



WEEK 1

# MACHINE LEARNING

UNLIMITED

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



# 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 |
|--------------------|--|--------|
| Kaggle Assignments | Kaggle is an online Competition  | 40%    |
| Final Exam         | Performance in exams, assessing theoretical knowledge and problem-solving skills | 50%    |

| ลำดับเบอร์เซ็นต์ | จำนวนคน (ประมาณ) | คะแนน | ระดับผลสัมฤทธิ์ |
|------------------|------------------|-------|-----------------|
| 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 50% of the test data.  
This competition has completed. This leaderboard reflects the final standings.

| #  | △    | Team                         | Members | Score     | Entries | Last | Solution |
|----|------|------------------------------|---------|-----------|---------|------|----------|
| 1  | —    | 66076020-ชุมพัก              | ●       | 0.9801245 | 2       | 3mo  |          |
| 2  | + 1  | 66076002-หนานพัก             | ●       | 0.8584349 | 3       | 3mo  |          |
| 3  | + 1  | 65076051-ภพพิชา              | ●       | 0.5956180 | 3       | 3mo  |          |
| 4  | + 7  | 66076019-ชนธิก               | ●       | 0.5923106 | 2       | 3mo  |          |
| 5  | + 10 | 66076017-ทองเดือน            | ●       | 0.5770735 | 4       | 3mo  |          |
| 6  | + 7  | 66076021-อันพิทักษณ์         | ●       | 0.5753778 | 6       | 3mo  |          |
| 7  | + 3  | 66076022-อันศ                | ●       | 0.5442650 | 9       | 3mo  |          |
| 8  | + 6  | APAPJ                        | ●       | 0.5357674 | 3       | 3mo  |          |
| 9  | + 2  | 66076040_วิรากานต์ เรียมมงคล | ●       | 0.5242341 | 8       | 3mo  |          |
| 10 | + 2  | 66076049 อะเรียร์ จันทร์     | ●       | 0.5102483 | 4       | 3mo  |          |
| 11 | + 6  | 66076038-อาทิตย์             | ●       | 0.5093011 | 2       | 3mo  |          |
| 12 | + 4  | 65076044-พชร์ญา              | ●       | 0.4985782 | 4       | 3mo  |          |
| 13 | + 4  | P                            | ●       | 0.4976292 | 4       | 3mo  |          |

## กุจิตร – ปรับตกล

สถาบันเทคโนโลยีพระจอมเกล้าเจ้าคุณทหารลาดกระบัง

ใบรายชื่อนักศึกษา แยกตามชื่อวิชา

ภาคการศึกษา 1 ปีการศึกษา 2568

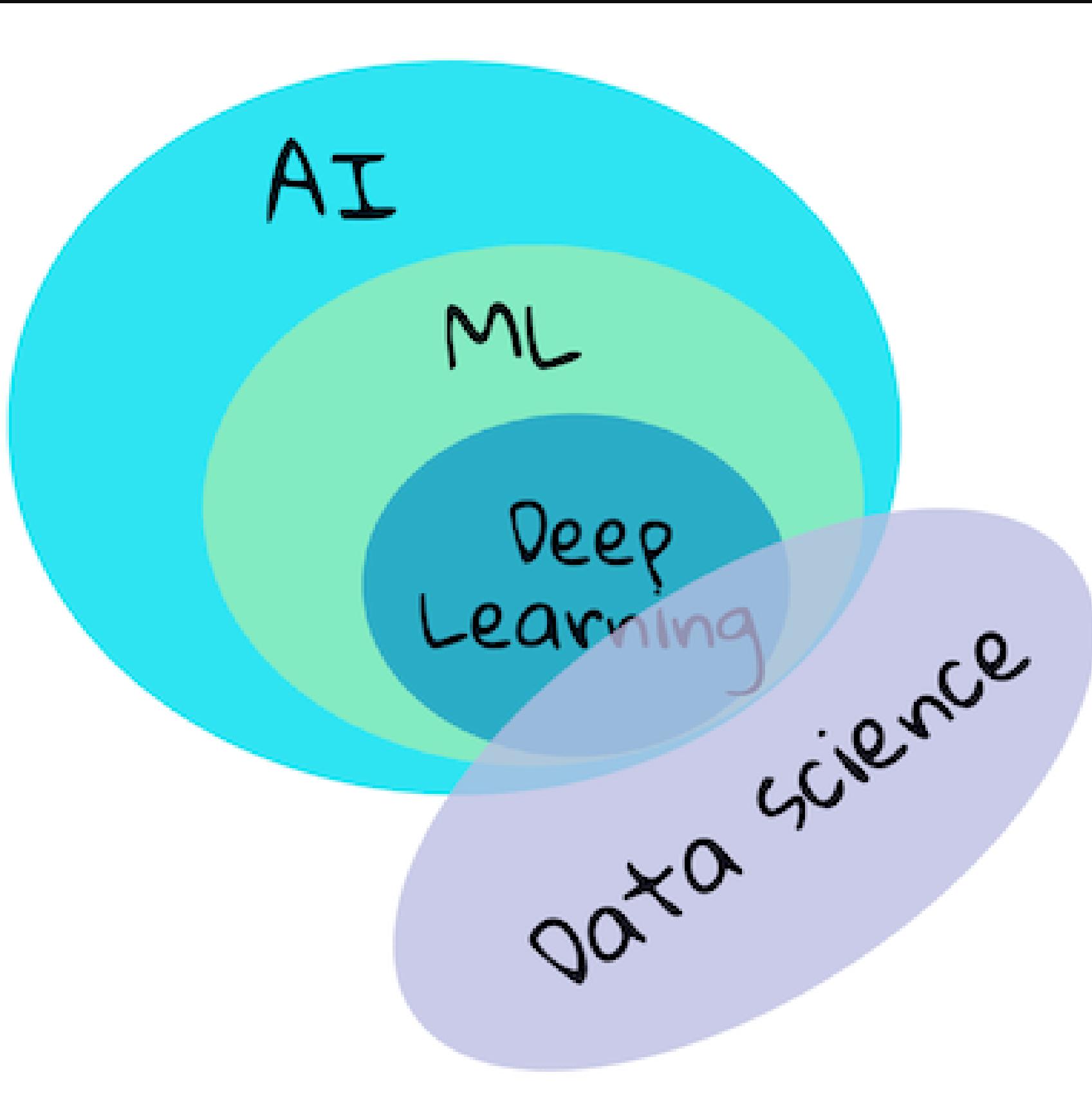
คณะทุกคณะ

รหัสวิชา 06048203 รายวิชา MACHINE LEARNING หน่วยกิต 3 กตัญ รวมทุกกลุ่ม

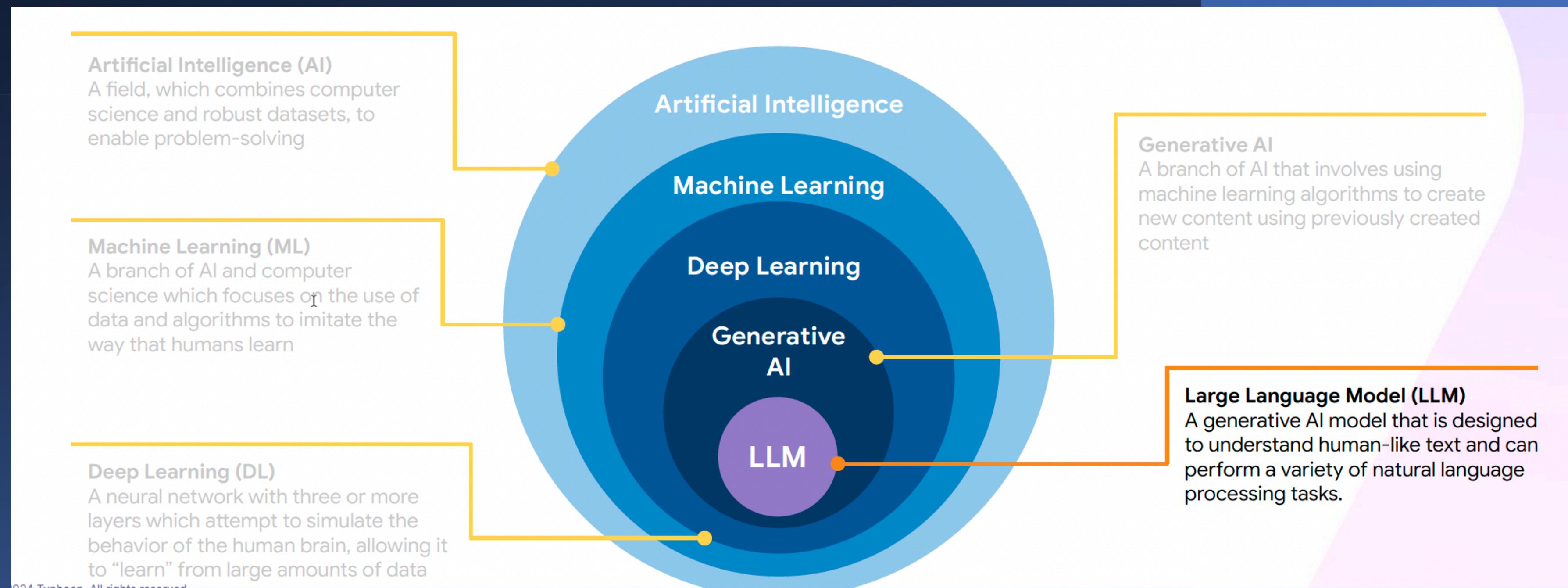
อาจารย์ผู้สอน พศ. ดร.ทักษิณ พลอยสุวรรณ

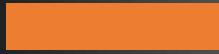
| ลำดับที่ | รหัส น.ส. | ชื่อ-นามสกุล                | หมายเหตุ |
|----------|-----------|-----------------------------|----------|
| 1        | 68076005  | นายกฤตney กับดพล            |          |
| 2        | 68076006  | นายก้องกพ อภิศักดิ์กุล      |          |
| 3        | 68076009  | นางสาวจิรา วารีรักษ์        |          |
| 4        | 68076012  | นายชนาธิป อรมาธีวัฒน์กุล    |          |
| 5        | 68076013  | นายชยานันต์ นันทกิจธรรม     |          |
| 6        | 68076015  | นางสาวชาลิสา น้อยบุญเติม    |          |
| 7        | 68076022  | นายณัฐพล ทันสมัย            |          |
| 8        | 68076023  | นายณัฐพล แพรศรี             |          |
| 9        | 68076028  | นายเดชินท์ เจริญพร้อม       |          |
| 10       | 68076029  | นายทองแท้ ศิริมากร          |          |
| 11       | 68076033  | นายธีระศักดิ์ เงินทอง       |          |
| 12       | 68076035  | นางสาวนันี อัลลแสง          |          |
| 13       | 68076037  | นางสาวนันท์ชพร เป็ญไบปริชา  |          |
| 14       | 68076038  | นายนิติพัฒน์ บุญเกตุ        |          |
| 15       | 68076040  | นางสาวเบญจมาภรณ์ เจิงแกะ    |          |
| 16       | 68076043  | นายปิยพนธ์ เป็นวงศ์         |          |
| 17       | 68076044  | นายปีรัตน์ ยศธนาภรณ์        |          |
| 18       | 68076045  | นายไปรย์ อัครพลิน           |          |
| 19       | 68076047  | นายพัทธดนย์ จันทร์เกตุ      |          |
| 20       | 68076050  | นางสาวแพรวา พลอยภาระจักร    |          |
| 21       | 68076052  | นายภาณุพงษ์ บุตรดี          |          |
| 22       | 68076053  | นายภาณุวิชญ์ บุญหมัก        |          |
| 23       | 68076054  | นายราวดี จรุคงเดช           |          |
| 24       | 68076056  | นายวิทวัส แสตนเวนทร์        |          |
| 25       | 68076057  | นายวิริยะ พลชานี            |          |
| 26       | 68076059  | นายศิริกัลย์ สุขโต          |          |
| 27       | 68076060  | นายศิริพล ครร เชิงไพบูลย์   |          |
| 28       | 68076061  | นางสาวศิริลักษณ์ ทองจัด     |          |
| 29       | 68076063  | นางสาวศุภกิรา ศิริเสรี      |          |
| 30       | 68076064  | นายสมศักดิ์ เนื่องมัจฉา     |          |
| 31       | 68076065  | นายสรราเสรีย มากเจริญ       |          |
| 32       | 68076066  | นางสาวสรุดา น้อยหม่อ        |          |
| 33       | 68076069  | นายสุทธิวัฒน์ หวังดีอโนไซค์ |          |
| 34       | 68076071  | นายอธิชัย ติริสวรรณาสี      |          |
| 35       | 68076072  | นายอนุชา เอื้อสุขกุล        |          |
| 36       | 68076073  | นายอาทิตย์ อัลลโน           |          |
| 37       | 68076078  | นายศุภณัฐ วีรรักษ์ตระกูล    |          |

รวมจำนวนนักศึกษาทั้งสิ้น 37 คน



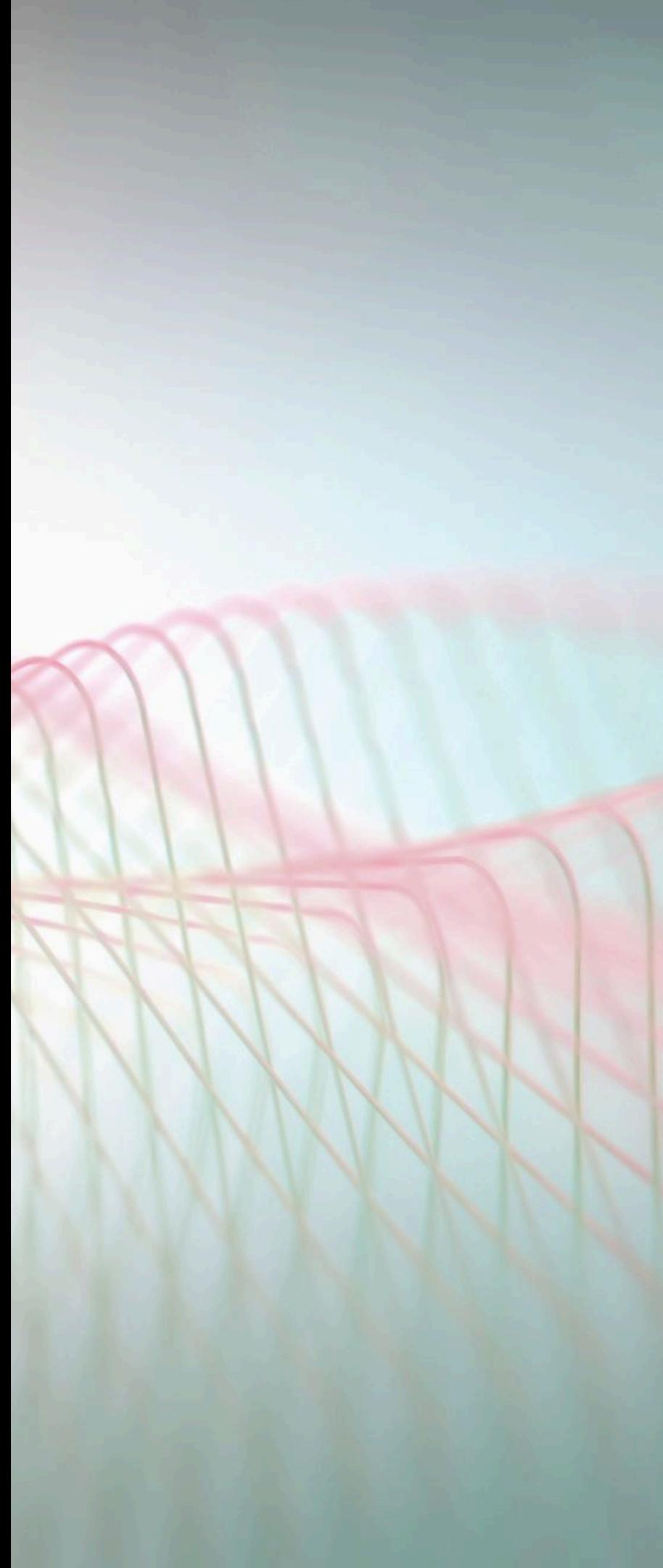
- Artificial Intelligence (AI) is a field focused on creating intelligent systems that can perform tasks requiring human-like intelligence. It encompasses both narrow AI, which is designed for specific tasks, and general AI, which aims to achieve human-level intelligence.
- Machine Learning (ML) is a 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.

---

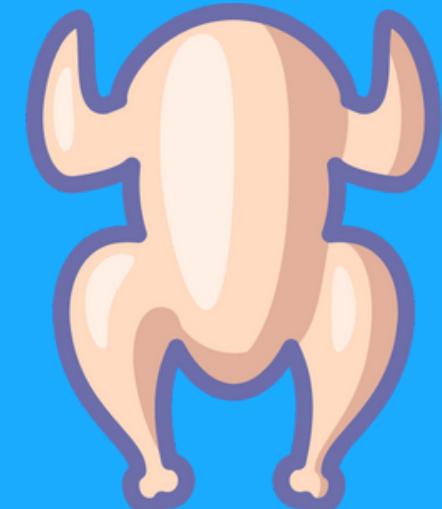
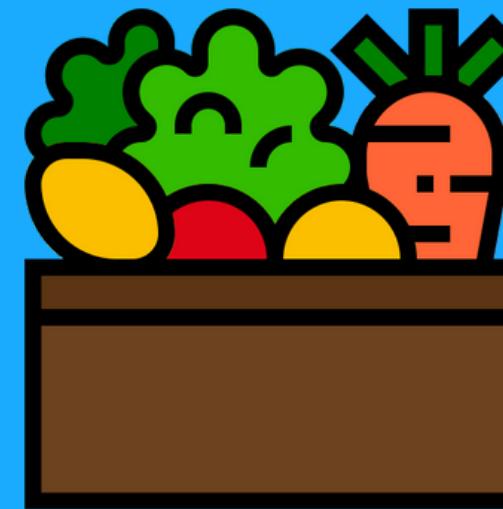
**When you don't have much data** — deep learning models usually require a fairly large amount of data to produce great results.

---

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

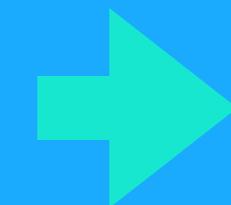
Traditional  
programming

Inputs

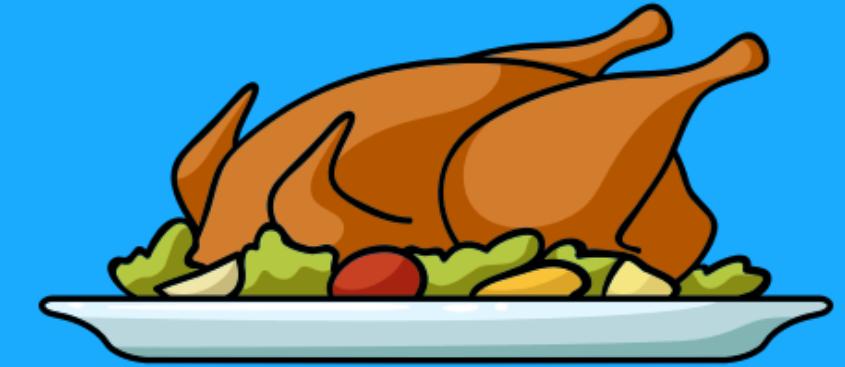


Rules

1. Cut vegetables
2. Season chicken
3. Preheat oven
4. Cook chicken for 30-minutes
5. Add vegetables



Output

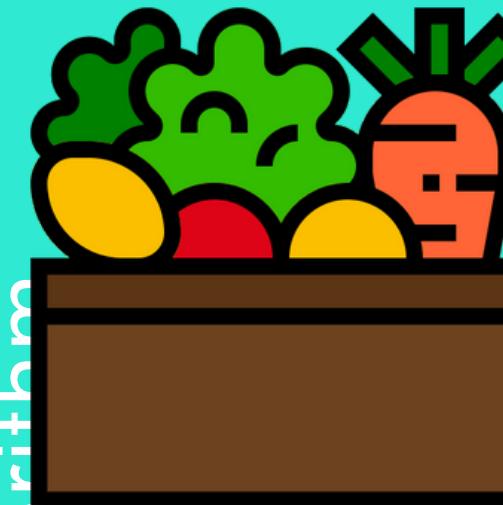


Starts with

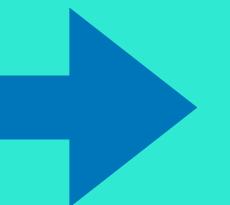
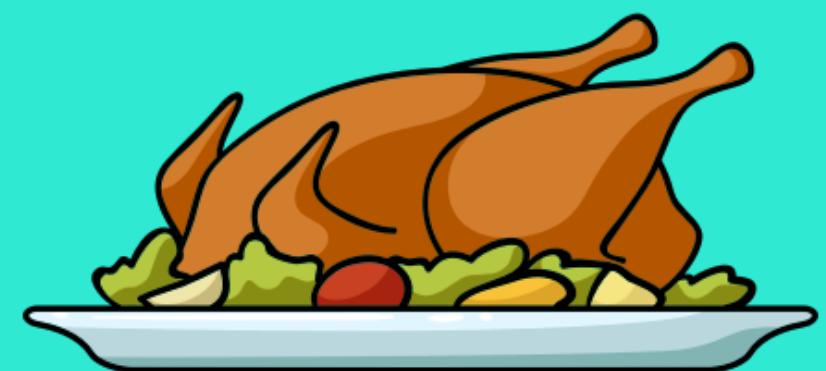
Makes

Machine  
learning  
algorithms

Inputs



Output



Rules

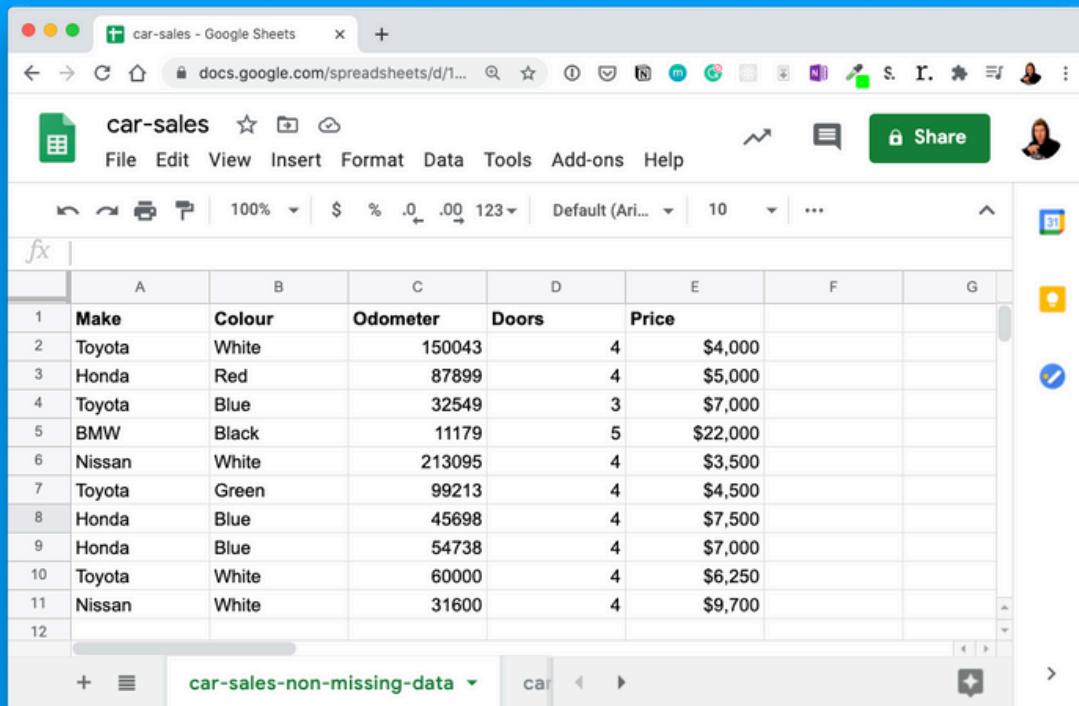
1. Cut vegetables
2. Season chicken
3. Preheat oven
4. Cook chicken for 30-minutes
5. Add vegetables

Starts with

Figures out

# 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  
boosted  
machine  
  
dmlc  
**XGBoost**

## Deep Learning



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

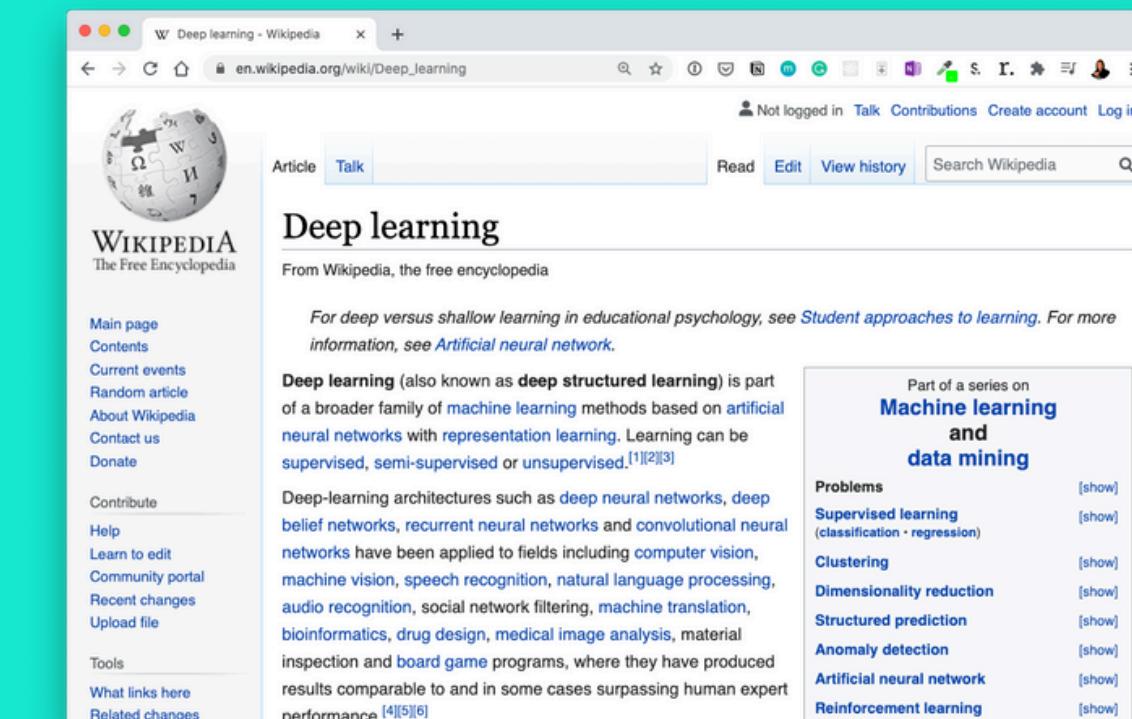
What you want to hear:

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

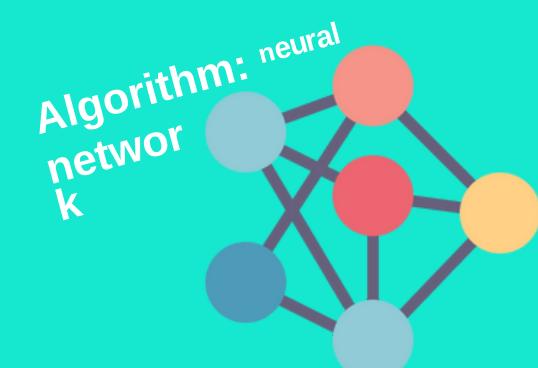
From Wikipedia, the free encyclopedia

For deep versus shallow learning in educational psychology, see *Student approaches to learning*. For more information, see *Artificial neural network*.

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**.<sup>[1][2][3]</sup>

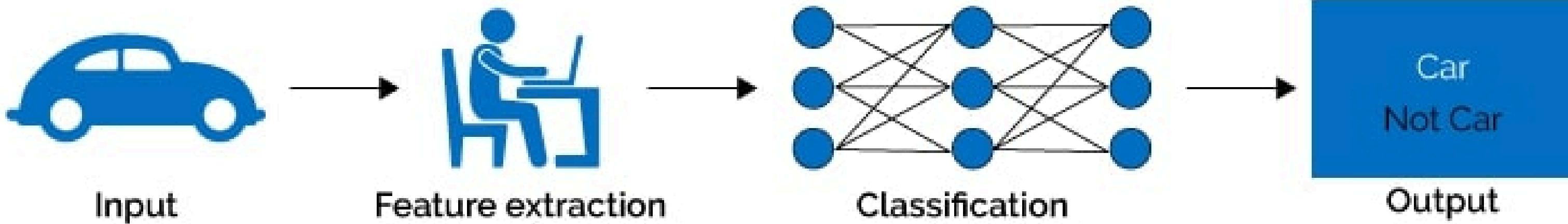
Deep-learning architectures such as **deep neural networks**, **deep belief networks**, **recurrent neural networks** and **convolutional neural networks** have been applied to fields including **computer vision**, **machine vision**, **speech recognition**, **natural language processing**, **audio recognition**, **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.<sup>[4][5][6]</sup>

Unstructured  
data

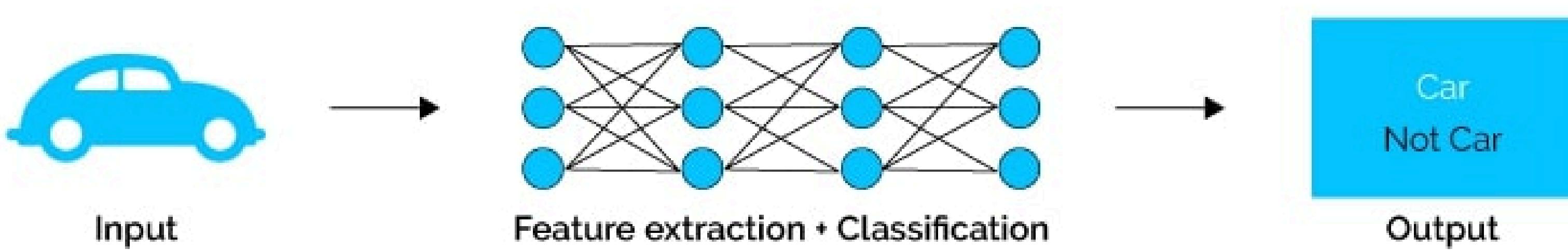


Algorithm: neural  
network

## 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)

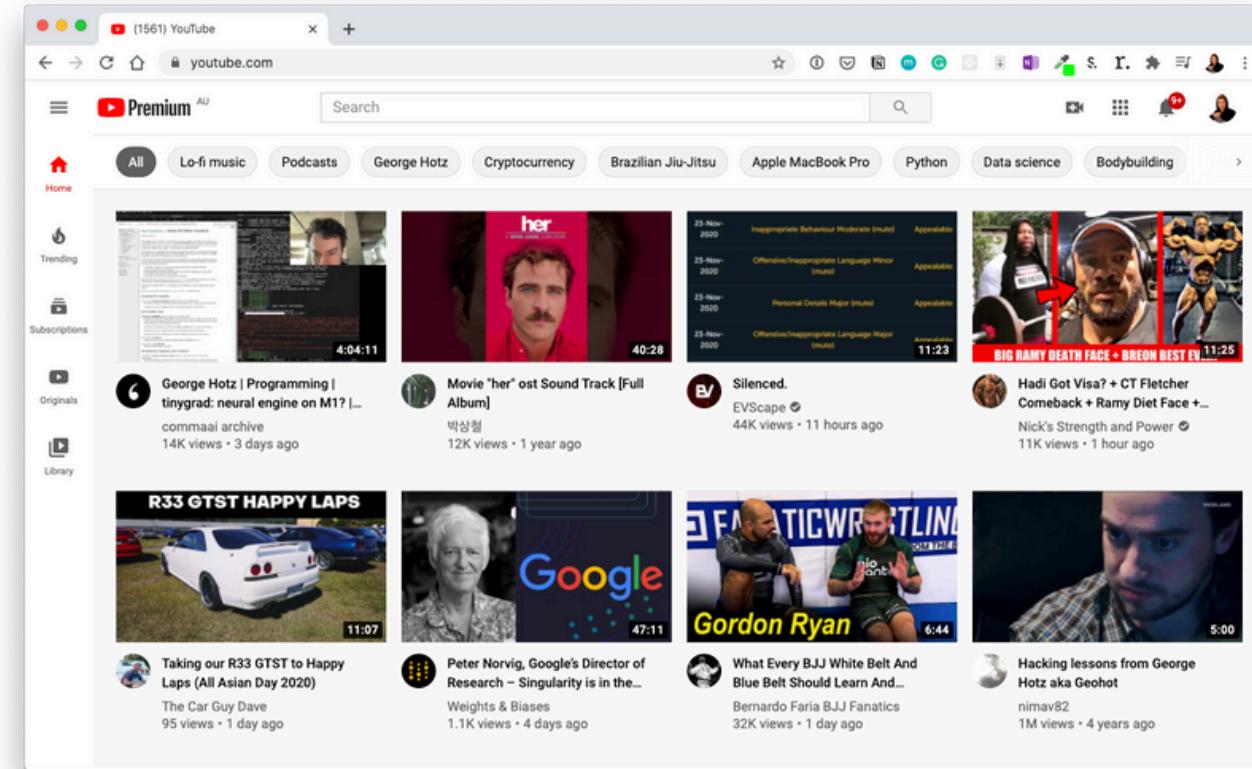
(depending how you represent your problem,  
many algorithms can be used for both)

Structured data



Unstructured data

# Deep Learning Use Cases



A screenshot of a web browser displaying Google Translate. The interface shows "ENGLISH - DETECTED" on the left and "SPANISH" on the right. The input text "deep learning is epic" is in the English section, and the translated text "el aprendizaje profundo es épico" is in the Spanish section. There are also microphone icons and a "Send feedback" button.

Translation



Computer  
Vision

To: [daniel@mrdourke.com](mailto:daniel@mrdourke.com)  
Hey Daniel,

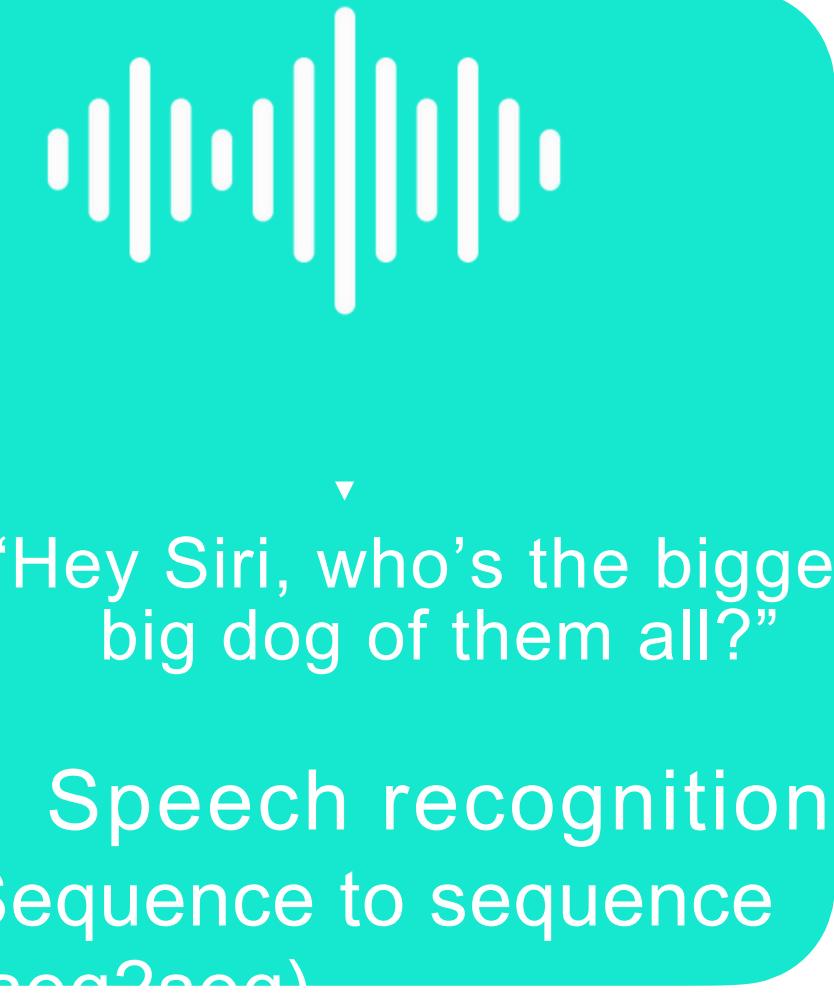
This deep learning course is incredible! I  
can't wait to use what I've learned!  
Not spam

To: [daniel@mrdourke.com](mailto:daniel@mrdourke.com)  
Hay daniel...

C0ongratu1ations! U win \$1139239230

Spam

Natural Language Processing  
(NLP)



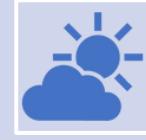
"Hey Siri, who's the biggest dog of them all?"

Speech recognition  
Sequence to sequence  
(seq2seq)

# Example of Application of machine learning



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



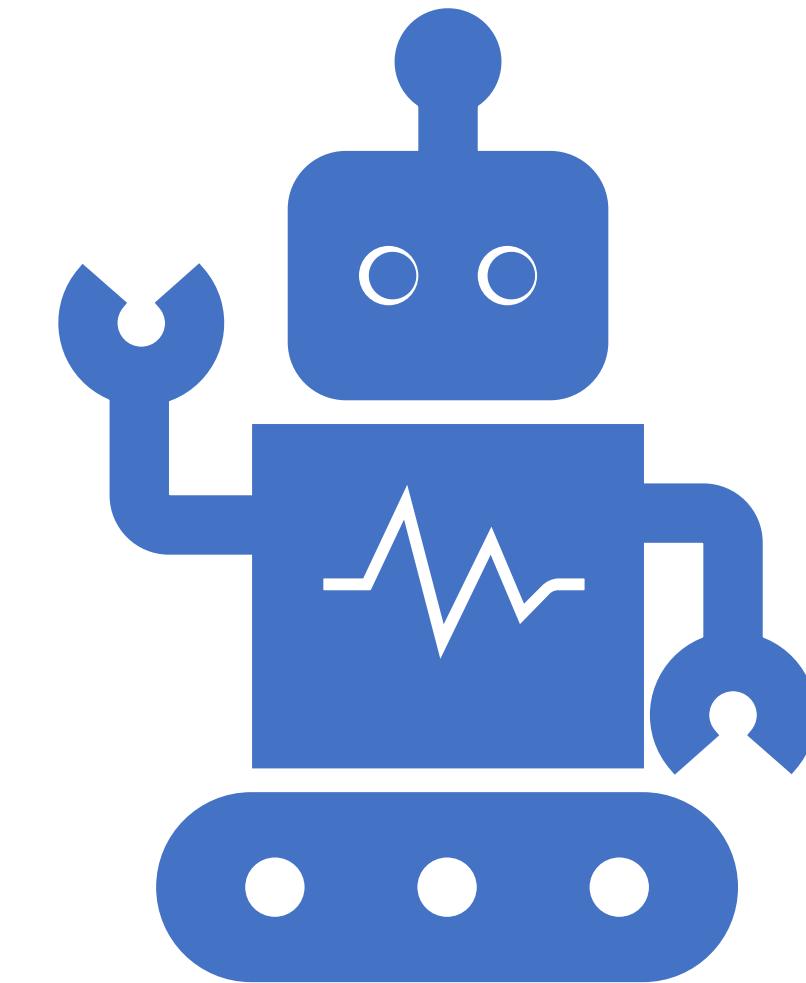
To leverage weather data to predict weather events.



To understand the sentiment of a text.

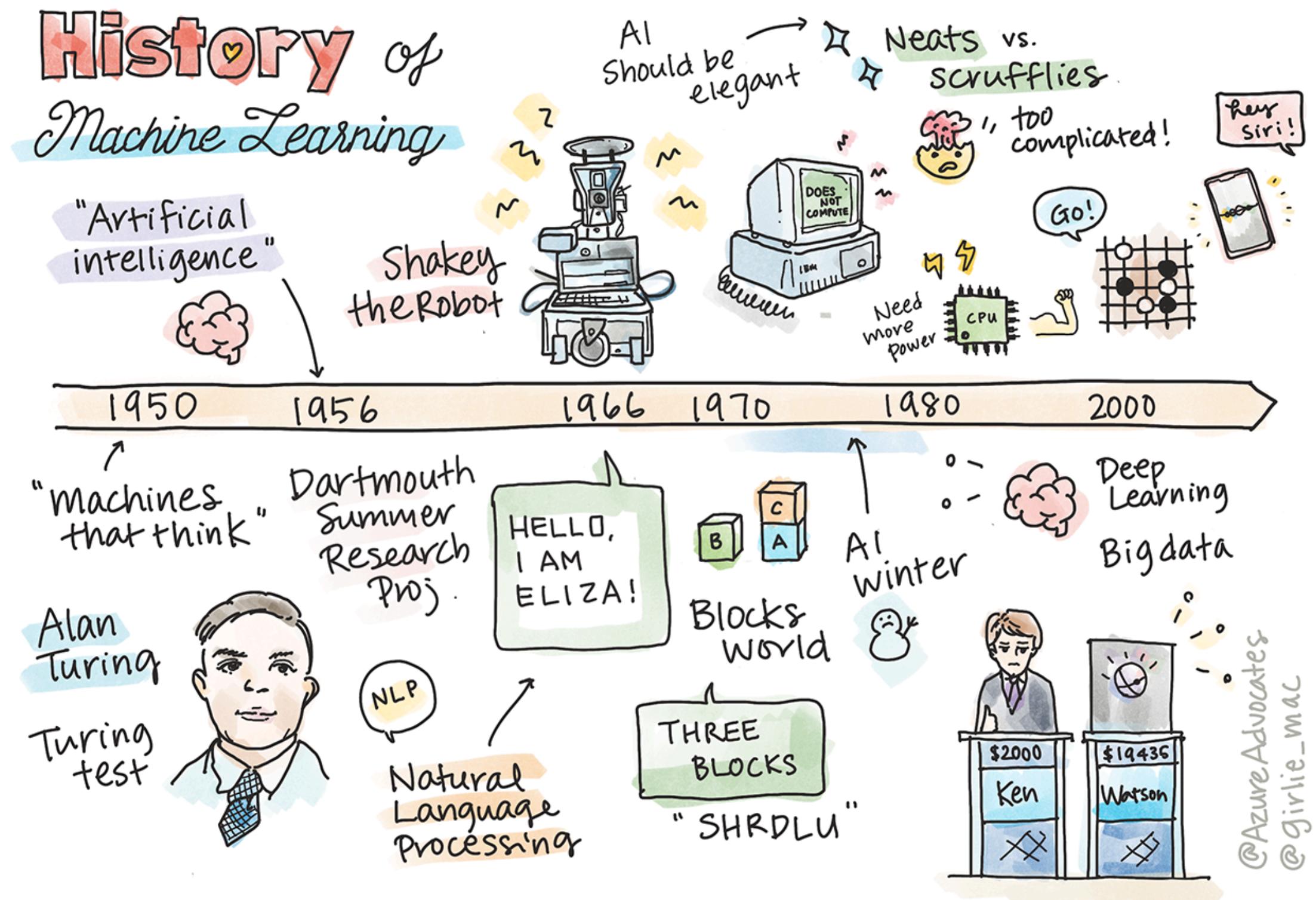


To detect fake news to stop the spread of propaganda.



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    | III | ZZZZZ | AAAAA   |
| EE     | LL    | II  | ZZ    | AA AA   |
| EEEEEE | LL    | II  | ZZZ   | AAAAAAA |
| EE     | LL    | II  | ZZ    | AA AA   |
| EEEEEE | LLLLL | III | ZZZZZ | 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.

The image is a movie poster for "The Imitation Game". It features a man in a dark suit standing from behind, looking at a large, complex machine filled with numerous circular components, likely a Bombe machine used for cracking codes. The machine is set against a dark, moody background with red lighting. At the top, there is a quote: "THE TRUE ENIGMA WAS THE MAN WHO CRACKED THE CODE". At the bottom, the cast is listed as "BENEDICT CUMBERBATCH KEIRA KNIGHTLEY", and the title "THE IMITATION GAME" is prominently displayed in red. Below the title, it says "COMING SOON" and "SPURCANAL".

# 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:

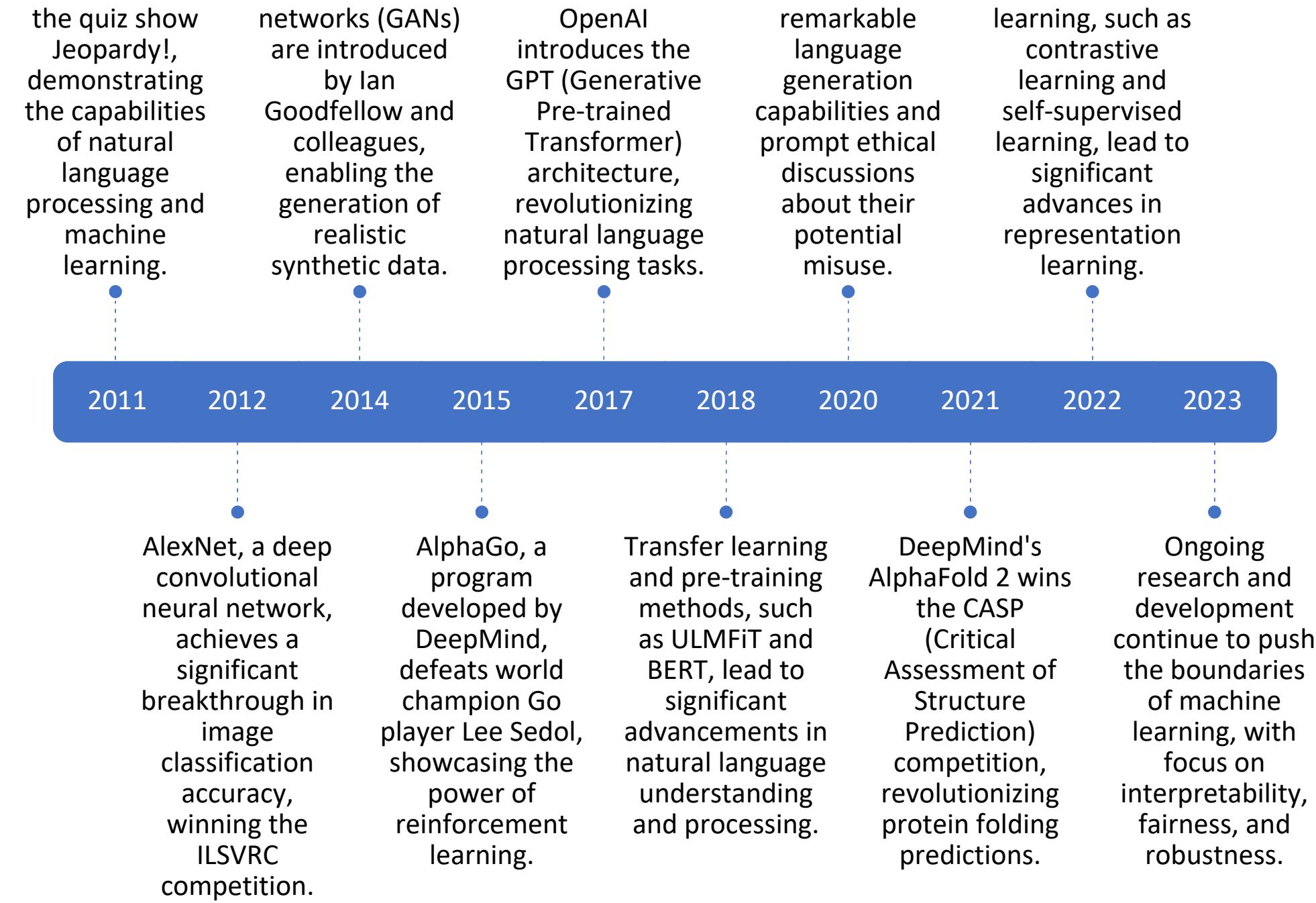
- - 1981: Gerald DeJong develops the "Explanation-Based Learning" approach, enabling systems to learn from explicit explanations.
- - 1986: Geoffrey Hinton, David Rumelhart, and Ronald Williams demonstrate the practical effectiveness of backpropagation, leading to a resurgence of interest in neural networks.

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.

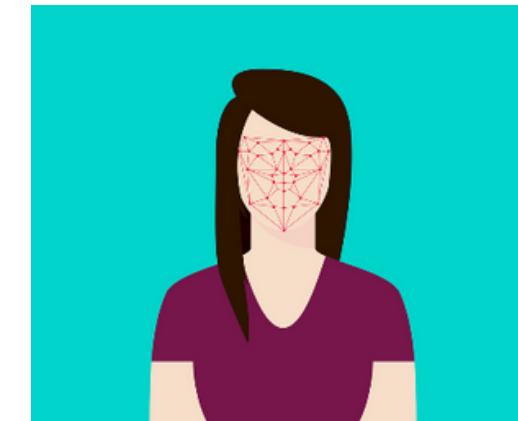
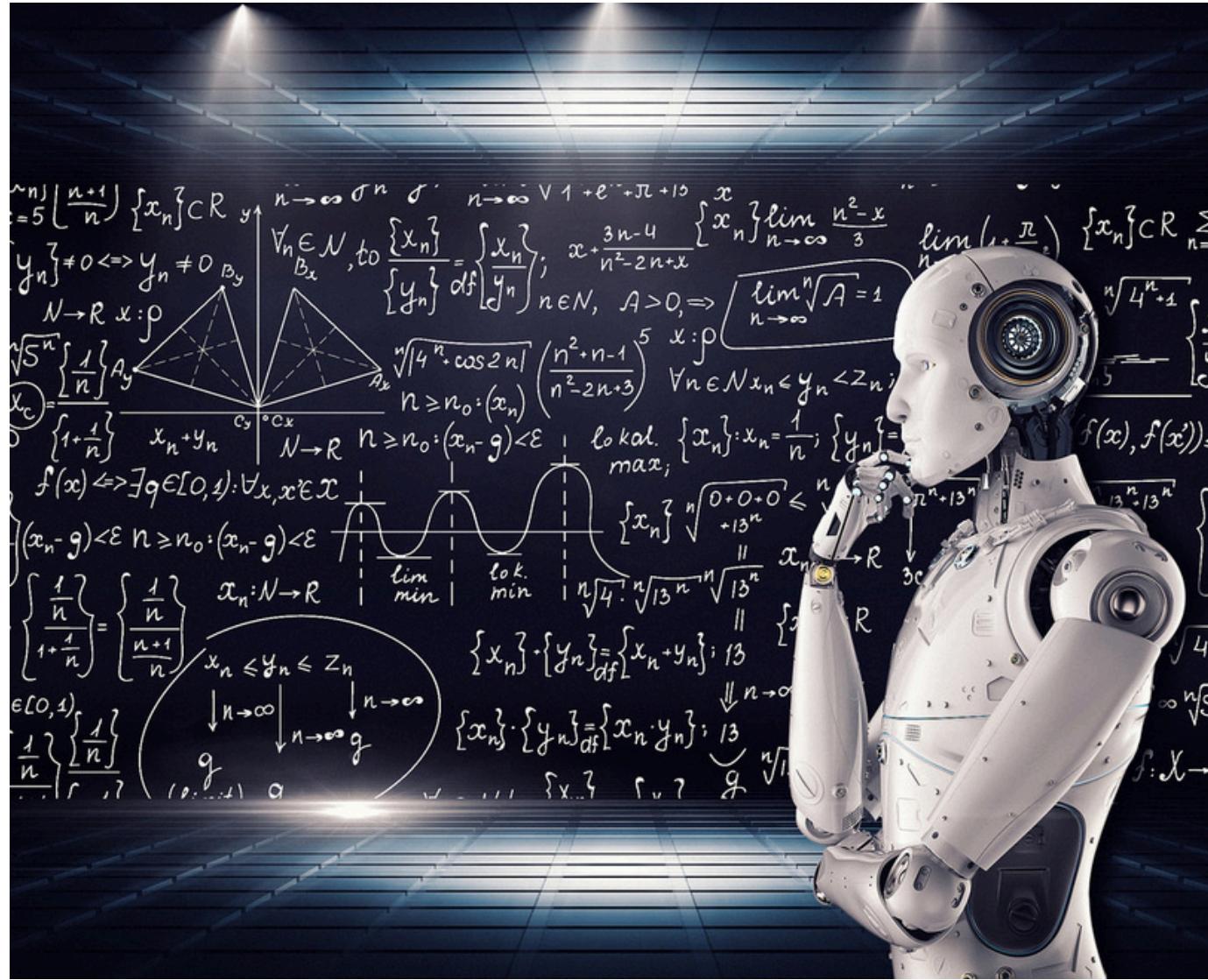
2000s:

- - 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.



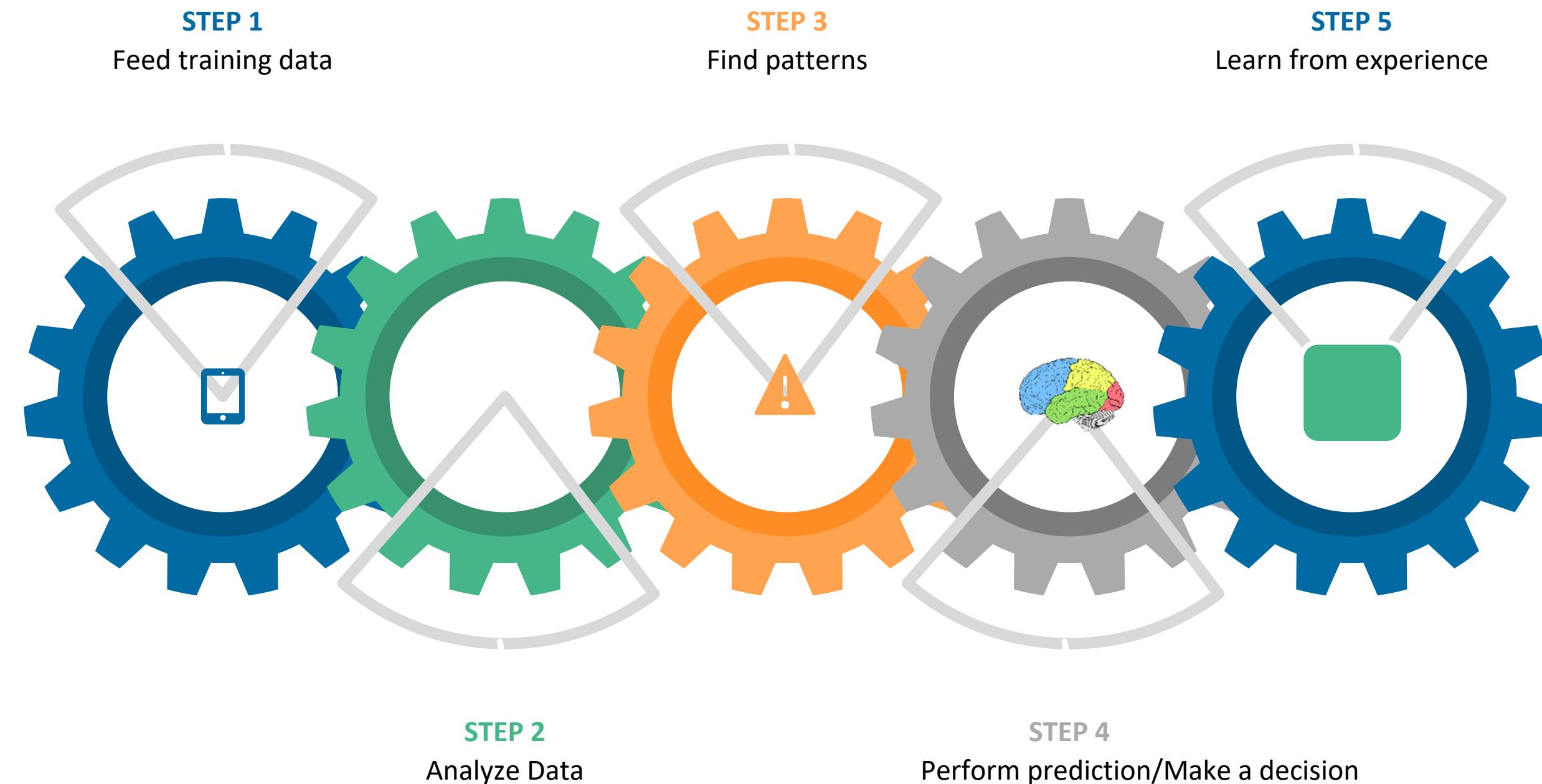
# MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE: INTRODUCTION

- 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

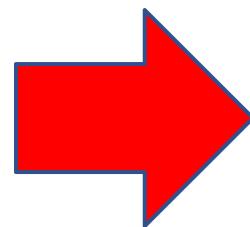
- Machine learning is the study of algorithms that teach computers to learn from experience.
- Through experience (more training data), computers can continuously improve their performance.



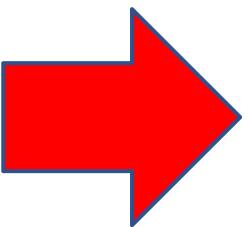


# MACHINE LEARNING: BIG PICTURE

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

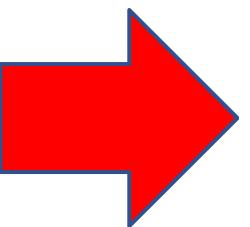


**MACHINE LEARNING**  
Subset of AI that enable machines to improve at tasks with experience



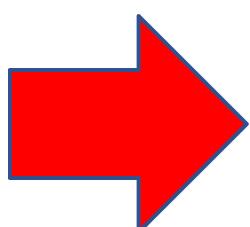
## SUPERVISED LEARNING

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 I USE?

## Classification

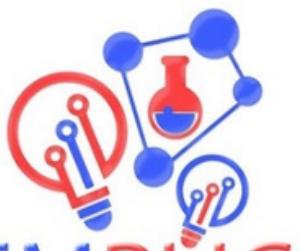
- **Support Vector Machines**
- **Naïve Bayes**
- **Random forest**
- **K Nearest Neighbours**
- **Logistic regression**

## Regression

- Predicting continuous values such as temperature
- **Simple Linear Regression**
- **Multiple Linear Regression**
- **Polynomial Regression**

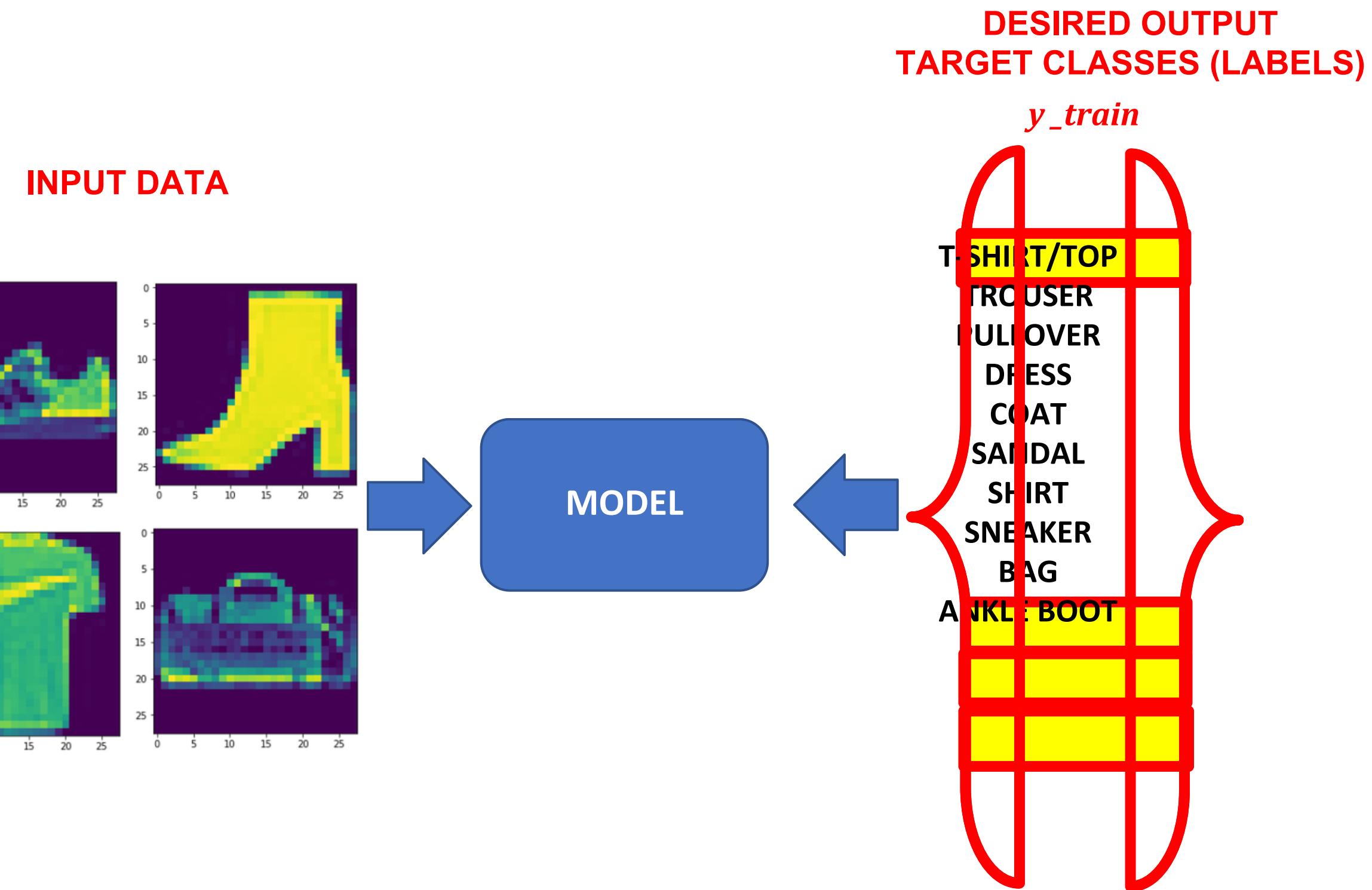
## Clustering

- No labelled data
- Finding Patterns in data is required
- Market segmentation
- **K-Means Clustering**



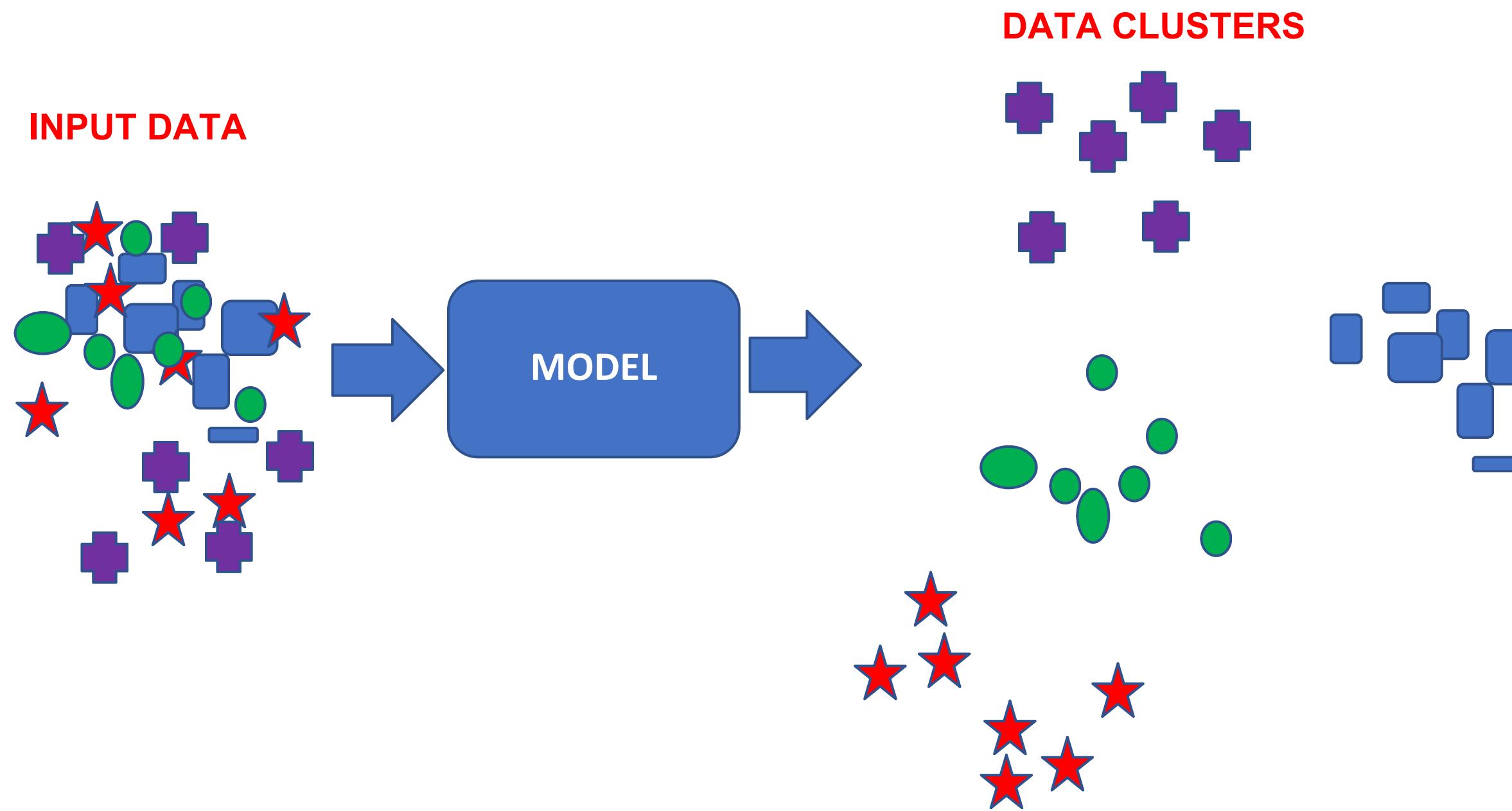
# MACHINE LEARNING: SUPERVISED LEARNING

- **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.

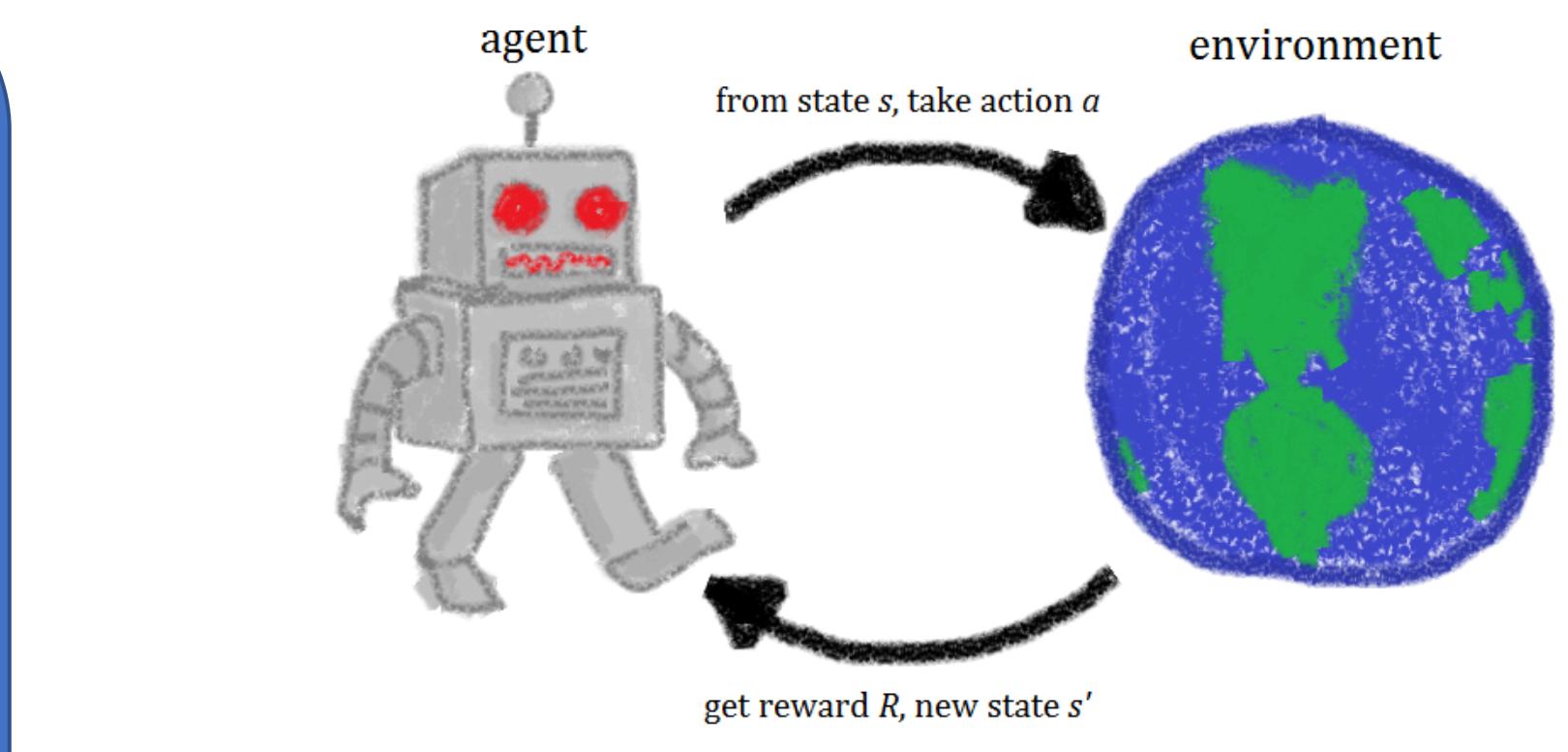
Random Forests: Random forests are an ensemble learning method that combines multiple decision trees. Each tree is built on a random subset of features, and the final prediction is made based on the majority vote or average of the predictions from individual trees.

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](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.

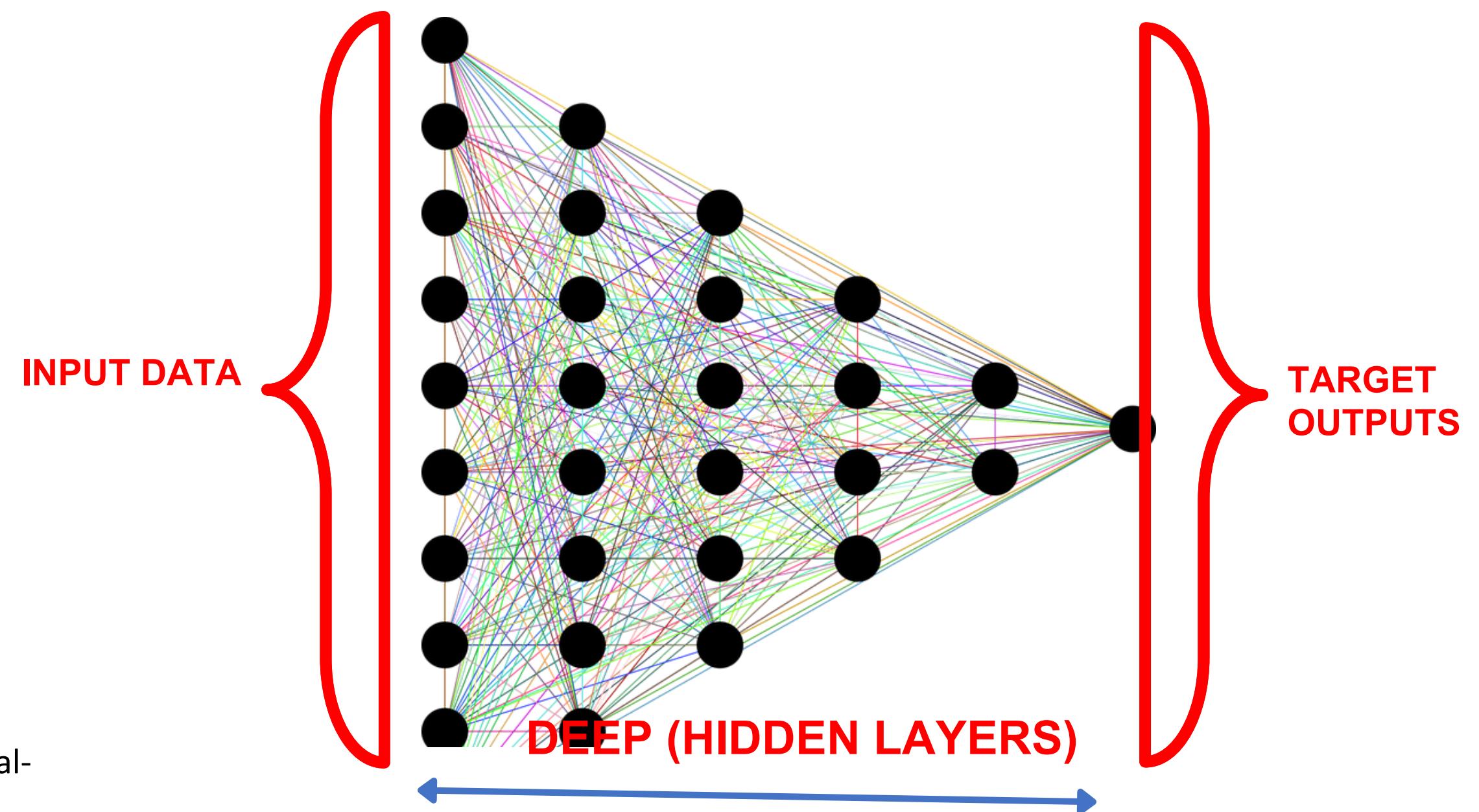
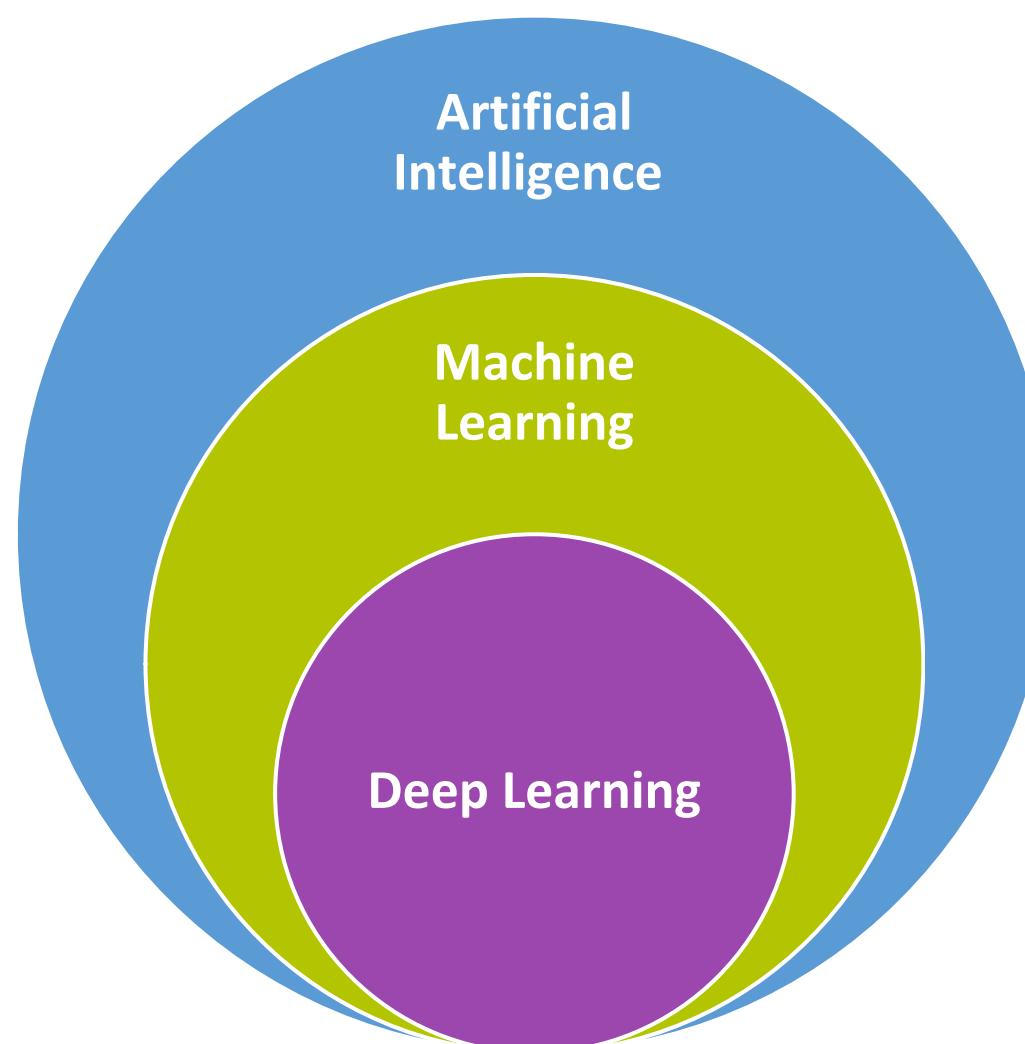


Photo Credit: <https://pixabay.com/en/neural-network-thought-mind-mental-3816319/>