Artificial Intelligence

Dr. Tran Quang Huy

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OUTLINE

Chapter 1: Overview of AI

Chapter 2: Artificial Neural Networks

Chapter 3: Searching, Knowledge, Reasoning, Planning

Chapter 4: Machine learning

W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
L	L	L	L	E	L	L	L	P	P

L: Lesson; E: Essay; P: Project

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OBJECTIVES

- Kiến thức: Sinh viên được cung cấp các kiến thức nền tảng nhập môn trí tuệ nhân tạo như: các phương pháp tìm kiếm, các phương pháp biểu diễn vấn đề, các phương pháp biểu diễn tri thức, các phương pháp lập luận không chắc chắn, các phương pháp suy diễn tự động. Hiểu được các khái niệm, nguyên lý và giải thuật cơ bản làm cho máy tính tự học.
- Kỹ năng: Dựa vào các kiến thức đã học, sinh viên có đủ kỹ năng để giải quyết các bài toán thực tế, biết cách đưa ra các biểu diễn thích hợp cho từng vấn đề cụ thể, cách biểu diễn tri thức, đề xuất các phương pháp tìm kiếm và lập luận thích hợp. Tự hiện thực được một số hệ thống thông minh đơn giản.
- Năng lực tự chủ và trách nhiệm: Sinh viên tự phát huy ý tưởng sáng tạo, hoàn thành các bài tập và áp dụng kiến thức đã học để giải quyết một số bài toán cụ thể, chủ động nghiên cứu, thảo luận và thường xuyên cập nhật các kiến thức mới.

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REFERENCES

Main reference:	• Stuart Russell & Peter Norvig, Artificial Intelligence - A Modern Approach, Prentice Hall, 3rd edition, 2009.
Additional reference	• Wolfgang Ertel, Introduction to Artificial Intelligence, Second Edition, Springer, 2017.

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Evaluation Methods

	Details	Percentage
Process	- Diligence - In-class test	20%
Mid-term	- Practice	30%
Final	- Project	50%

PROJECT: HOW TO DO?

- Number of groups: 16 (2 students per group)
- Task: optional
- Duration: From week 01 to week 10
- Outcome: 01 report and simulation/real test

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L	L	L	L	E	L	L	L	P	P

L: Lesson; E: Essay; P: Project

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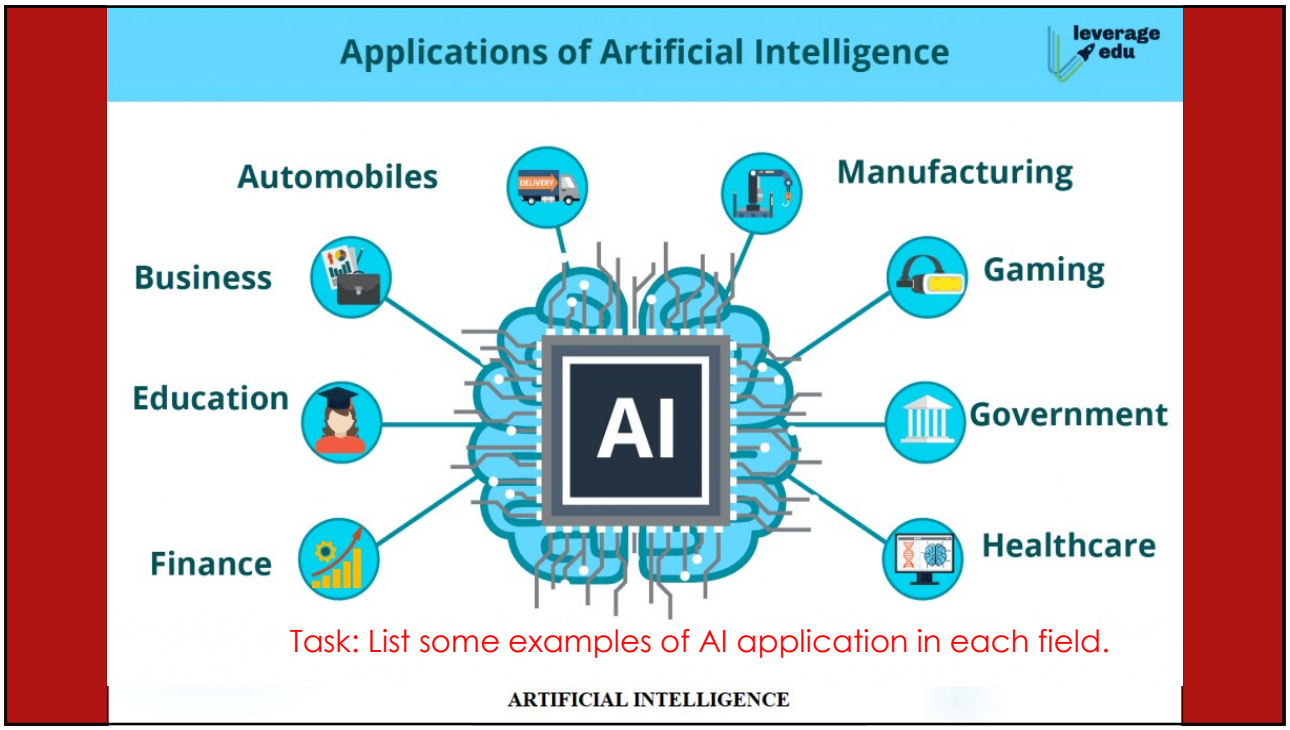
OUTLINE

How to present your project?

- Two groups choose a similar topic and present at the same time
- Content: no limited in AI field
- Presentation time: 15 minutes/group
- Language: English
- Score: Lecturer 50% and Classmate 50%


Applications of Artificial Intelligence
leverage edu
Automobiles
Manufacturing
Business
Gaming
Education
Government
Finance
Healthcare
AI
Task: List some examples of AI application in each field.
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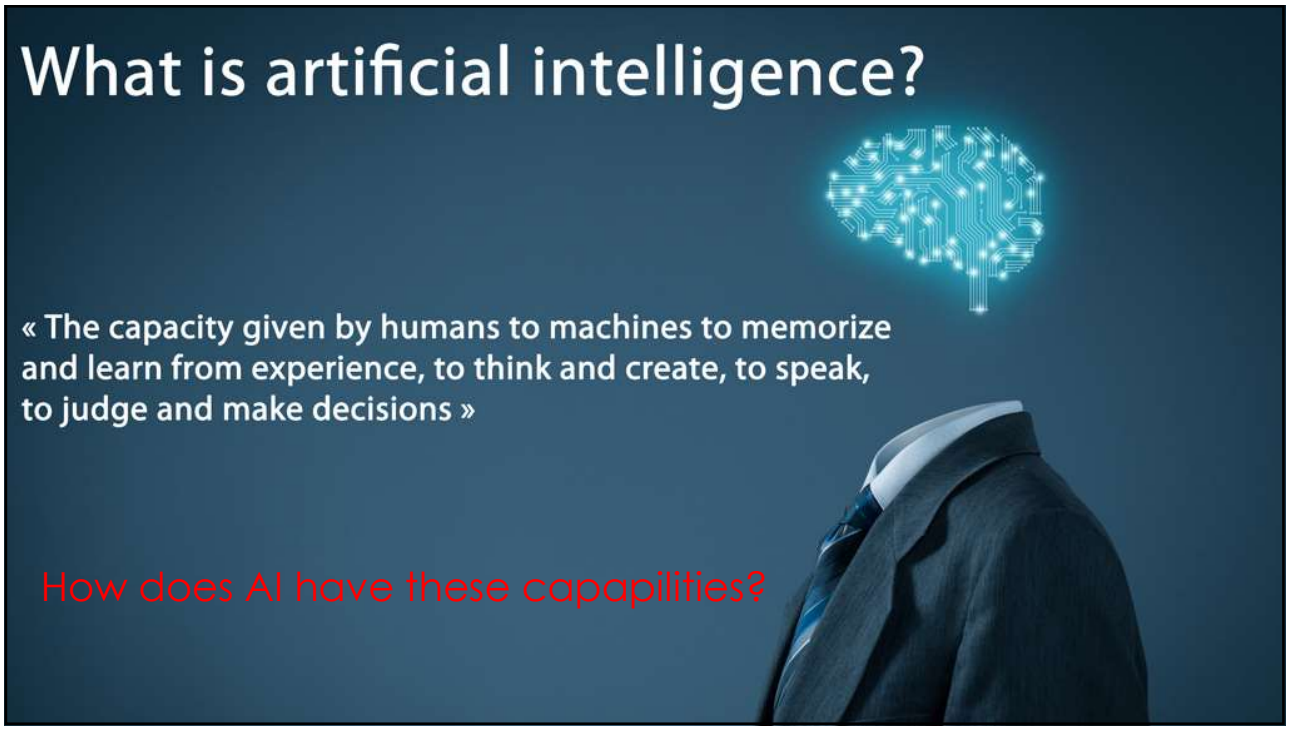
What is artificial intelligence?
« The capacity given by humans to machines to memorize and learn from experience, to think and create, to speak, to judge and make decisions »
How does AI have these capapilities?

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AI definition

- "At the heart of the matter, Artificial Intelligence is the advanced computer, which is aimed at answering affirmatively to the question. It tries to reproduce or simulate the intellect of humans on computers."

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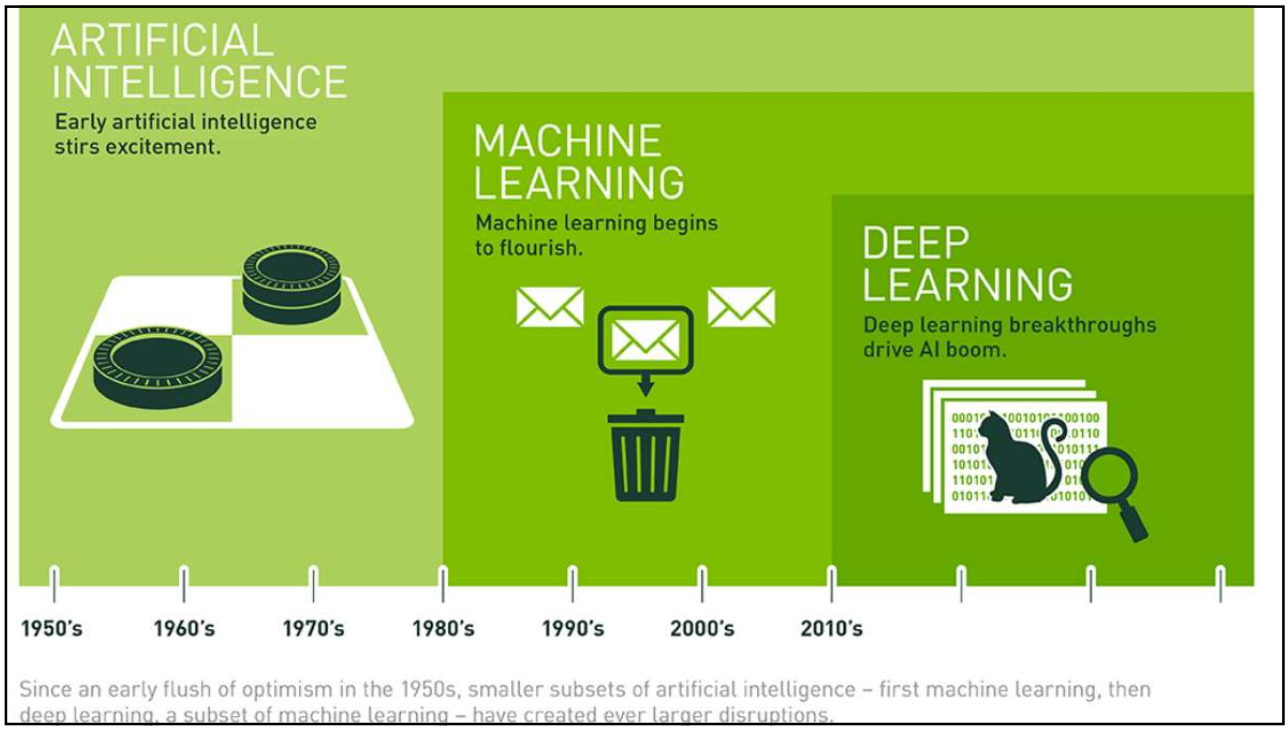
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Early artificial intelligence stirs excitement.
MACHINE LEARNING
Machine learning begins to flourish.
DEEP LEARNING
Deep learning breakthroughs drive AI boom.
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

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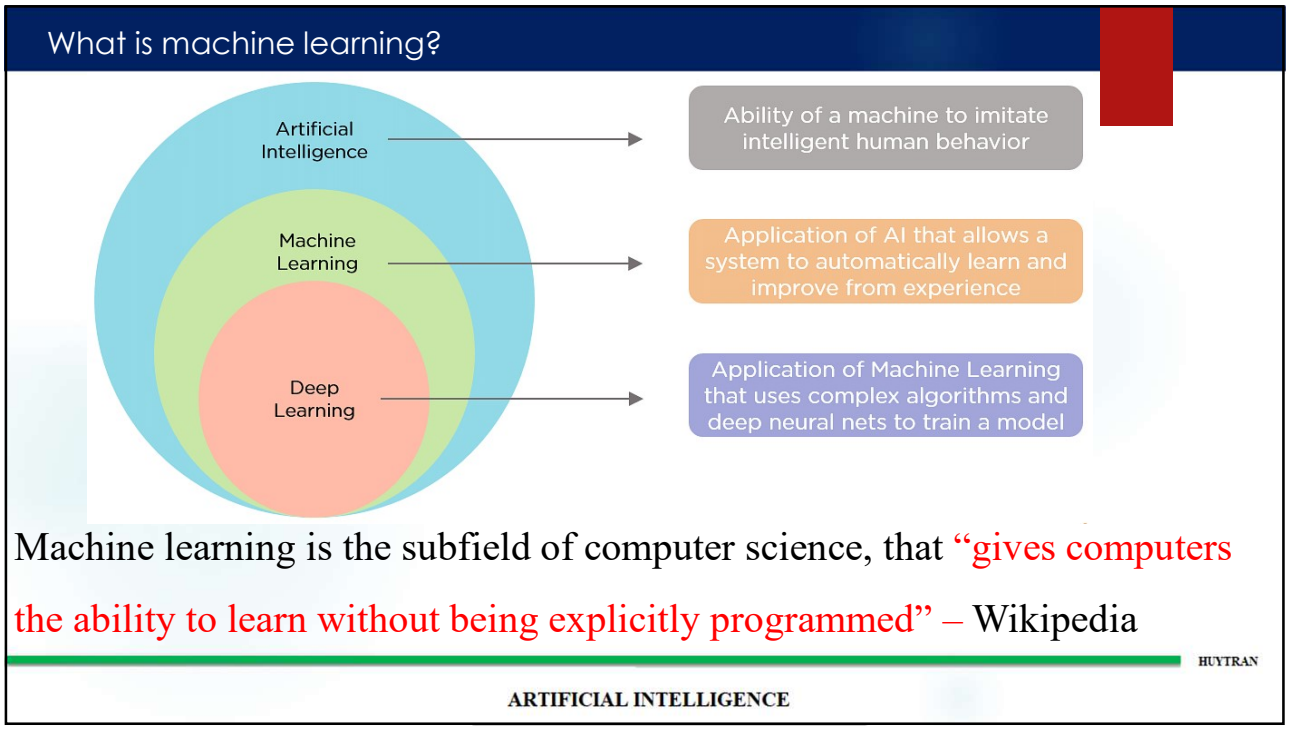
What is machine learning?
Artificial Intelligence
Machine Learning
Deep Learning
Ability of a machine to imitate intelligent human behavior
Application of AI that allows a system to automatically learn and improve from experience
Application of Machine Learning that uses complex algorithms and deep neural nets to train a model
Machine learning is the subfield of computer science, that "gives computers the ability to learn without being explicitly programmed" – Wikipedia
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ChatGPT (Chat Generative Pre-trained Transformer[2]) is a chatbot developed by OpenAI and launched in November 2022. It is built on top of OpenAI's GPT-3 family of large language models and has been fine-tuned (an approach to transfer learning) using both supervised and reinforcement learning techniques.
ChatGPT was launched as a prototype on November 30, 2022, and quickly garnered attention for its detailed responses and articulate answers across many domains of knowledge. Its uneven factual accuracy, however, was identified as a significant drawback.[3] Following the release of ChatGPT, OpenAI's valuation was estimated at US$29 billion.[4]

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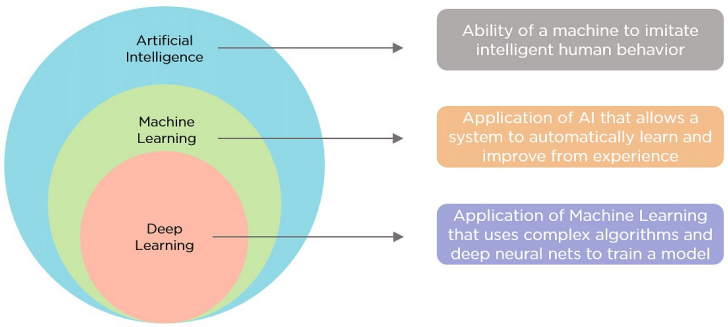
What is deep learning?

Deep learning is a class of machine learning algorithms that uses multiple layers to progressively extract higher-level features from the raw input. For example, in image processing, lower layers may identify edges, while higher layers may identify the concepts relevant to a human such as digits or letters or face – Wikipedia



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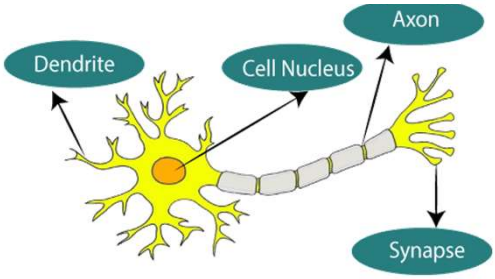
Understand artificial neural networks with biological analogy?

Biological neural networks establish the structure of the human brain, and the phrase "Artificial Neural Network" is taken from them. Artificial neural networks, like the human brain, have neurons that are coupled to one another in various layers of the networks. Nodes are the name for these neurons.



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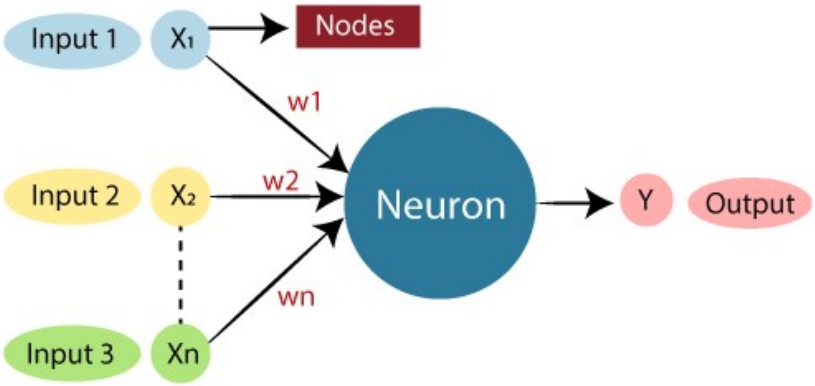
The diagram seen here is a typical Biological Neural Network diagram.

The standard Artificial Neural Network resembles the illustration below.



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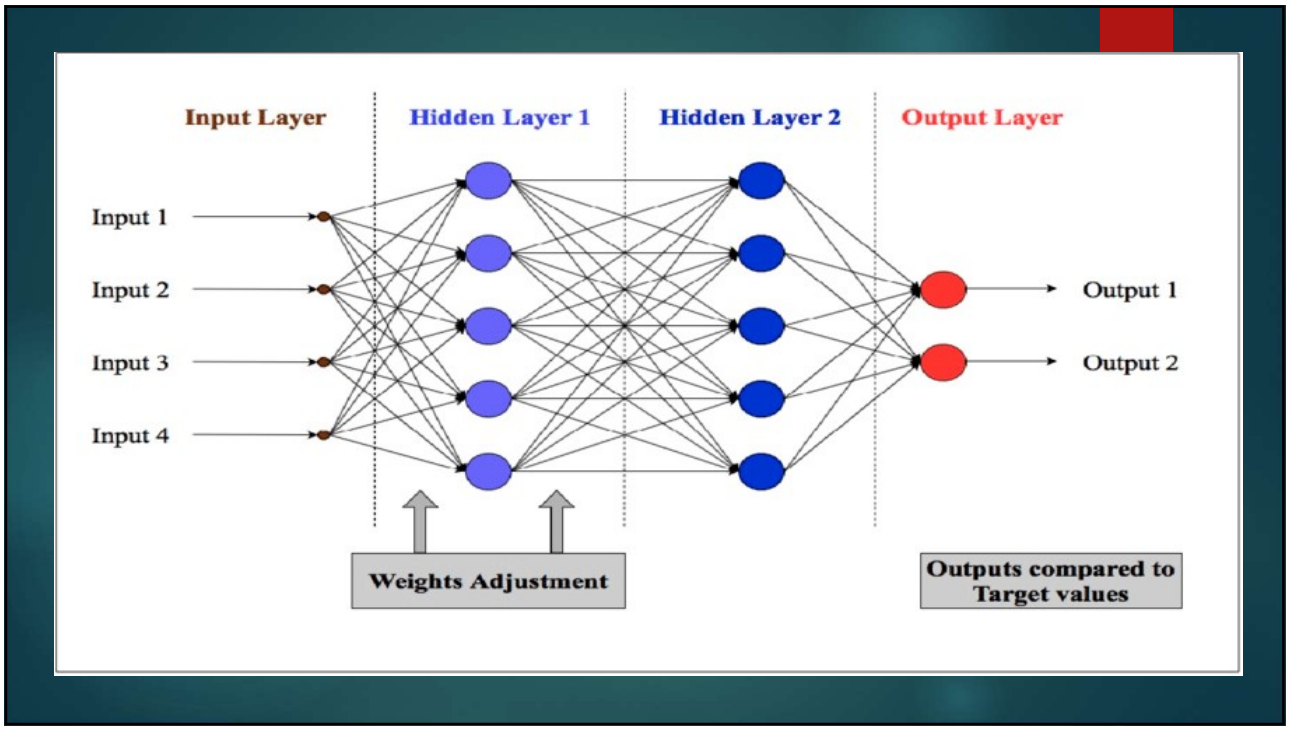

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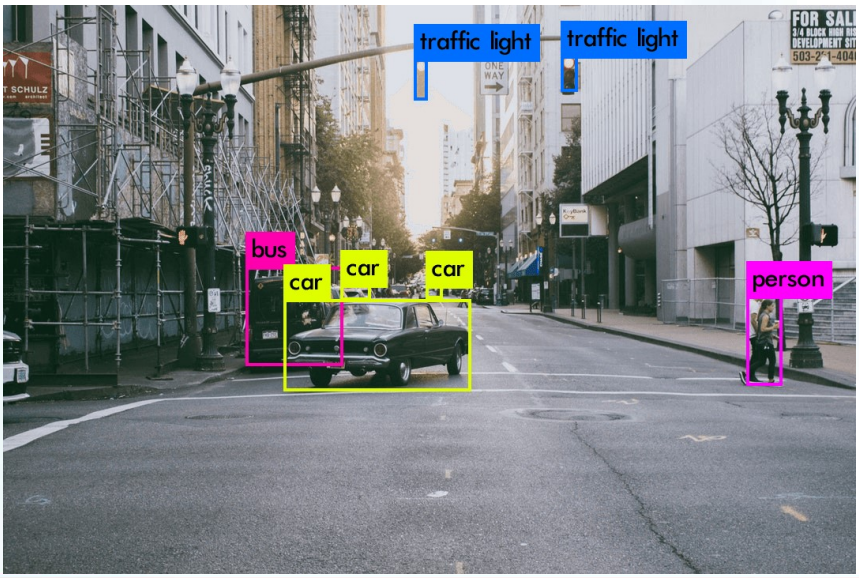
EXAMPLE



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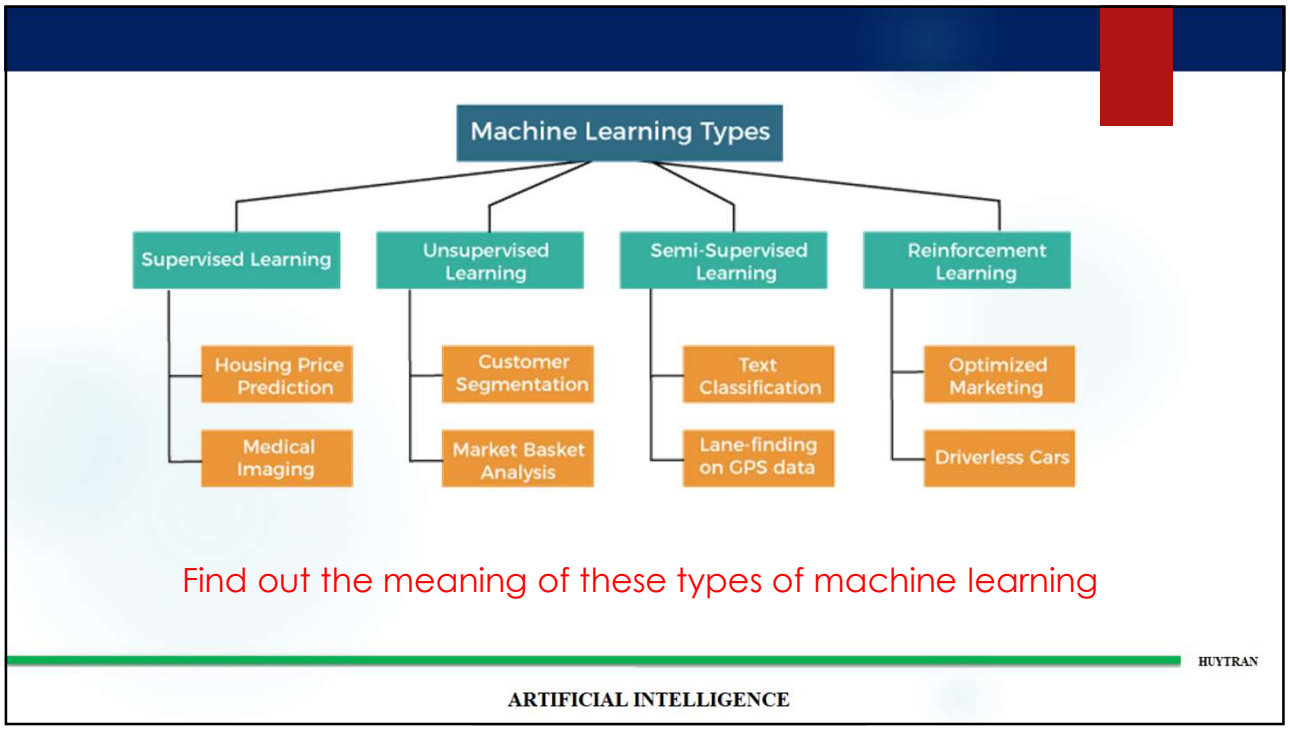
Machine Learning Types
Supervised Learning
Unsupervised Learning
Semi-Supervised Learning
Reinforcement Learning
Housing Price Prediction
Medical Imaging
Customer Segmentation
Market Basket Analysis
Text Classification
Lane-finding on GPS data
Optimized Marketing
Driverless Cars
Find out the meaning of these types of machine learning
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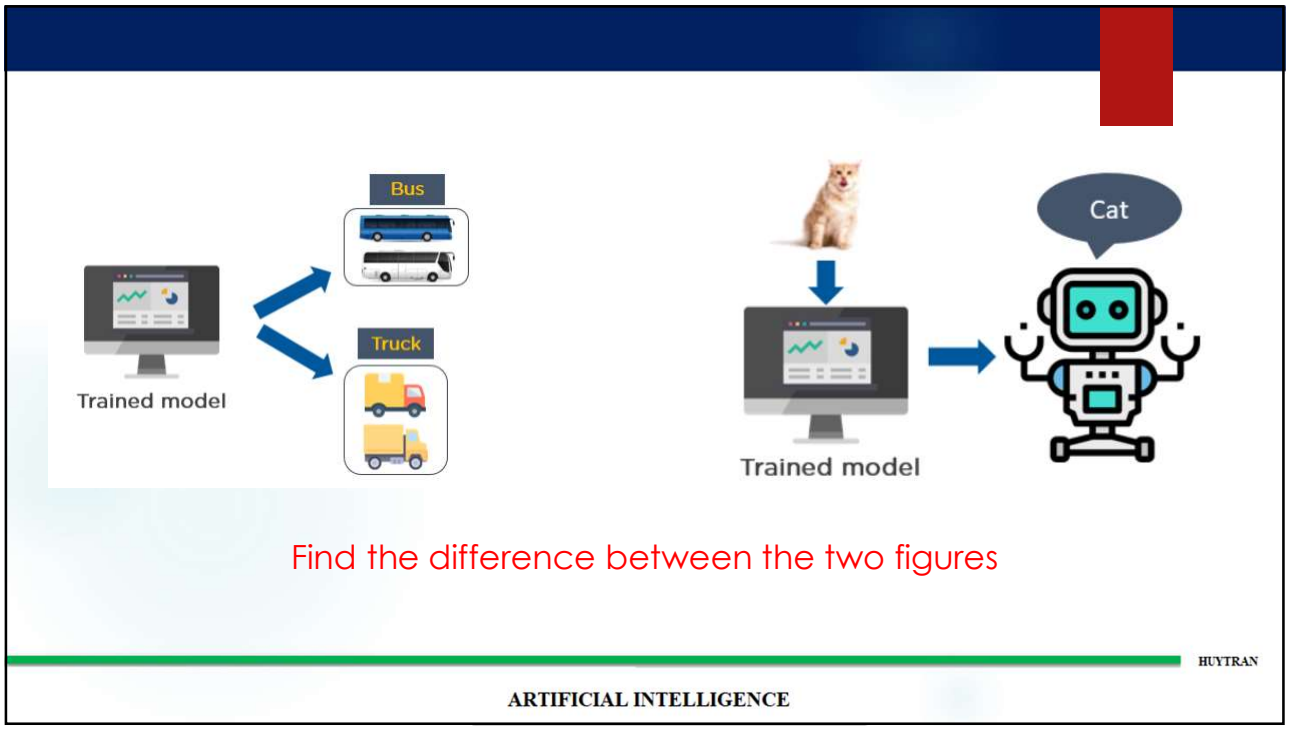
Bus
Truck
Trained model
Cat
Trained model
Find the difference between the two figures
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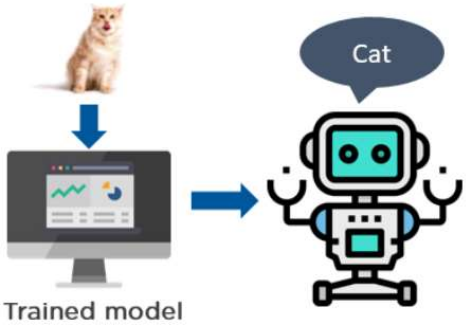
Supervised learning is a type of machine learning that uses labeled data to train machine learning models. In labeled data, the output is already known. The model just needs to map the inputs to the respective outputs.



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Some of the most popularly used supervised learning algorithms are:

- Linear Regression
- Logistic Regression
- Support Vector Machine
- K Nearest Neighbor
- Decision Tree
- Random Forest
- Naive Bayes

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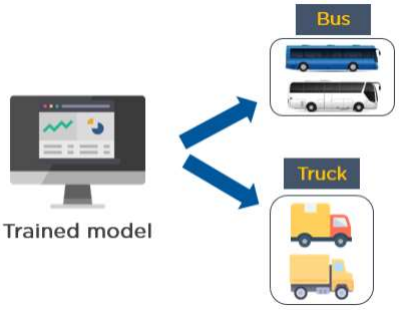
Unsupervised learning is a type of machine learning that uses unlabeled data to train machines. Unlabeled data doesn't have a fixed output variable. The model learns from the data, discovers the patterns and features in the data, and returns the output.



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Algorithms:

Selecting the right algorithm depends on the type of problem you are trying to solve. Some of the common examples of unsupervised learning are:

- K Means Clusterin
- Hierarchical Clustering
- DBSCAN
- Principal Component Analysis

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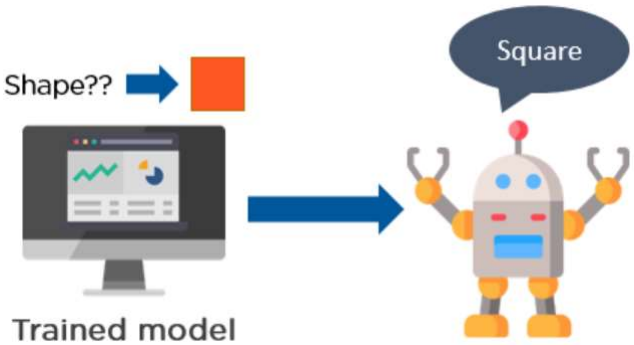
Reinforcement Learning trains a machine to take suitable actions and maximize its rewards in a particular situation. It uses an agent and an environment to produce actions and rewards. The agent has a start and an end state. But, there might be different paths for reaching the end state, like a maze. In this learning technique, there is no predefined target variable.



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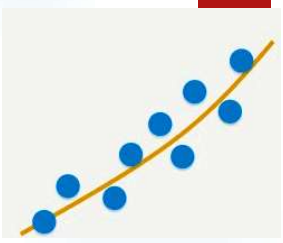
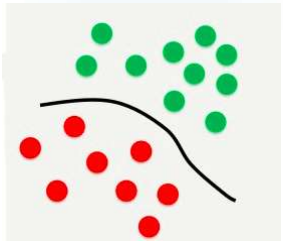
Regression vs. Classification in Machine Learning

Regression and Classification algorithms are Supervised Learning algorithms. Both the algorithms are used for prediction in Machine learning and work with the labeled datasets. But the difference between both is how they are used for different machine learning problems.

The main difference between Regression and Classification algorithms that Regression algorithms are used to **predict the continuous** values such as price, salary, age, etc. and Classification algorithms are used to **predict/Classify the discrete values** such as Male or Female, True or False, Spam or Not Spam, etc.





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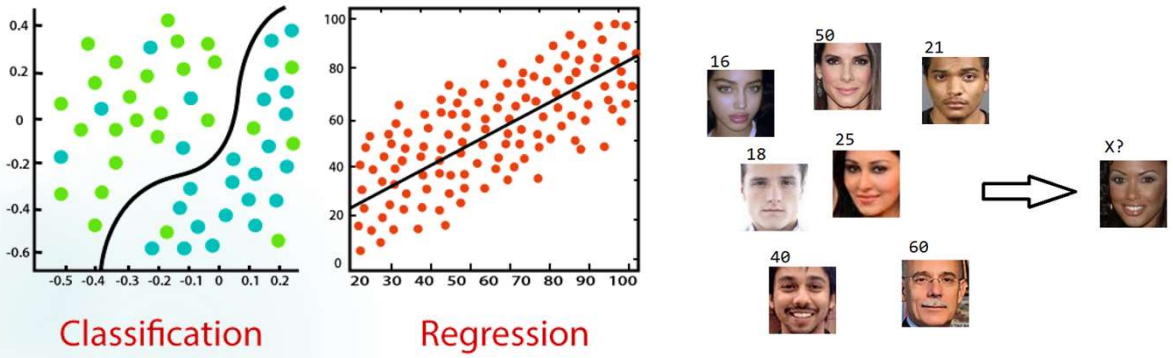
Regression



Quiz

1. What is AI?
2. The relationship among AI, machine learning, and deep learning
3. List main types of machine learning
4. What is semi-supervised learning?
5. The main difference between classification and regression
6. List 03 favorite AI project

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