is used for
learning is called **Supervised Learning**.

- Lets say there are 2 friends

- One friend gives 1 million coins (10 Lakhs) to the another of 3 different currencies.

Currencies	Weights
• One Rupee	4 Grams
• One Dollar	9 Grams
• One Pound	3 Grams

So, on the basis of weights Machine can predict the
currency of the coin.

Weights = Feature

Currency = Label

When data is fed to the machine it learns that
which feature is associated with which label.

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1. Supervised Learning

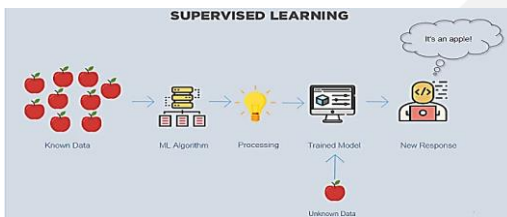
- In **supervised learning**, we use **known or labeled data** for the training data.
- Since the **data is known**, the learning is, **therefore, supervised**, i.e., directed into successful execution.
- The **input data** goes through the Machine Learning algorithm and is used to **train the model**.
- Once the **model is trained** based on the known data, you can **use unknown data** into the model and get a **new response**.

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1. Supervised Learning



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Algorithms used for Supervised Learning

- Polynomial regression
- Random forest
- Linear regression
- Logistic regression
- Decision trees
- K-nearest neighbors
- Naive Bayes

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2. Unsupervised Learning

- Lets say we have a cricket dataset of various players with the respective scores and wickets taken.
- This data is feed into the ML model.
- Machine identifies the performance of players.
- It plots a graph with x axis and y axis.

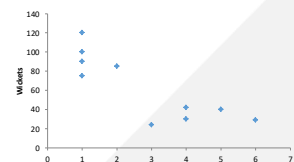
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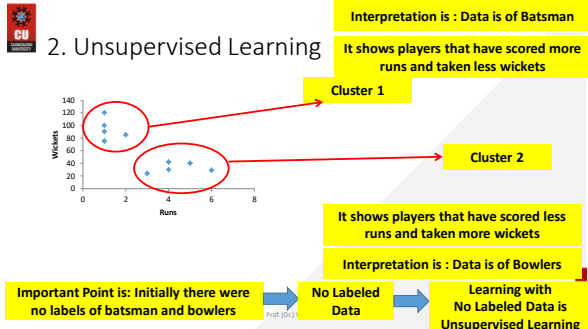
2. Unsupervised Learning

Wickets	Runs
1	100
1	90
2	85
1	75
1	120
4	30
5	40
3	24
6	29
4	42



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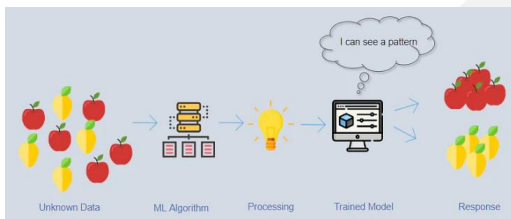
2. Unsupervised Learning

- In unsupervised learning, the **training data is unknown and unlabeled** - meaning that no one has looked at the data before.
- Without the aspect of known data, **the input cannot be guided to the algorithm**, which is where the unsupervised term originates from.
- This **data is fed** to the Machine Learning algorithm and is used **to train the model**.
- The **trained model tries to search for a pattern and give the desired response**.

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2. Unsupervised Learning



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3. Semi-Supervised Learning

- In this learning is obtained both from the supervised learning and unsupervised learning.



ML Researchers → use Labeled data + Unlabeled data in conjunction → it improves learning accuracy

Algorithms used for Unsupervised Learning

- Partial least squares
- Fuzzy means
- Singular value decomposition
- K-means clustering
- Apriori
- Hierarchical clustering
- Principal component analysis

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4. Reinforcement Learning

- Let's say we have an image of a dog.
- Image is fed into the model.
- Model task is to identify that it is a dog.
- If model identifies it to be a dog then a positive response is there.
- If model identifies it to be a cat then a negative response is there.

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4. Reinforcement Learning

- Now machine learns from the feedback.
- If any other image of dog comes at a later time then the model will be able to classify it correctly.

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4. Reinforcement Learning

- Reinforcement Learning is a **feedback-based** Machine learning technique.
- In Reinforcement Learning an **agent learns to behave in an environment by performing the actions and seeing the results of actions.**
- For each **good action**, the agent gets **positive feedback**, and for each **bad action**, the agent gets **negative feedback** or penalty.

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4. Reinforcement Learning

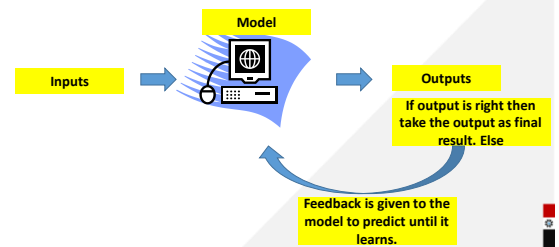
- In Reinforcement Learning, the **agent learns automatically using feedbacks** without any labeled data, unlike supervised learning.
- Since there is **no labeled data**, so **the agent is bound to learn by its experience only.**
- Like traditional types of data analysis, here, the **algorithm discovers data through a process of trial and error** and then decides what action results in higher rewards.

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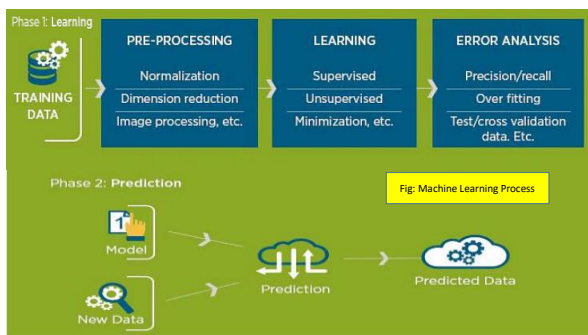


Generalized Machine Learning Model



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Task: Scenario-1

- Facebook recognizes your friend in a picture from an album of tagged photographs.
- Decide that it is Supervised/Unsupervised/ Reinforcement Learning and support your answer with a suitable reason (BT-Level5)

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Task: Scenario-2

- Netflix recommends a new movie based on the past movie choices.
- Decide that it is Supervised/Unsupervised/ Reinforcement Learning and support your answer with a suitable reason (BT-Level5)

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Task: Scenario-3

- Analyzing bank data for suspicious transactions and flagging fraud transactions.
- Decide that it is Supervised/Unsupervised/ Reinforcement Learning and support your answer with a suitable reason (BT-Level5)

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Summary

- Introduction
- Types of Machine Learning
- Examples
- Machine Learning Process

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REFERENCES

- <https://www.javatpoint.com/machine-learning>
- https://www.tutorialspoint.com/machine_learning/index.htm
- https://www.simplilearn.com/tutorials/machine-learning-tutorial/what-is-machine-learning?source=sl_frs_nav_playlist_video_clicked

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THANK YOU

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