INFORMATICS INSTITUTE OF TECHNOLOGY

DEPARTMENT OF COMPUTING

Trends in Computer Science
4COSC008C

MACHINE LEARNING

Overview of Machine Learning.

Describe and compare two different machine learning techniques.

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INTRODUCTION

"Machine learning is the branch of computer science that utilizes previous experiences to learn from and use its knowledge to make future decisions." (Pratap Dangeti,2017, p08)

Machine Learning is a fast-growing technology that enables application in every sphere of life, enabling improvement of performance that accelerates the quality of future programs from Spotify suggestion to Weather prediction to Stock market and even Detecting malicious Cancerous cells else remain silent.

This subfield focuses on building algorithms to obtain mathematical models that fit the input data,

Finding a relation between input and output despite system dynamics that are difficult or impossible to represent in a wide variety of applications.

Therefore, Machine Learning with an approximation of data interference of the sample creates the most relevant, efficient, and useful algorithms.

This report will be focusing on a foundational understanding of machine learning techniques and applicational real-world examples in approaching machine learning techniques.

THE STRUCTURE OF DIFFERENT MACHINE LEARNING TECHNIQUES

Machine learning has become a crucial sector, due to computers' ability to self-learn without a requirement for intensive programming. Computers now have the ability to learn, improve and advance on their own at a higher phase than even humans! They can perform calculations and process information with higher accuracy, and greater speed, effortlessly and efficiently even with very large quantities of data.

Machine learning further helps the designer anticipate all possible solutions for the same type of problems. (i.e. if a robot is programmed to navigate mazes, it must have the ability to learn the layout of each maze and navigate through it.). This further has the ability to predict and adopt changes in conditions, that the designer cannot foresee (e.g., prediction of stock market changes). But unlike animals, computers learn face or voice pattern algorithms. This is a huge challenge for programmers to help computers identify these algorithms.

It can be concluded that machine learning is a process, where a statistical modal is built based on gathered datasets and algorithms, which focuses on solving practical problems. (Vishal et. al,2021)

Therefore, choosing the right algorithm is a critical factor in predicting the future. There are Four categories of machine learning algorithms:

- Supervised
- Unsupervised
- Semi-supervised
- Reinforcement

Types of Machine Learning Techniques:

This can be categorized into three distinct types:

1.   Supervised learning:

This learning mode enables one to learn from past information, about the task that the machine has to execute. Here past information is similar to gaining experience. Supervised learning comes with a description. This is a predictive learning method.

Further classified into two sections:

1. Classification: The output variable is a category.
2. Regression: Output is a real value.

    (Vishal et. al,2021)

Labelled training Data	⇨	Labelled Training Data	⇨	Predictive Model	⇨	Test Data
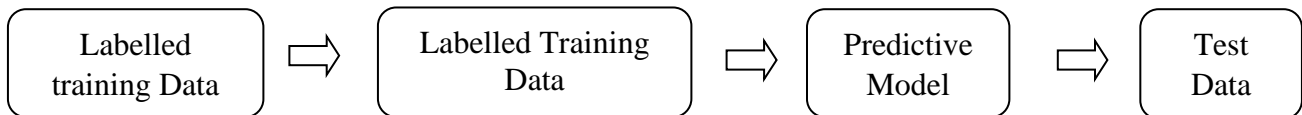
2.   Unsupervised Learning:

This is a descriptive learning method Where a machine recognizes patterns in an unknown object by grouping similar objects since there is no labeled training data to learn from nor a prediction to be made. The objective of this algorithm is to find Natural grouping or patterns within data elements or records. Achieving based on pattern discovery or knowledge discovery. Widely used to detect anomalies and outliers in an optimum way. Further divided into:

1. Clustering: Grouping based on factors.
2. Association: Rule algorithm, goal is to find new rules by evaluating previous ones.

    (Vishal et. al,2021)

Unlabeled Data	⇨	Using Unsupervised Learning Model	⇨	Data Patterns
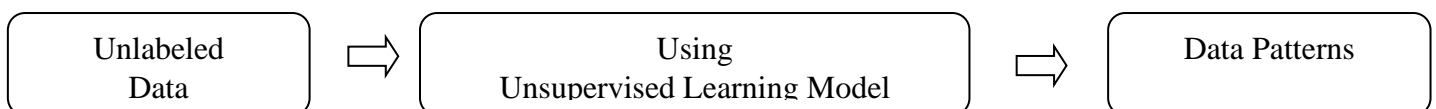
3.   Reinforcement Learning:

Sequential decisions are to be made rather than one-shot decision-making, by mincing how humans learn by interacting with the environment. (Pratap Dangeti,2017).
This is made possible by learning from a series of reinforcements, Giving rewards or punishment. (Stuart J,2016).

However, the most commonly used types are Supervised and Unsupervised Learning.

COMPARISON OF MACHINE LEARNING TECHNIQUES

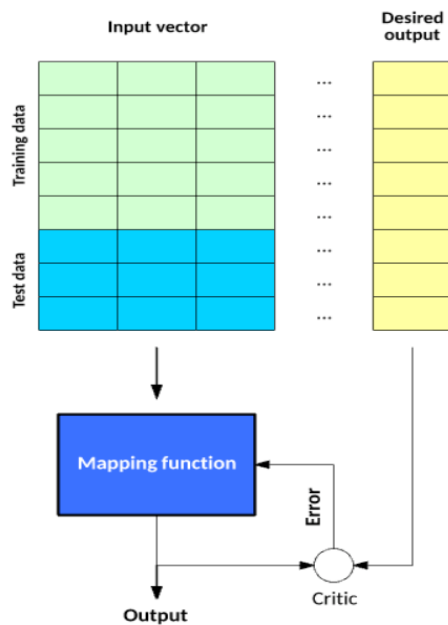|	Supervised	Unsupervised
	This type of learning is used when you know how to clarify a given data, Dataset is a collection of labeled examples.	Used when there is no idea about the class or label in a particular data. This model will have to find the pattern in the data.
	Human annotation is involved. (Hui,2021). Superior or a teacher.	Discovers information by itself.
	Learning is a collection of pairs, Gather information and generate output data from the previous one, only using experience helping efficiency parameters.	The model takes a feature vector as an input then it is transformed into another vector or value, used to solve a practical problem.
	The algorithm is based on labeled training data and allows the evaluation of possible outcomes of unpredicted data. (Subramanian et al., 2022).	Algorithm focus on performing processing tasks that are rather more complex than supervised learning.
	Additionally, the data scientist must redesign the model to ensure the observation provided remain true before changing their data.	Collecting unlabeled data from a computer is simpler and faster than Labeled data involving manual intervention. (Andriy,2019).
	Has a feedback mechanism	No feedback

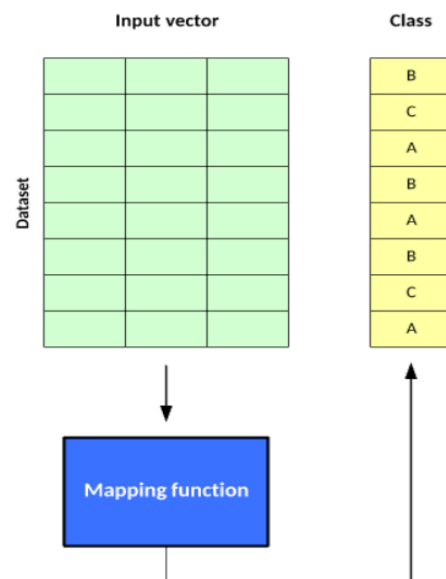*Figure 1: Supervised Learning.*

Figure 1:Unsupervised Learning.

APPLICATIONS OF MACHINE LEARNING TECHNIQUES

"AI isn't just creating new kinds of art; it's creating new kinds of artists. We want to extend, not replace, the creative process" (Doug Eck, no date)

Doung Euk is a principal Research scientist at Google research and a Director on Brain Team.

"Wherever there is a substantial amount of past data, machine learning can be used to generate actionable insight from the data." (Raghav et al., 2016).

Supervised

The process of training a predictive model is known as supervised learning (Raghav et al., 2016).

This is the most frequent type of machine learning used in practice.

1. Handwriting Recognition.
2. Stock market predictions.
3. Disease prediction.
4. Fraud detection.

(Subramanian et al., 2022).

Unsupervised

This is a descriptive model used for grouping similar objects.

1. Market Basket analysis.
2. Recommender Systems.
3. Customer Segmentation.

(Subramanian et al., 2022).

Conclusion

In this era of computational intelligence, Machine Learning has become one of the most promising tools to unlock training challenges and think beyond current limitations, helping to explore and construct algorithms that can learn with no or little human involvement from available inputs.

This input training data represents experience to produce the best algorithm solutions to enhance the performance of that particular task exceptionally accurately and dependably in various dimensions.

The evolution of machine learning has opened up; Applications with Implementations of Machine Learning Techniques provide innovative insights into every possible sector with better decisions and smart actions.

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