

MACHINE LEARNING

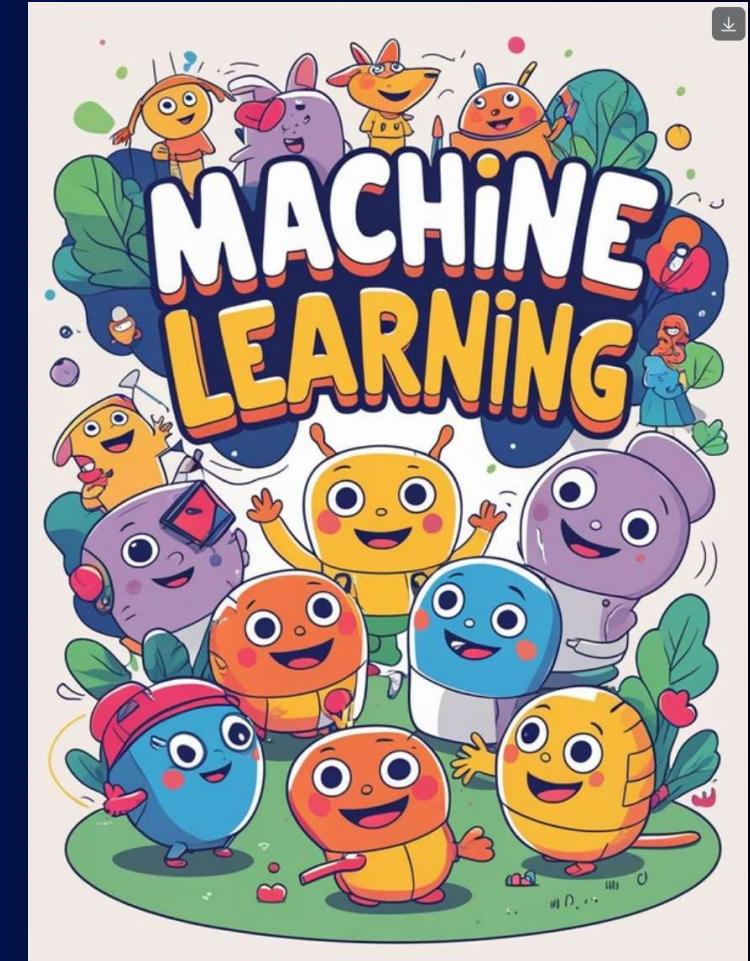


UNLIMITED

Presented by **Asst. Prof. Dr. Tuchsanai Ploysuwan**



WEEK 1



Machine Learning

06048203

Document



Week	Topic
1	Introduction to Machine Learning
2	Fundamental and Prompt Engineering
3	Advanced Prompting Techniques
4	AI Agent Programming for Machine Learning
5	AI Agent for Machine Learning
6	Regression & Advance Regression
7	Logistic Regression
8	K-nearest neighbors
9	Support vector machine
10	Naïve Bayes
11	Decision tree
12	Random forest
13-15	Application in Real world

Criteria	Description	Weight
Homework	Assignments to be done individually or in groups various topics in Machine Learning learned in class.	20%
Kaggle Assignments	Kaggle is an online Competition	20%
Final Exam	Performance in exams, assessing theoretical knowledge and problem-solving skills	60%

ลำดับเปอร์เซ็นต์	จำนวนคน (ประมาณ)	คะแนน	ระดับผลลัพธ์
Top 10%	4 คน	100	ยอดเยี่ยม
11–20%	4 คน	95	ดีเยี่ยม
21–40%	8 คน	90	ดีมาก
41–60%	8 คน	85	ดี
61–80%	8 คน	75	พอใช้
Bottom 20%	5 คน	65	ควรปรับปรุง

AI4BA-No1_Exam_2024_2

Thai silk

Overview Data Code Models Discussion Leaderboard Rules Team Submissions Settings

Leaderboard

Raw Data Refresh

Search leaderboard

Public Private

The private leaderboard is calculated with approximately 60% of the test data. This competition has completed. This leaderboard reflects the final standings.

#	Team	Members	Score	Entries	Last	Solution
1	—	66076020-สมศักดิ์	0.9801245	2	3mo	
2	+ 1	66076002-สมศักดิ์	0.8584349	3	3mo	
3	- 1	65076051-ภานุชัย	0.5956180	3	3mo	
4	- 7	66076019-สมศักดิ์	0.5923106	2	3mo	
5	- 10	66076017-สมศักดิ์	0.5770735	4	3mo	
6	- 7	66076021-สมศักดิ์	0.5753778	6	3mo	
7	- 3	66076022-สมศักดิ์	0.5442650	9	3mo	
8	+ 6	APARU	0.5357674	3	3mo	
9	- 2	66076040-รัตน์สิริเมธ์	0.5242341	8	3mo	
10	- 2	66076049-อัจฉริ์ จันทร์	0.5102483	4	3mo	
11	- 6	66076030-ภานุชัย	0.5093011	2	3mo	
12	- 4	65076044-พงษ์	0.4985782	4	3mo	
13	- 4 P		0.4976292	4	3mo	

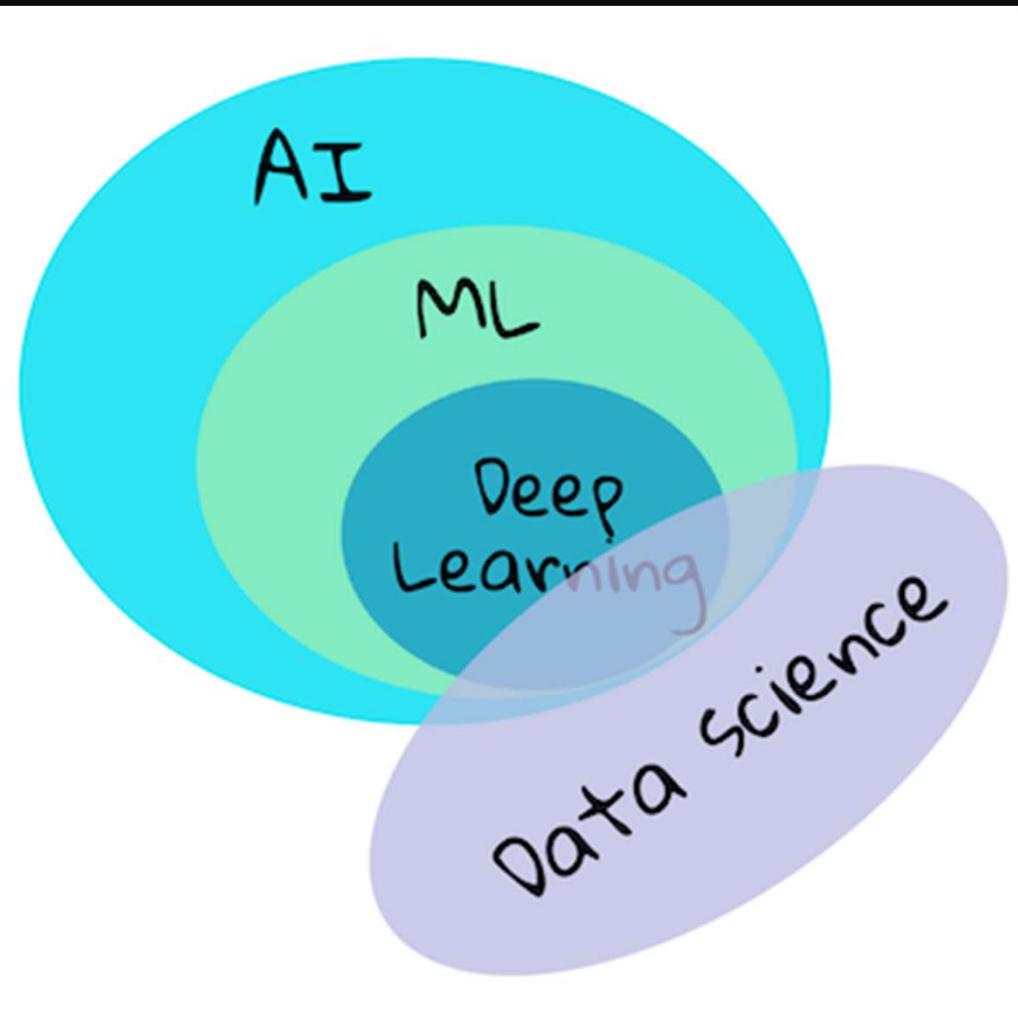
ทุจริต – ปรับตัว

สถาบันเทคโนโลยีพระจอมเกล้าเจ้าคุณทหารลาดกระบัง
ในรายชื่อนักศึกษา แยกตามสาขาวิชา
ภาคการศึกษา 1 มีการศึกษา 2568
คณะทุกคณะ

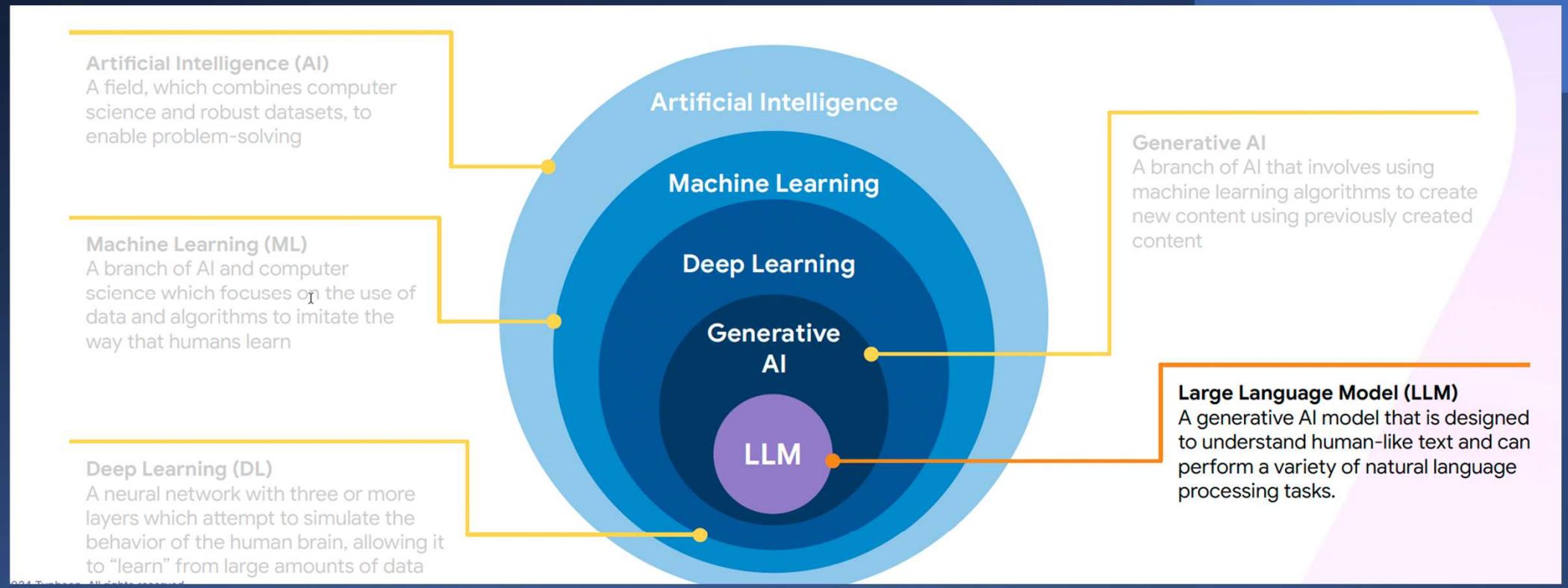
รหัสวิชา 06048203 รายวิชา MACHINE LEARNING หน่วยกิต 3 กลุ่ม รวมทุกกลุ่ม
อาจารย์ผู้สอน พศ. ดร. ทักษิณ พลดอบสุวรรณ

ลำดับที่	รหัส น.ส.	ชื่อ-นามสกุล	หมายเหตุ
1	68076005	นาฎกฤตณ์ กัปเพล	
2	68076006	นานาถ่องพร อกทิกัลกุล	
3	68076009	นางสาวจิรา วารีรักษ์	
4	68076012	นาชนาอิริป ธนาชีริกอปุกุล	
5	68076013	นาชนานัตร เนื้อเทืองวาระ	
6	68076015	นางสาวชาลิตา น้อมบุญเติม	
7	68076022	นายณัฐพง หันสนับ	
8	68076023	นายณัฐพง แพรครี	
9	68076028	นาเดชินท์ เจริญพรธรรม	
10	68076029	นายทองแต่ ศิริกา	
11	68076033	นางธีระทัดต์ เจิมทอง	
12	68076035	นางสาวานันต์ อัลลัง	
13	68076037	นางสาวนันท์ชพร เมลัยนประชา	
14	68076038	นายนิติพัฒน์ นุบูรณ์	
15	68076040	นางสาวนฤมลมาภรณ์ เยี่ยนแกะ	
16	68076043	นาปีย์พนธ์ เป็นวงศ์	
17	68076044	นาปีย์รัตน์ ยศวนayan	
18	68076045	นาโนไปรษ วงศ์ลิน	
19	68076047	นายพัทธดนย์ จันทร์หงส์	
20	68076050	นางสาวแพรว พ้องภาระจ่างครร	
21	68076052	นายภาณุพงศ์ บุกรตี	
22	68076053	นายภาณุวิชญ์ บุญหนัก	
23	68076054	นางวรรษี จุร่องเศช	
24	68076056	นายวิทัศ แสตนเวนท์	
25	68076057	นายธีรบง พลข่าน	
26	68076059	นายศิริกัลย์ สุโถด	
27	68076060	นายศิริกา ศรีชัยไพบูลย์	
28	68076061	นางสาวศิรีลักษณ์ ทองพัด	
29	68076063	นางสาวทกิจารา ศิริเสธ	
30	68076064	นายสมศักดิ์ เมืองมจชา	
31	68076065	นายสรรราชริยุ	
32	68076066	นางสาวสารุดา เนื้อยน้อ	
33	68076069	นายสุทธิวัฒน์ หวังดีเรนาโซค	
34	68076071	นายอธิวัฒน์ ติรสวรรณาภิ	
35	68076072	นายอนุชา เอ็งสูขกุล	
36	68076073	นายอาทิตย์ ลัลโน	
37	68076078	นายฤกุณธ์ ธีรากษ์กลาง	

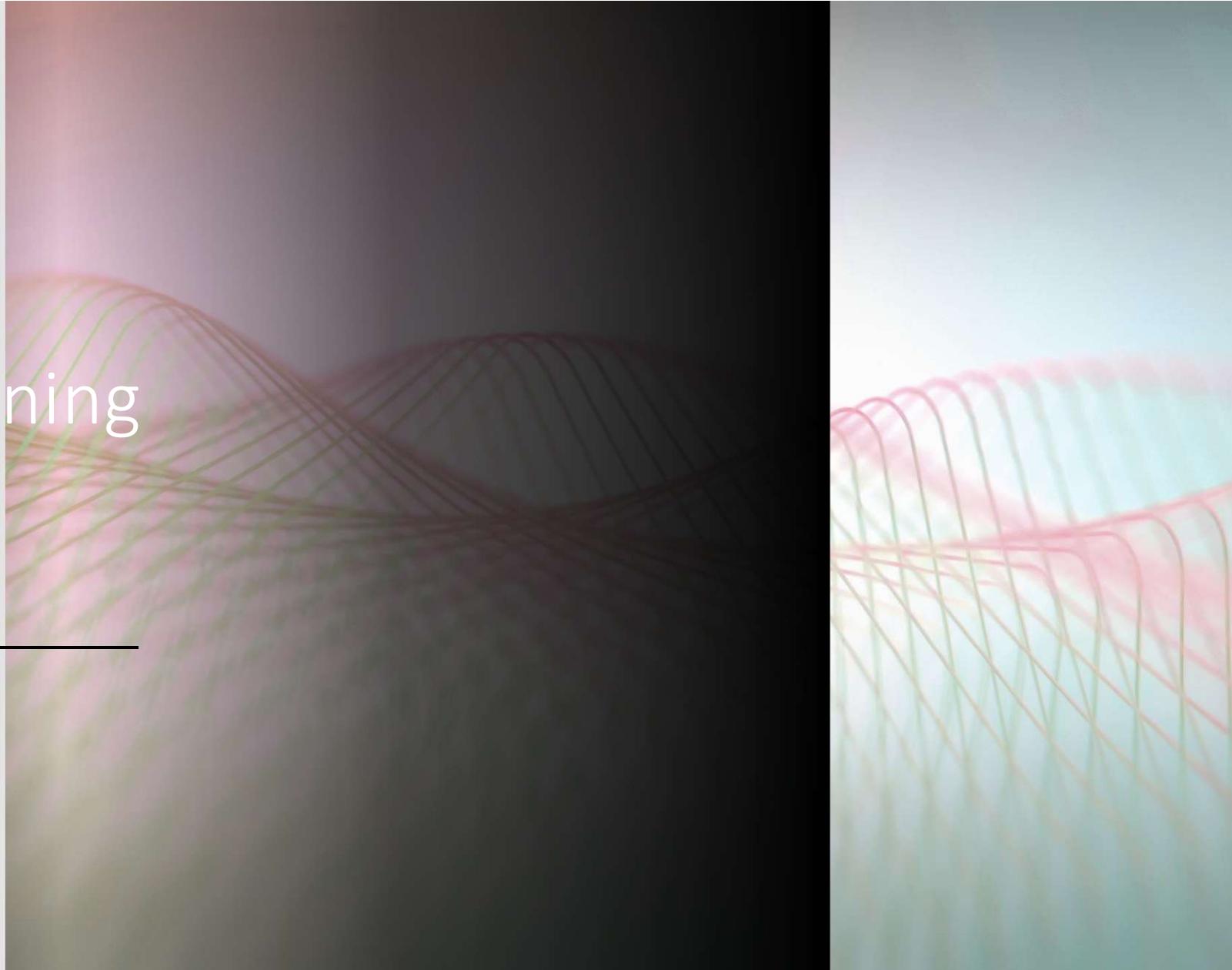
รวมจำนวนนักศึกษาทั้งสิ้น 37 คน



- Artificial Intelligence (AI) is a field focused on creating intelligent systems that can perform tasks requiring human-like intelligence. It encompasses both narrow AI, which is designed for specific tasks, and general AI, which aims to achieve human-level intelligence.
- Machine Learning (ML) is a subset of AI that involves developing algorithms and models that allow computers to learn from data and improve their performance without being explicitly programmed. ML focuses on pattern recognition, prediction, and decision-making based on learned patterns.
- Deep Learning is a specialized branch of ML that utilizes deep neural networks with multiple layers to automatically learn hierarchical representations of data. It excels at tasks involving complex patterns and feature extraction, and often requires substantial computational resources.
- Data Science is an interdisciplinary field that involves extracting knowledge and insights from data using scientific methods, processes, algorithms, and tools. It encompasses various techniques, including AI, ML, and Deep Learning, to analyze and interpret large and complex datasets to solve problems and make informed decisions.



“Why use
machine learning
(or deep
learning)?”



(maybe not very **simple**...)

“If you can build a **simple rule-based** system
that doesn’t require machine learning, do that.”

Good reason:

Why not?

Better reason: For a complex problem, can you think of all the rules?

(probably ^{not})



What deep learning is good for

Problems with long lists of rules—when the traditional approach fails, machine learning/deep learning may help.

Continually changing environments—deep learning can adapt ('learn') to new scenarios.

Discovering insights within large collections of data—can you imagine trying to hand-craft rules for what 101 different kinds of food look like?

What deep learning is not good for



When you need explainability—the patterns learned by a deep learning model are typically uninterpretable by a human.

When the traditional approach is a better option — if you can accomplish what you need with a simple rule-based system.

When errors are unacceptable — since the outputs of deep learning model aren't always predictable.

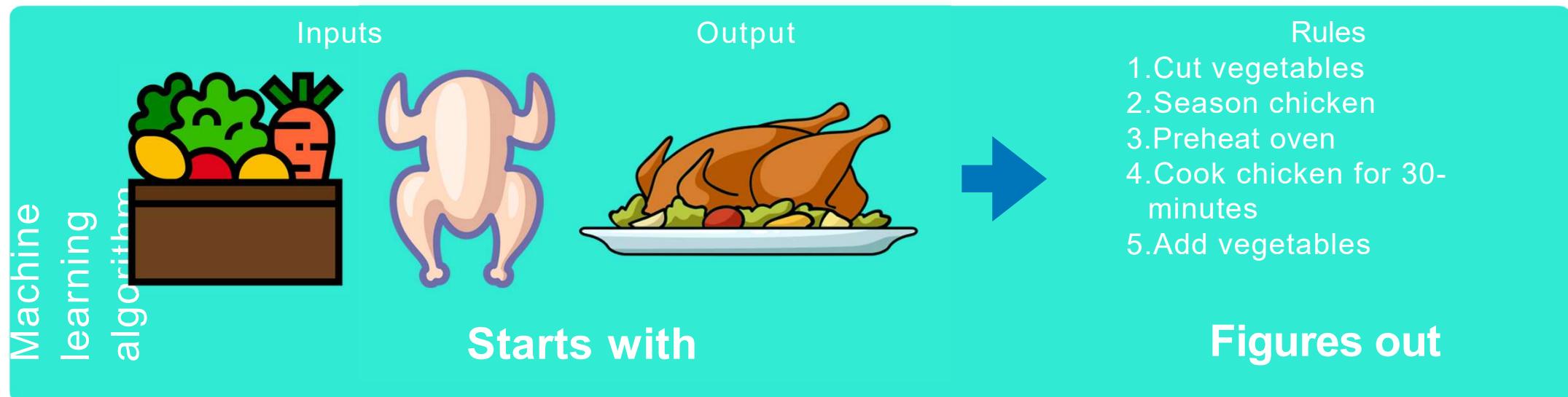
When you don't have much data — deep learning models usually require a fairly large amount of data to produce great results.

(though we'll see how to get great results without huge amounts of data)

Traditional programming

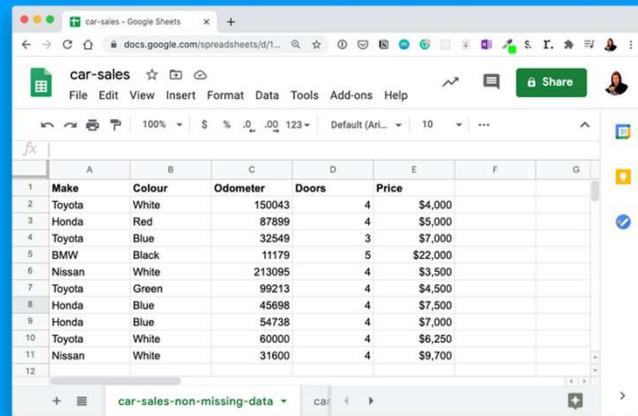


Machine learning algorithm

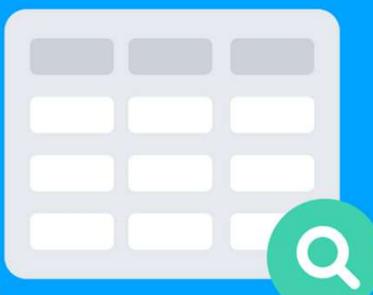


Machine Learning vs. Deep Learning

Machine Learning



Make	Colour	Odometer	Doors	Price
Toyota	White	150043	4	\$4,000
Honda	Red	87899	4	\$5,000
Toyota	Blue	32549	3	\$7,000
BMW	Black	11179	5	\$22,000
Nissan	White	213095	4	\$3,500
Toyota	Green	99213	4	\$4,500
Honda	Blue	45698	4	\$7,500
Honda	Blue	54738	4	\$7,000
Toyota	White	60000	4	\$6,250
Nissan	White	31600	4	\$9,700



Structured data

Algorithm:
gradient
machine

dmlc
XGBoost

Deep Learning



Daniel Bourke @mrdbourke · Nov 1
"How do I learn #machinelearning?"

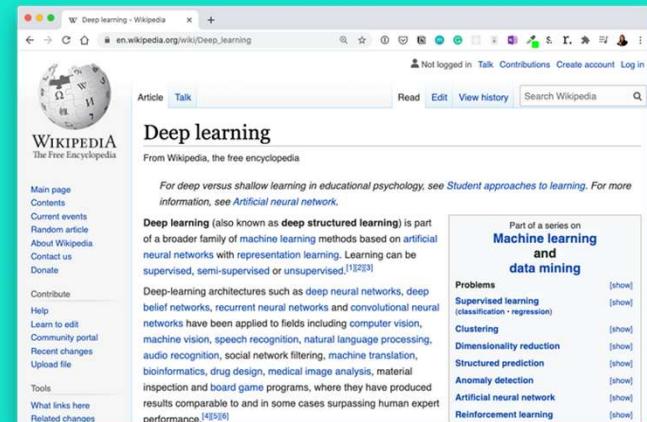
What you want to hear:

1. Learn Python
2. Learn Math/Stats/Probability
3. Learn software engineering
4. Build

What you need to do:

1. Google it
2. Go down the rabbit hole
3. Resurface in 6-9 months and reassess

See you on the other side.



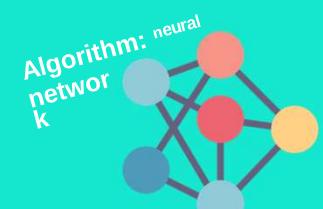
Deep learning

From Wikipedia, the free encyclopedia

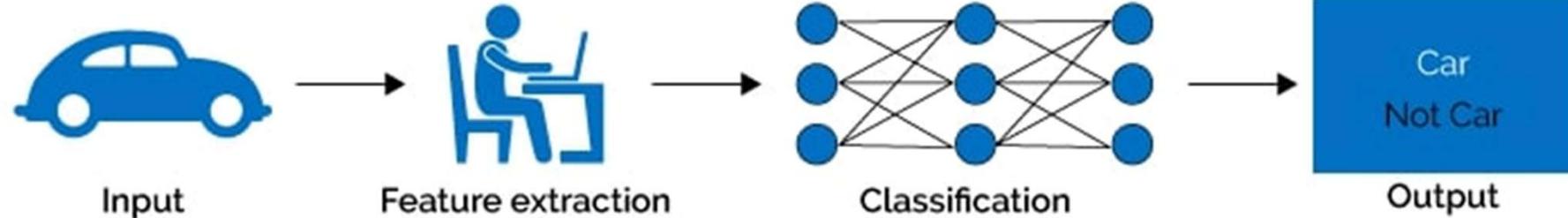
Deep learning (also known as **deep structured learning**) is part of a broader family of machine learning methods based on artificial neural networks with representation learning. Learning can be supervised, semi-supervised or unsupervised.^{[1][2][3]}

Deep-learning architectures such as deep neural networks, deep belief networks, recurrent neural networks and convolutional neural networks have been applied to fields including computer vision, machine vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics, drug design, medical image analysis, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance.^{[4][5][6]}

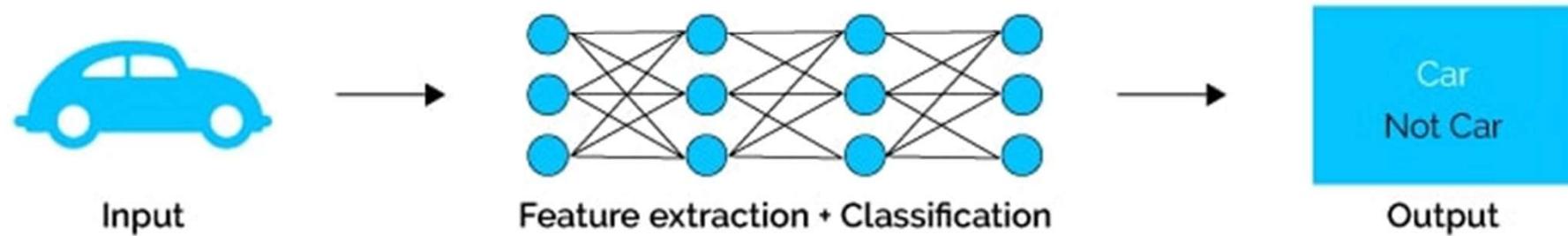
Unstructured data



Machine Learning



Deep Learning



Machine Learning vs. Deep Learning

(common algorithms)

- Random forest
- Gradient boosted models
- Naive Bayes
- Nearest neighbour
- Support vector machine
- ...many more

(since the advent of deep learning these are often referred to as "shallow algorithms")

- Neural networks
- Fully connected neural network
- Convolutional neural network
- Recurrent neural network
- Transformer
- ...many more

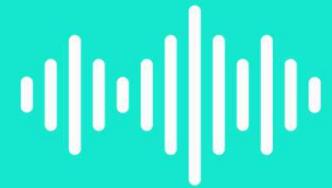
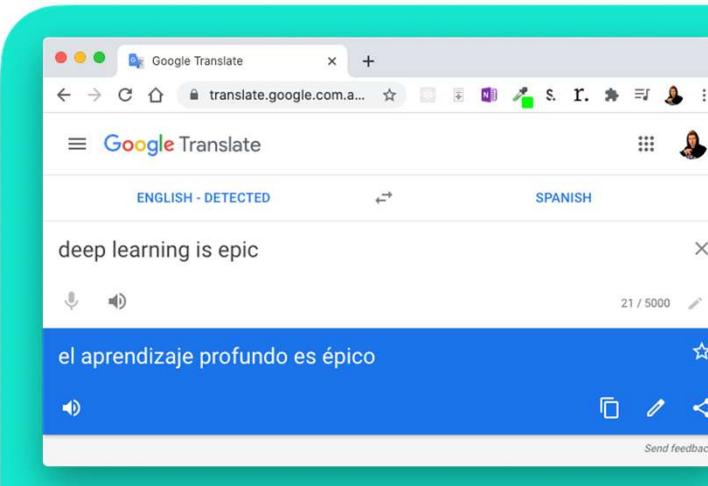
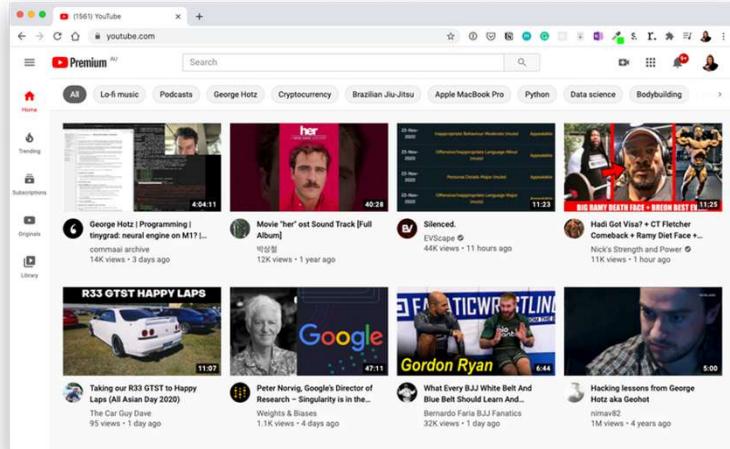
What we're focused on building
(with PyTorch)

(depending how you represent your problem,
many algorithms can be used for both)

Structured data

Unstructured data

Deep Learning Use Cases



"Hey Siri, who's the biggest dog of them all?"

Speech recognition
Sequence to sequence
(Seq2Seq)



Computer
Vision

To: daniel@mrbourke.com
Hey Daniel,

This deep learning course is incredible!
I can't wait to use what I've learned!
Not spam

To: daniel@mrbourke.com
Hay daniel...

Congratulations! U win \$1139239230

Spam

Natural Language Processing
(NLP)

Example of Application of machine learning



To predict the likelihood of disease from a patient's medical history or reports.



To leverage weather data to predict weather events.

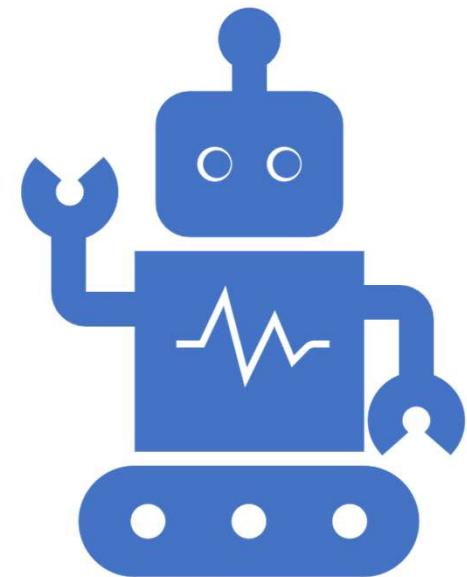


To understand the sentiment of a text.

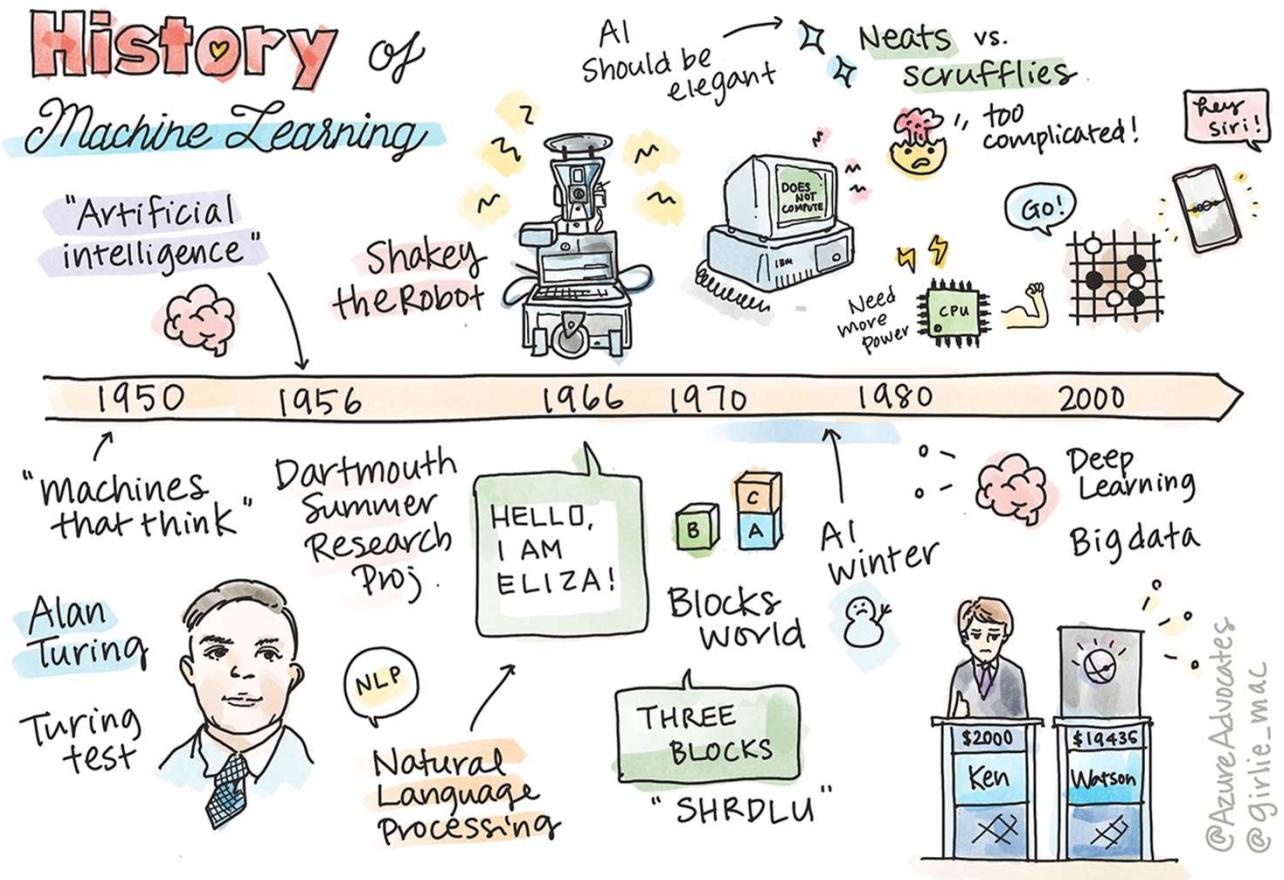


To detect fake news to stop the spread of propaganda.

Finance, economics, earth science, space exploration, biomedical engineering, cognitive science, and even fields in the humanities have adapted machine learning to solve the arduous, data-processing heavy problems of their domain.



History of learning



```
Welcome to
      EEEEEE LL     IIII    ZZZZZZ  AAAAAA
      EE   LL     II     ZZ  AA   AA
      EEEEEE LL     II     ZZZ  AAAAAAA
      EE   LL     II     ZZ  AA   AA
      EEEEEE LLLLLL IIII ZZZZZZ  AA   AA

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?
YOU: Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU: They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU: Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU: He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU: It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```

Eliza, an early 'chatterbot', could converse with people and act as a primitive 'therapist'. You'll learn more about Eliza in the NLP lessons.



Notable discoveries

1950s:

- 1950: Alan Turing proposes the "Turing Test" as a measure of machine intelligence.
- 1956: John McCarthy organizes the Dartmouth Workshop, marking the birth of artificial intelligence (AI) as a field of study.

1960s:

- 1967: The concept of nearest neighbor algorithms is introduced by Evelyn Fix and Joseph Hodges.
- 1969: The "Perceptron" algorithm, a type of artificial neural network, is developed by Frank Rosenblatt.

1970s:

- 1970: The "ID3" algorithm is introduced by J.R. Quinlan, becoming one of the first decision tree learning algorithms.
- 1974: Paul Werbos introduces the concept of backpropagation, a crucial technique for training artificial neural networks.

1980s:

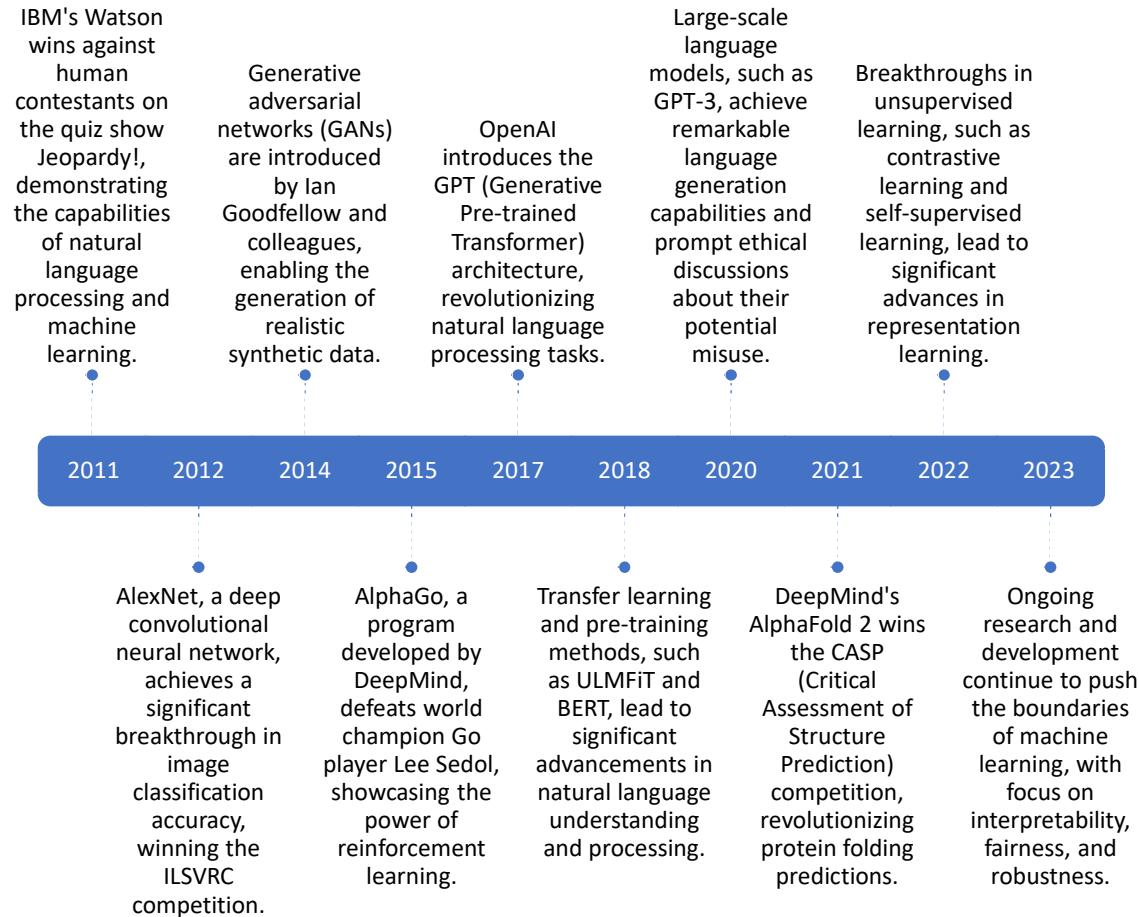
- 1981: Gerald DeJong develops the "Explanation-Based Learning" approach, enabling systems to learn from explicit explanations.
- 1986: Geoffrey Hinton, David Rumelhart, and Ronald Williams demonstrate the practical effectiveness of backpropagation, leading to a resurgence of interest in neural networks.

1990s:

- 1995: Vladimir Vapnik and Alexey Chervonenkis propose the Support Vector Machines (SVM) algorithm for classification tasks.
- 1997: IBM's Deep Blue defeats world chess champion Garry Kasparov, showcasing the power of machine learning in complex games.

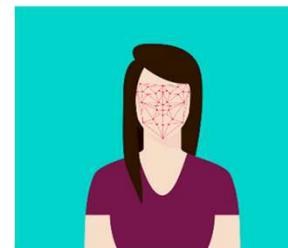
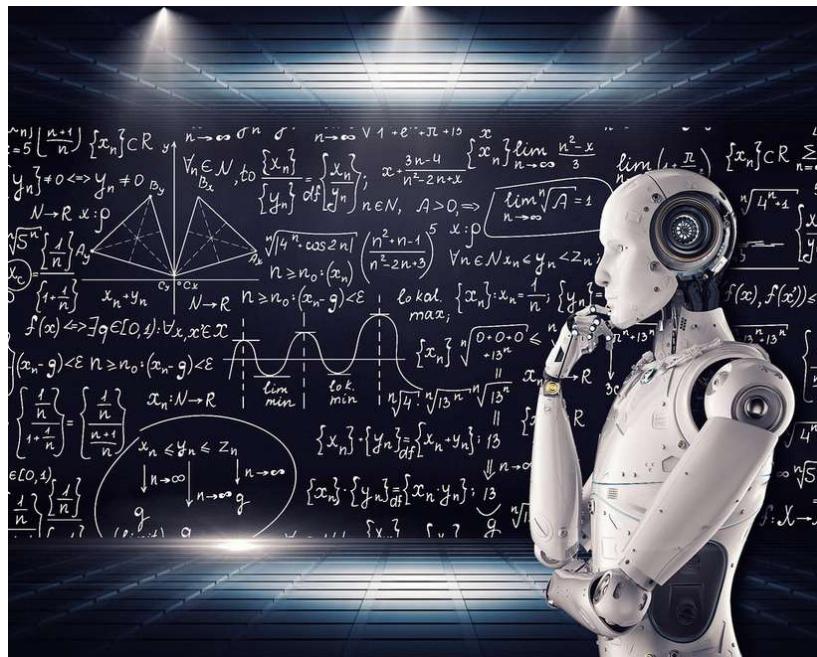
2000s:

- 2001: The "AdaBoost" algorithm, which combines multiple weak classifiers to form a strong classifier, is introduced by Yoav Freund and Robert Schapire.
- 2006: Geoffrey Hinton and colleagues publish a seminal paper on deep belief networks, paving the way for modern deep learning architectures.
- 2009: The "ImageNet" dataset and the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) are introduced, spurring advancements in computer vision.



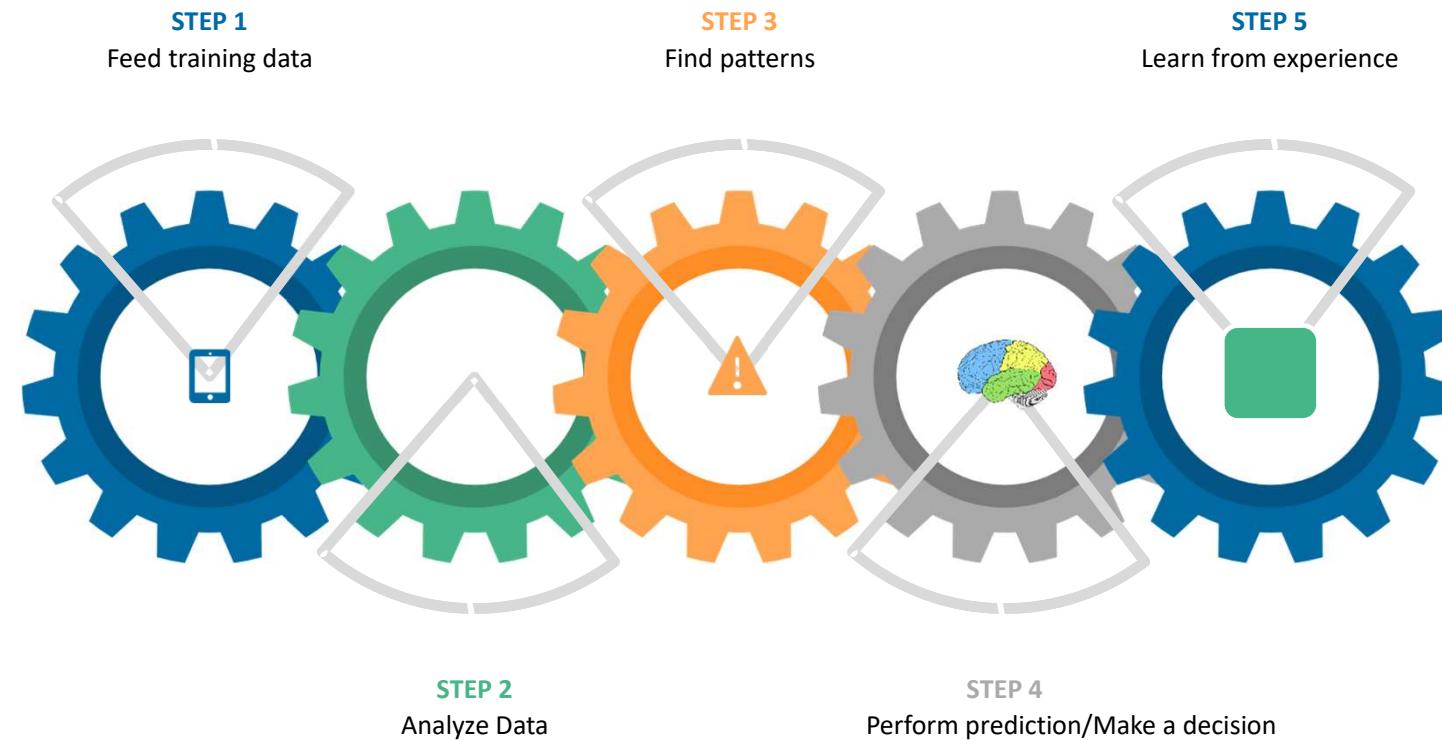
MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE: INTRODUCTION

- Artificial Intelligence/Machine learning does not only mean robots or Sci-Fi movies!
- Machine learning applications are everywhere!
- Google search engine, amazon recommender systems, Facebook facial recognition (tagging), Siri



MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE: PROCESS

- Machine learning is the study of algorithms that teach computers to learn from experience.
- Through experience (more training data), computers can continuously improve their performance.





MACHINE LEARNING: BIG PICTURE

ARTIFICIAL INTELLIGENCE
Science that enables computers to mimic human intelligence. Subfields: Machine Learning, robotics, and computer vision

MACHINE LEARNING
Subset of AI that enable machines to improve at tasks with experience

SUPERVISED LEARNING
Training algorithms using labeled input/output data.

UNSUPERVISED LEARNING
Training algorithms with no labeled data. It attempts at discovering hidden patterns on its own.

REINFORCEMENT LEARNING
Algorithm take actions to maximize cumulative reward.

CLASSIFICATION

REGRESSION

CLUSTERING

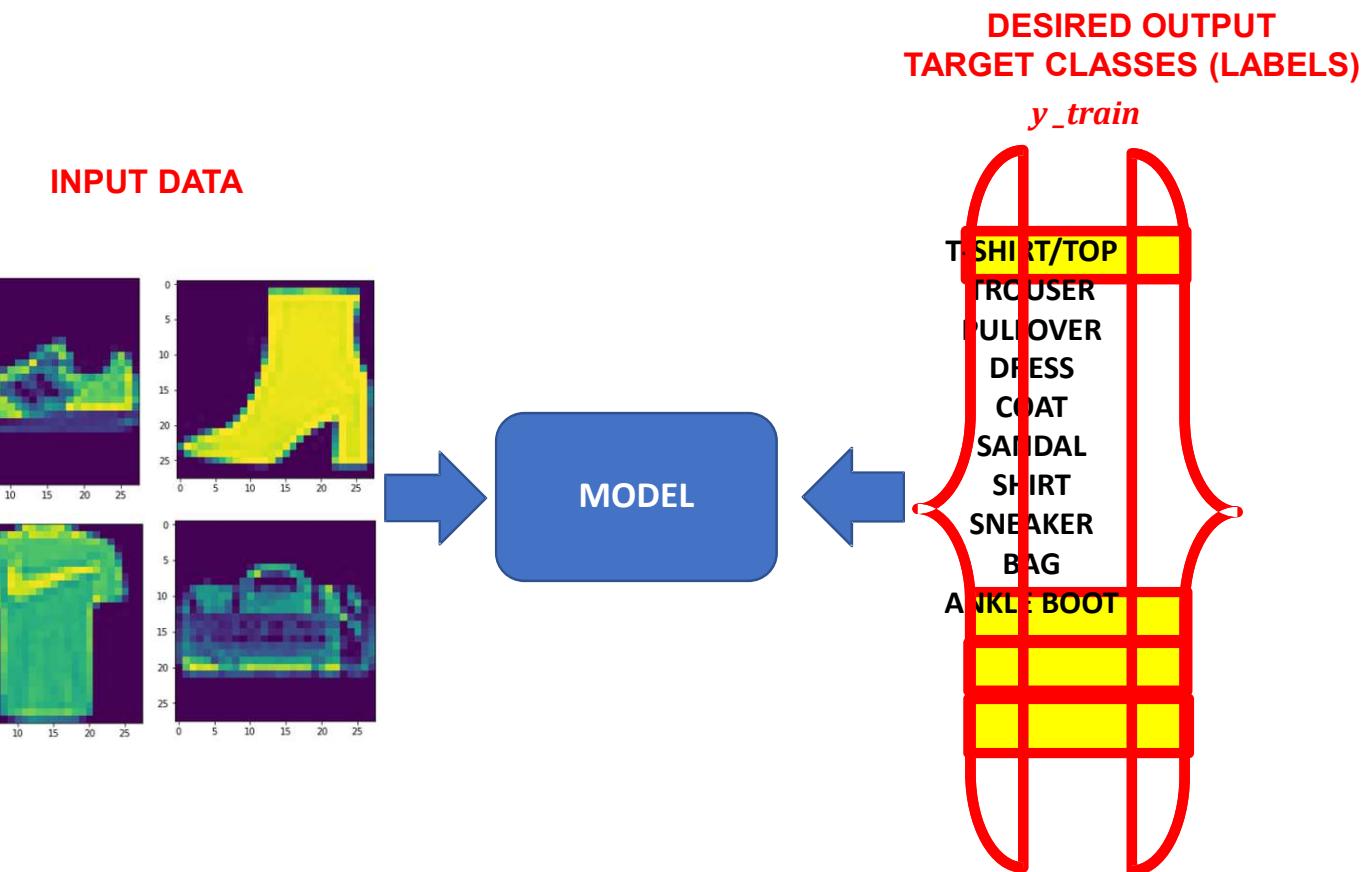
MACHINE LEARNING: WHICH TECHNIQUE SHOULD YOU USE?

Classification	Regression	Clustering
<ul style="list-style-type: none">○ Support Vector Machines○ Naïve Bayes○ Random forest○ K Nearest Neighbours○ Logistic regression	<ul style="list-style-type: none">○ Predicting continuous values such as temperature○ Simple Linear Regression○ Multiple Linear Regression○ Polynomial Regression	<ul style="list-style-type: none">○ No labelled data○ Finding Patterns in data is required○ Market segmentation○ K-Means Clustering



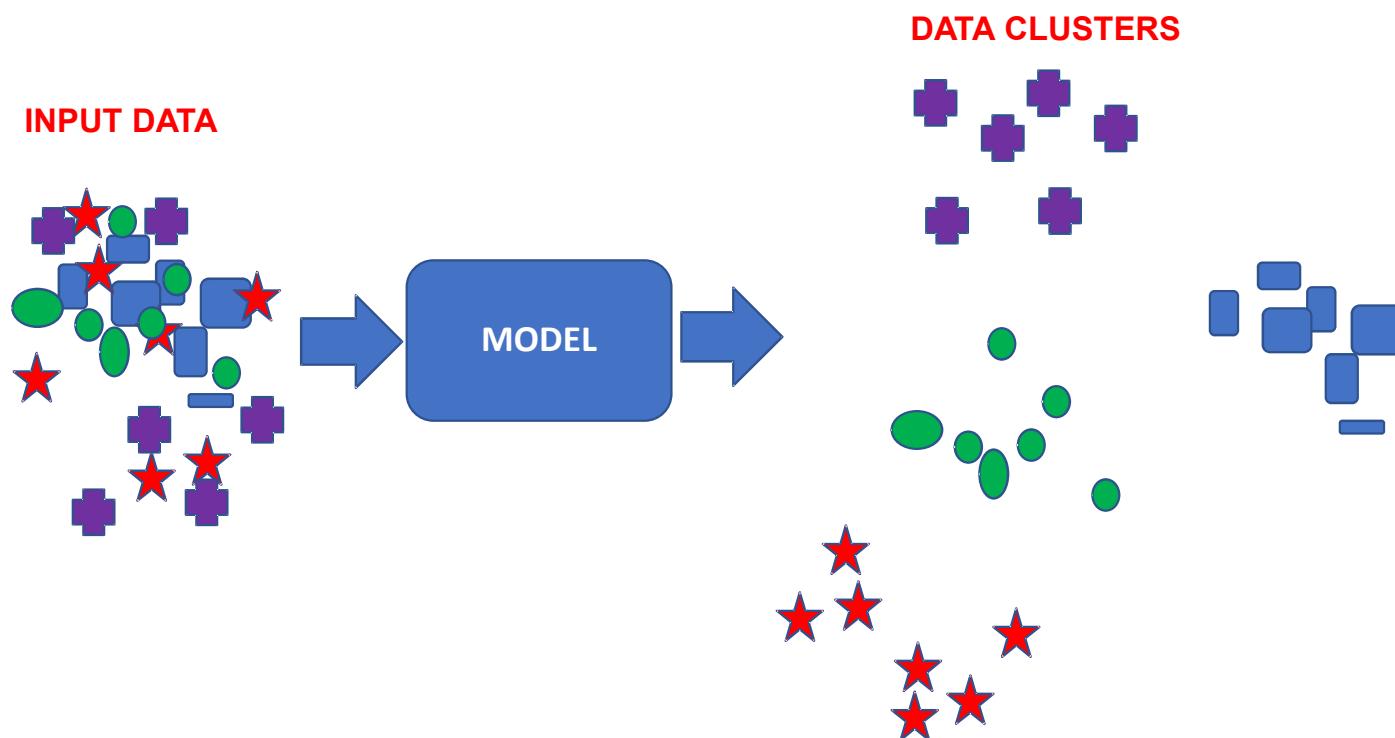
MACHINE LEARNING: SUPERVISED LEARNING

- **Supervised:** used to train algorithms using labeled input and output data.
 - Performance is assessed by comparing trained model prediction vs. real output.



MACHINE LEARNING: UNSUPERVISED LEARNING

- **Unsupervised learning:** provides the algorithm with no labeled data.
- The algorithm attempts at discovering hidden patterns within the training data.
- Unsupervised learning methods can analyze complex data that humans might find difficult to interpret.
- No feedback!

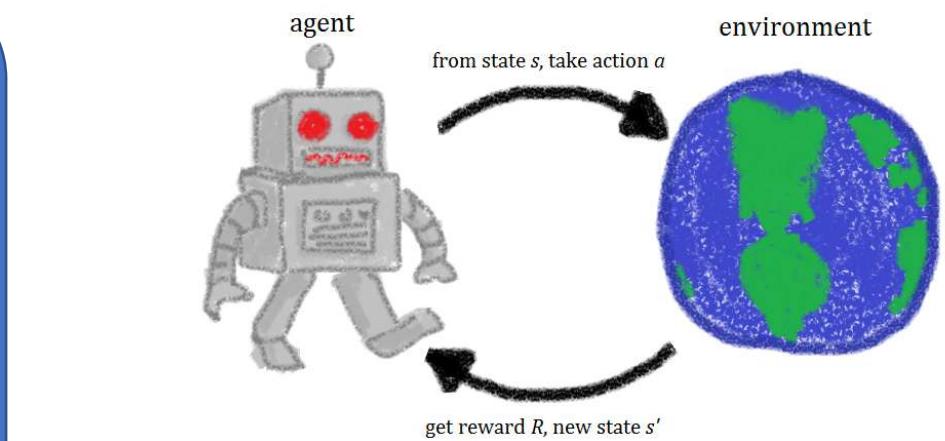
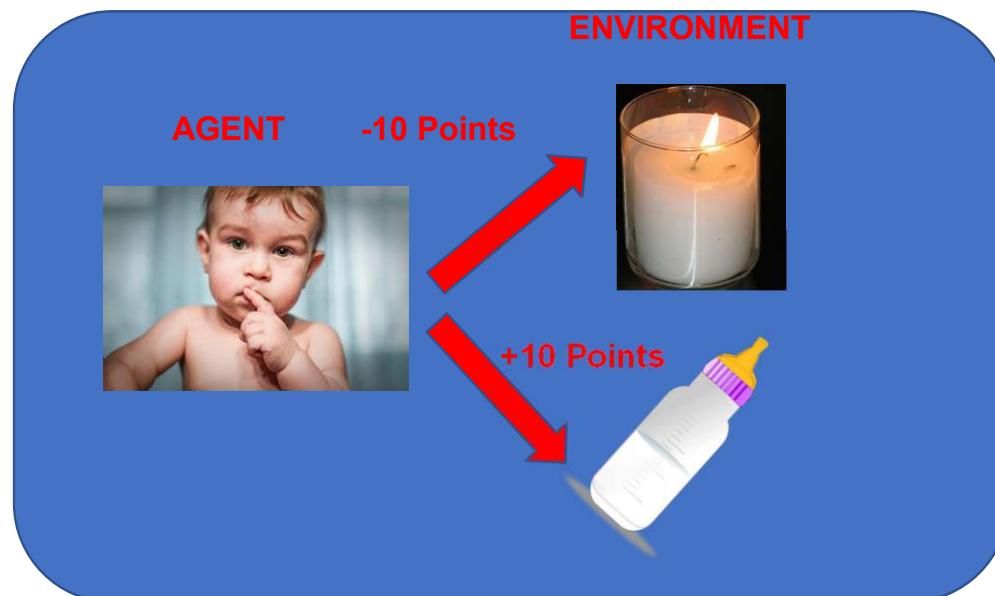


Machine learning

- Linear Regression: A linear regression algorithm fits a linear equation to the data by minimizing the difference between the predicted and actual values. It is used for regression tasks where the target variable is continuous.
- Logistic Regression: Logistic regression is used for binary classification problems. It estimates the probability of an instance belonging to a particular class by fitting a logistic function to the data.
- Decision Trees: Decision trees create a flowchart-like structure where each internal node represents a decision based on a feature, and each leaf node represents a class label or a numerical value. They are versatile and can be used for both classification and regression tasks.
- Random Forests: Random forests are an ensemble learning method that combines multiple decision trees. Each tree is built on a random subset of features, and the final prediction is made based on the majority vote or average of the predictions from individual trees.
- Support Vector Machines (SVM): SVM is a powerful algorithm used for classification tasks. It finds a hyperplane that maximally separates the data into different classes. SVM can handle linear and non-linear separable data by using different kernel functions.
- Naive Bayes: Naive Bayes is a probabilistic algorithm based on Bayes' theorem. It assumes that features are conditionally independent given the class label and uses this assumption to calculate the probability of an instance belonging to a particular class.

MACHINE LEARNING: REINFORCEMENT LEARNING

- Reinforcement learning allows machines take actions to maximize cumulative reward.
- Reinforcement algorithms learn by trial and error through reward and penalty.
- Two elements: **environment** and **learning agent**.
- The environment rewards the agent for correct actions.
- Based on the reward or penalty, agent improves its environment knowledge to make better decision.



https://commons.wikimedia.org/wiki/File:RL_agent.png

MACHINE LEARNING: DEEP LEARNING

- Deep learning is a subset of machine learning that utilizes multi-layer Artificial Neural Networks.
- Deep Neural Networks are inspired by the human brain and mimics the operation of biological neurons.

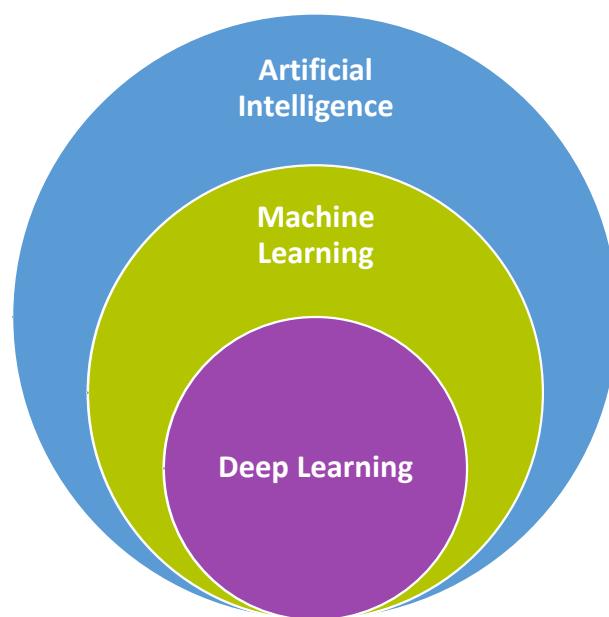


Photo Credit: <https://pixabay.com/en/neural-network-thought-mind-mental-3816319/>

