Machine Learning

- Introduction
- Terminologies Used
- Types of Machine Learning

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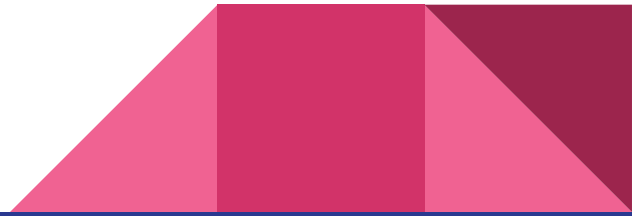
About The Course

- Classes would be 1.30 - 2 Hrs long.
- 4 - 6 Hours of self-study per week will be required to fully understand the concepts.
- Learning Resources and Doubt Solving will be shared on Github as well as in classes.
- Classes will be more based on concepts and reasoning rather than just using libraries.
- Required language - Python



Let’s Clear all the Big Terms

What is

1. **Artificial Intelligence (AI)**
2. **Machine Learning (ML)**
3. **Deep Learning (DL)**
4. **Data Science (DS)**

What is Artificial Intelligence?

AI is the technique which enables machines to mimic human/human-like behaviour.

The term AI was first introduced in 1956 but why is it so popular now?

- We did not have the data.
- We did not have the computational power.
- And we did not have the storage capacity.

But how can you enable a machine to mimic human behaviour?

Ans. By Writing Rules

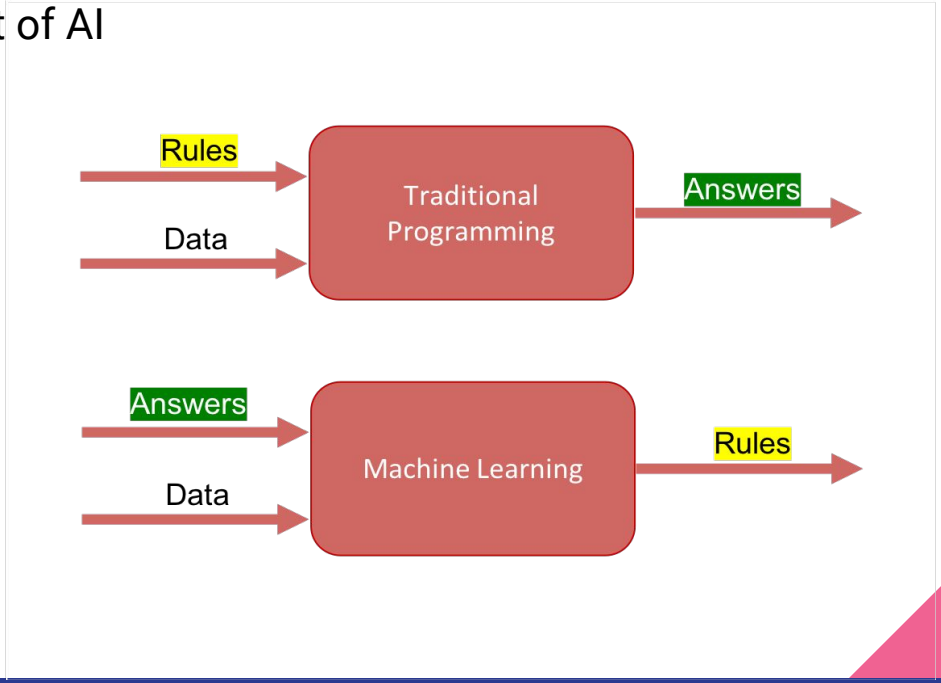
For Example:

1. Adding or Subtracting 2 numbers.
2. Finding shortest path in a maze.
3. Enabling robot to walk.
4. FAQ chatbots(rule-based)

But there is a problem with such a system!!!??

What is Machine Learning?

- It is the science of getting computers to act without being explicitly programmed.
- Machine Learning is an application of AI that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.
- ML is a subset of AI



What is Deep Learning?

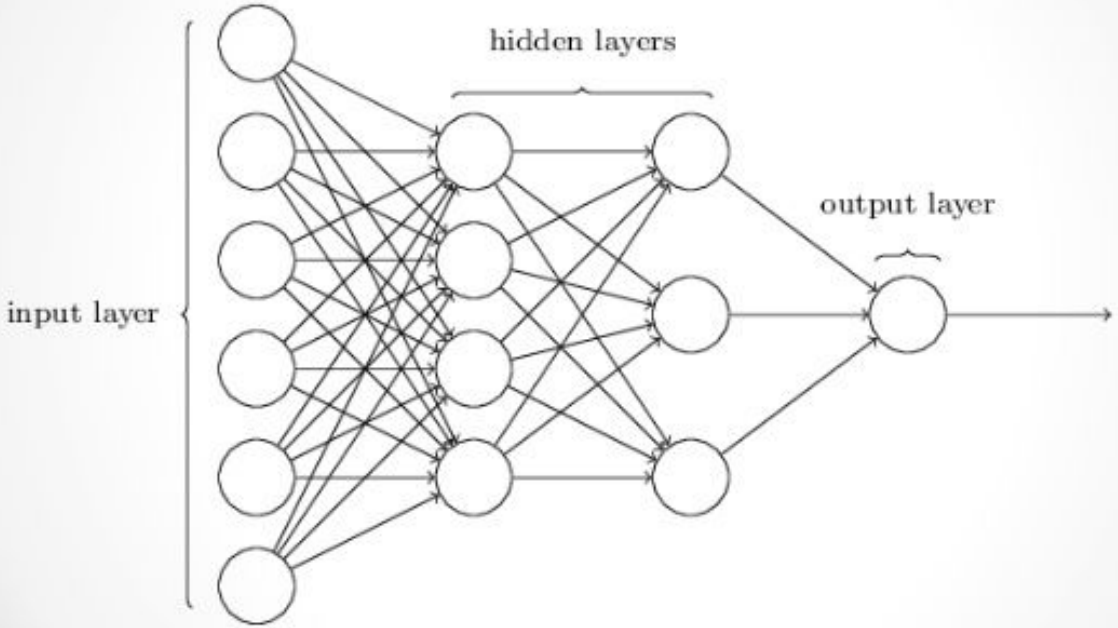
- Deep Learning is a subfield of Machine Learning that concerns with algorithms inspired by the structure and functions of our brain.
- It uses Neural Networks (similar to neurons in our brain) to identify patterns in just like our brain does.

For Example:

- Image Classification
- Object Detection
- Chatbots
- Face Recognition
- Pose Estimation
- Sentiment Analysis
- Recommendation Systems
- Self Driving Cars

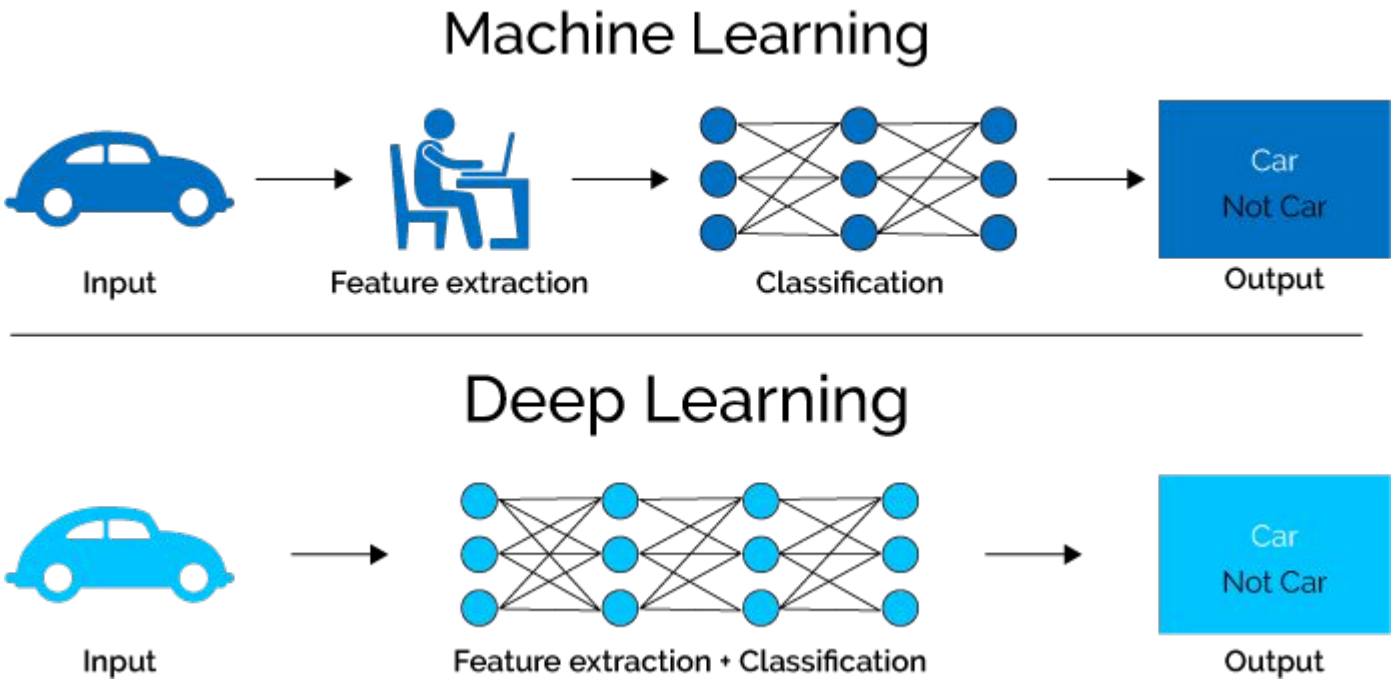
But why people uses Neural Networks over traditional ML algorithms?

Deep Learning Architecture

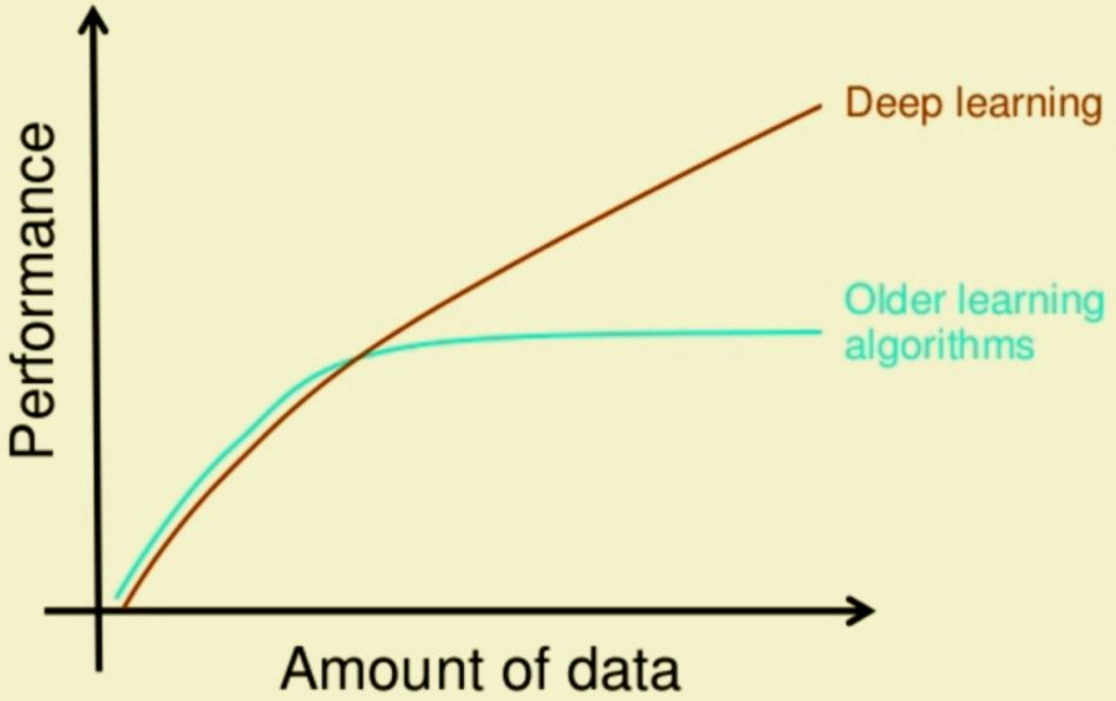


Example of a deep neural net architecture.

But why people uses Neural Networks over traditional ML algorithms?



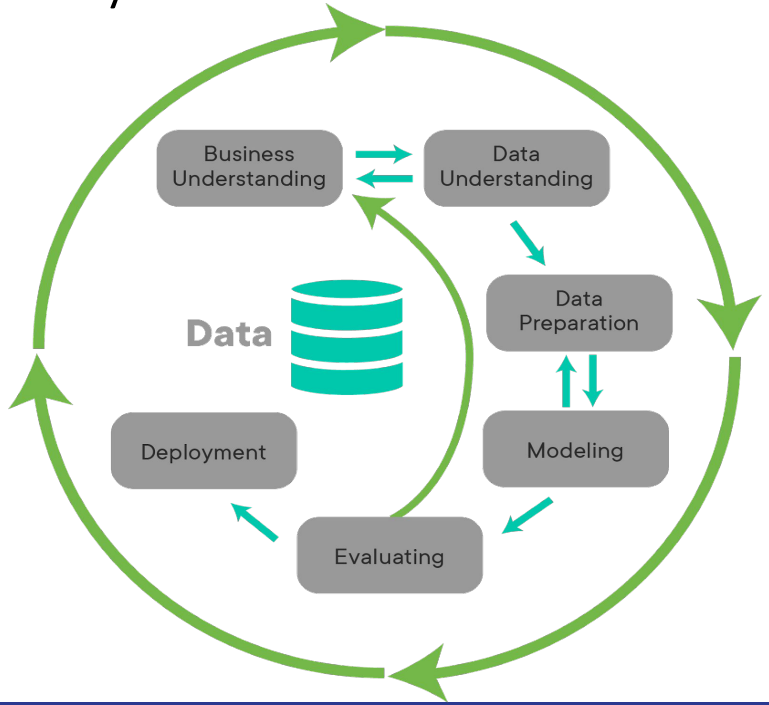
Why deep learning



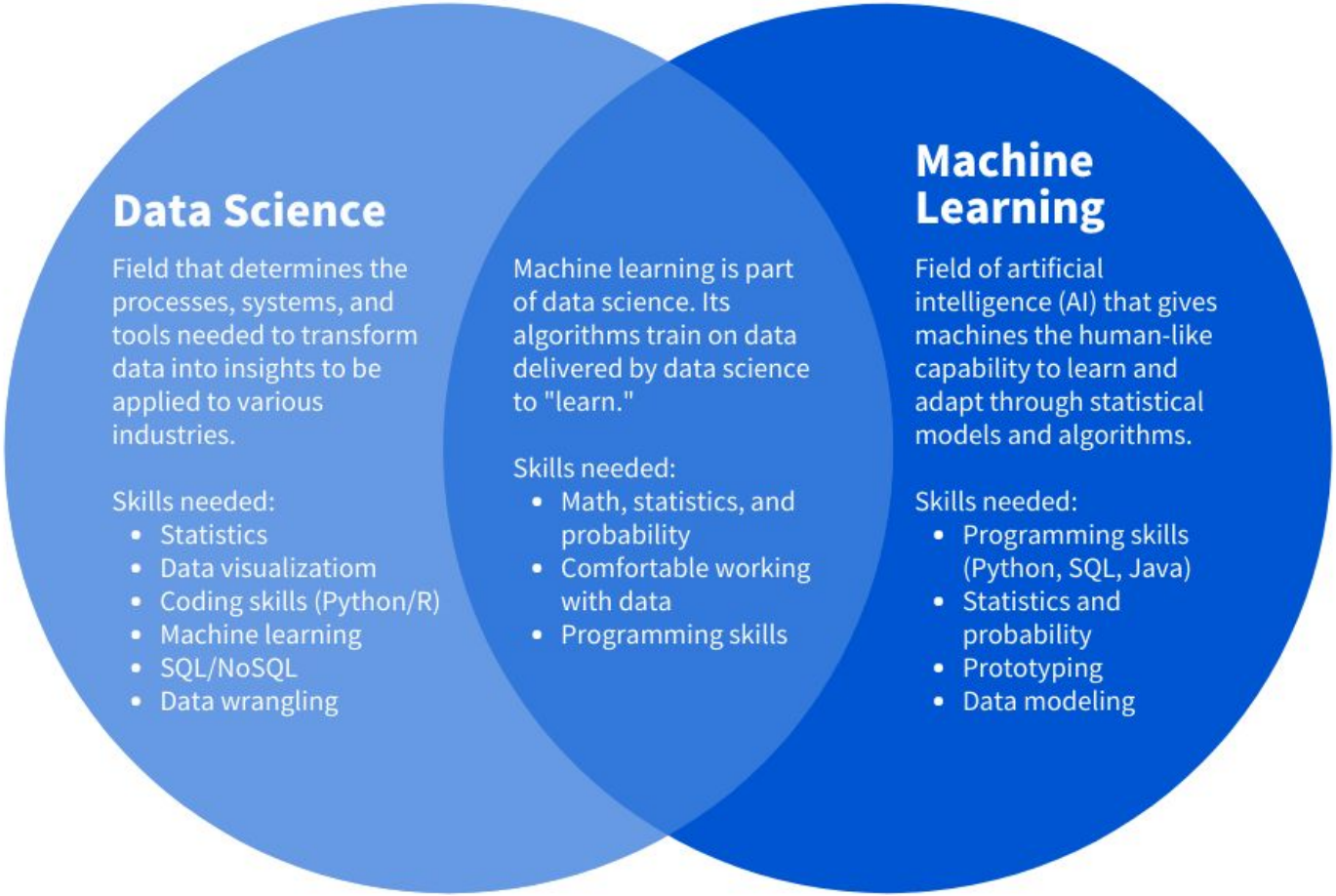
How do data science techniques scale with amount of data?

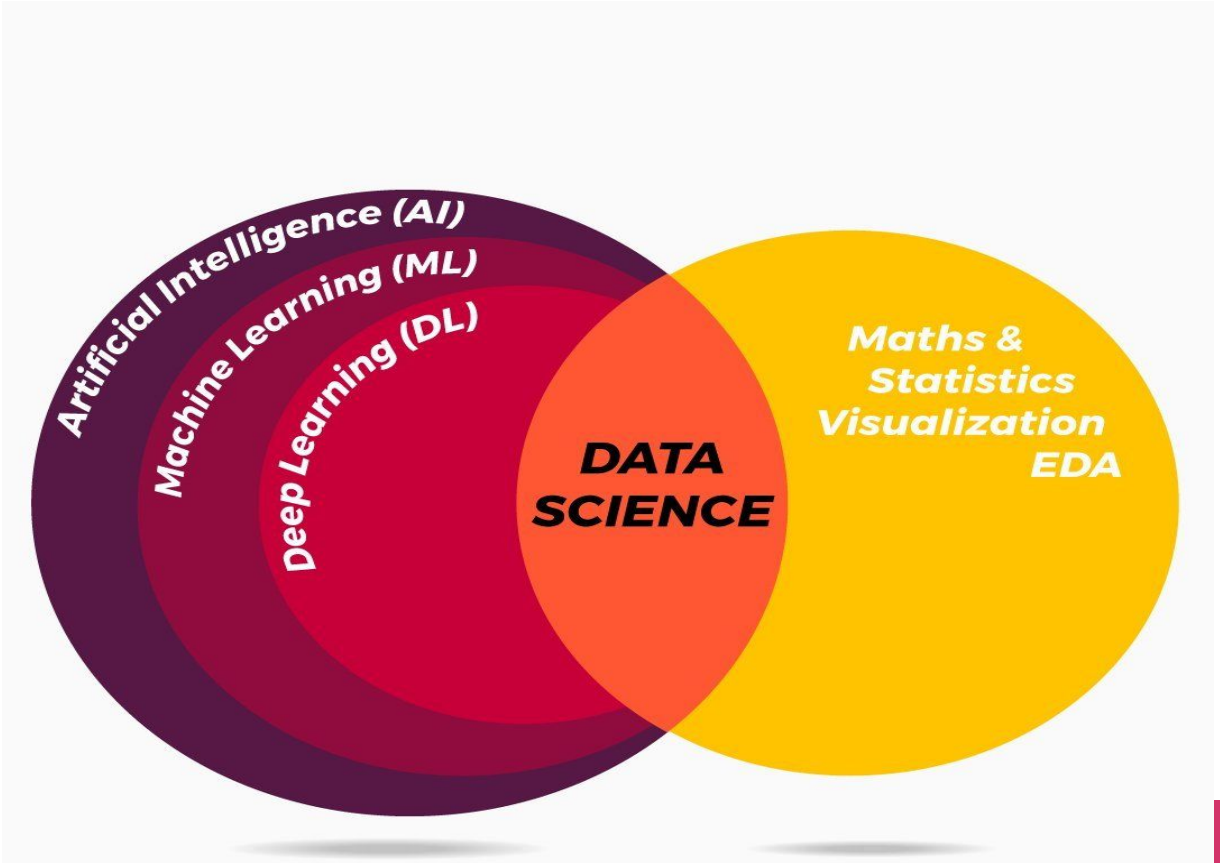
What is Data Science?

Data Science is the analysis and study of data.
Data Scientist is someone who combines the skills of software programmer, statistician and storyteller slash artist to extract the nuggets of gold hidden under mountains of data.



Only the “Modelling” part requires AI/ML algorithms, rest all consist of data collection, data cleaning, data visualization,etc.


Data Science
Field that determines the processes, systems, and tools needed to transform data into insights to be applied to various industries.
Skills needed:
Statistics
Data visualizatiom
Coding skills (Python/R)
Machine learning
SQL/NoSQL
Data wrangling
Machine learning is part of data science. Its algorithms train on data delivered by data science to "learn."
Skills needed:
Math, statistics, and probability
Comfortable working with data
Programming skills
Machine Learning
Field of artificial intelligence (AI) that gives machines the human-like capability to learn and adapt through statistical models and algorithms.
Skills needed:
Programming skills (Python, SQL, Java)
Statistics and probability
Prototyping
Data modeling


Artificial Intelligence (AI)
Machine Learning (ML)
Deep Learning (DL)
DATA SCIENCE
Maths &
Statistics
Visualization
EDA

Let’s Understand about the Data

Labelled vs Unlabelled Data

In the labelled data, we have the target variable where in unlabelled data, we do not have the target variable.

label	gender	age
healthy	m	18
healthy	f	29
healthy	f	34
healthy	m	21
...		
sick	m	68
sick	f	74
sick	m	65

Labelled data

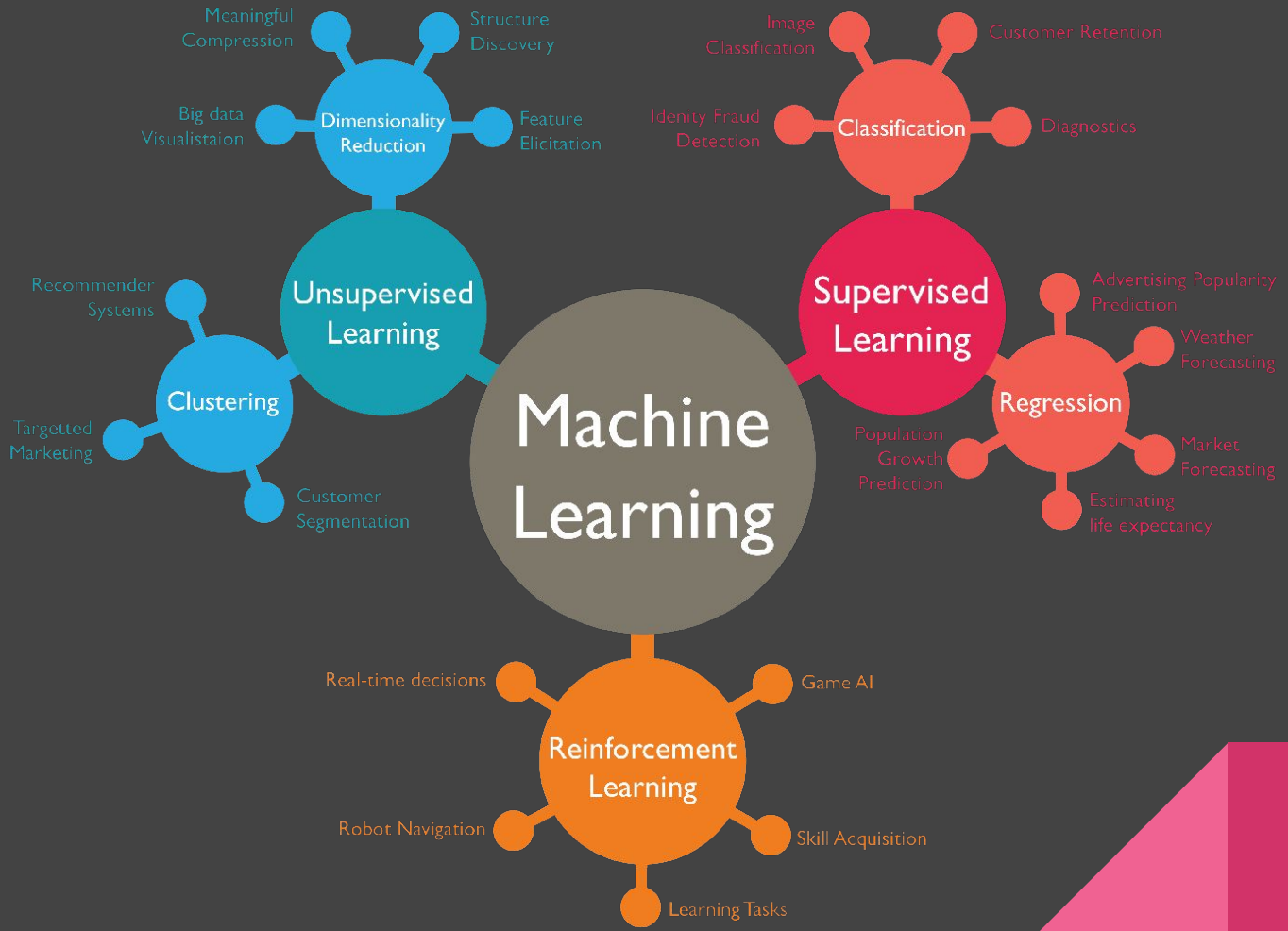
gender	age
f	65
m	21
...	
m	23
f	18
f	75

Unlabeled Data

More Examples:

- House Price Prediction
- Movie Recommendation
- Defining Group in a class
- Classifying Cat and Dog

Labelled Data
Unlabelled Data
Unlabelled Data
Labelled Data


Machine Learning
Unsupervised Learning
Dimensionality Reduction
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Clustering
Recommender Systems
Targetted Marketing
Customer Segmentation
Supervised Learning
Classification
Image Classification
Customer Retention
Idenity Fraud Detection
Diagnostics
Regression
Advertising Popularity Prediction
Weather Forecasting
Population Growth Prediction
Market Forecasting
Estimating life expectancy
Reinforcement Learning
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks

Types of Machine Learning

Supervised Learning

Here we have the labelled data (Training Data) and we try to predict the desired output on the unlabelled data (Testing Data).

Examples:

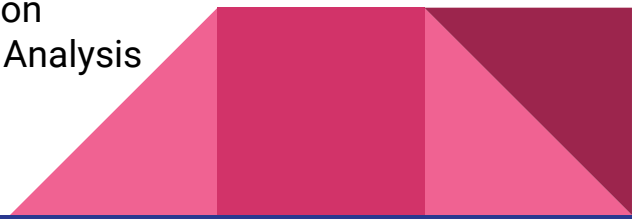
- Spam Email Detection
- Animal Classification
- Price Prediction
- Sentiment Analysis

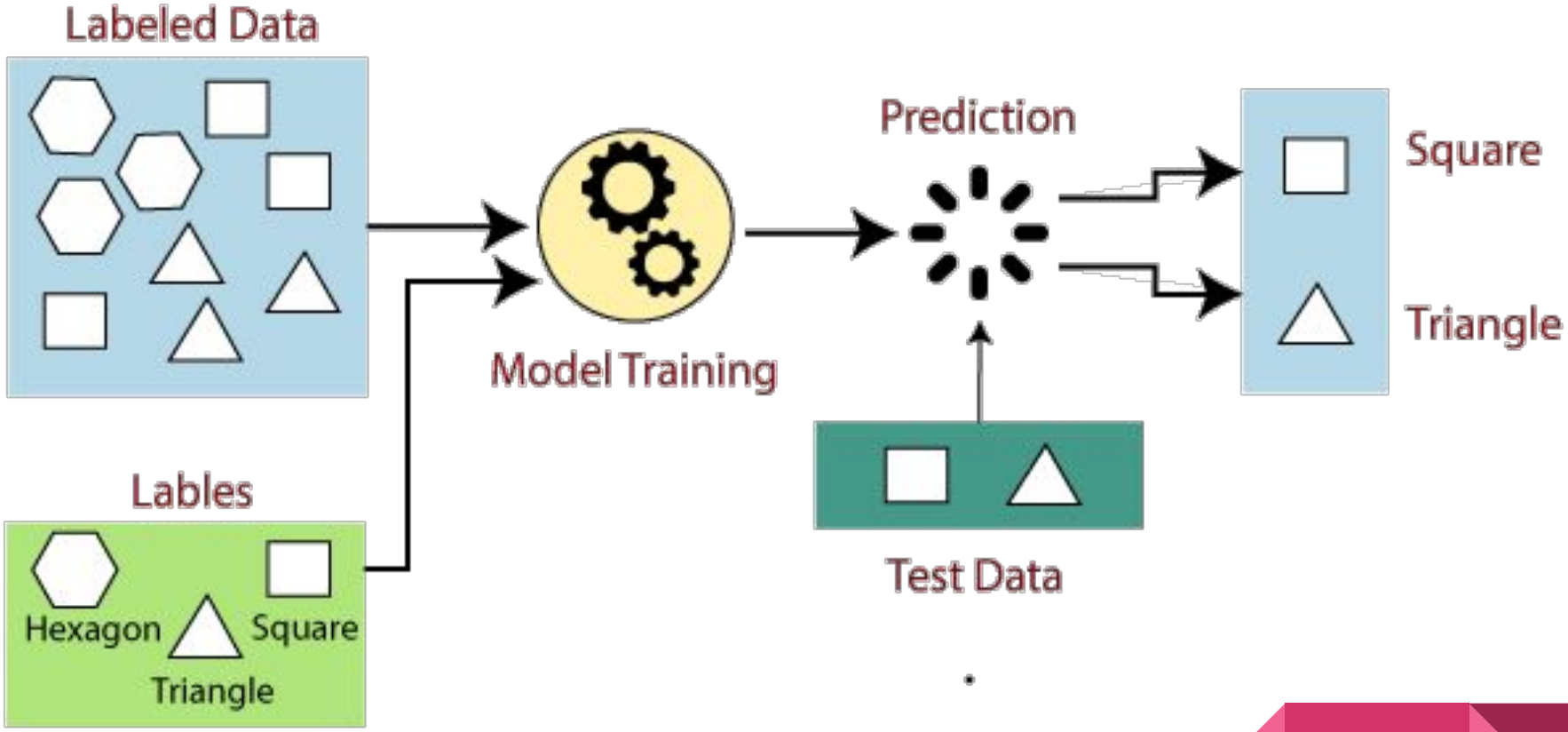
Unsupervised Learning

Here we only have unlabelled data and we try to find some relation(structure or pattern) in that data.

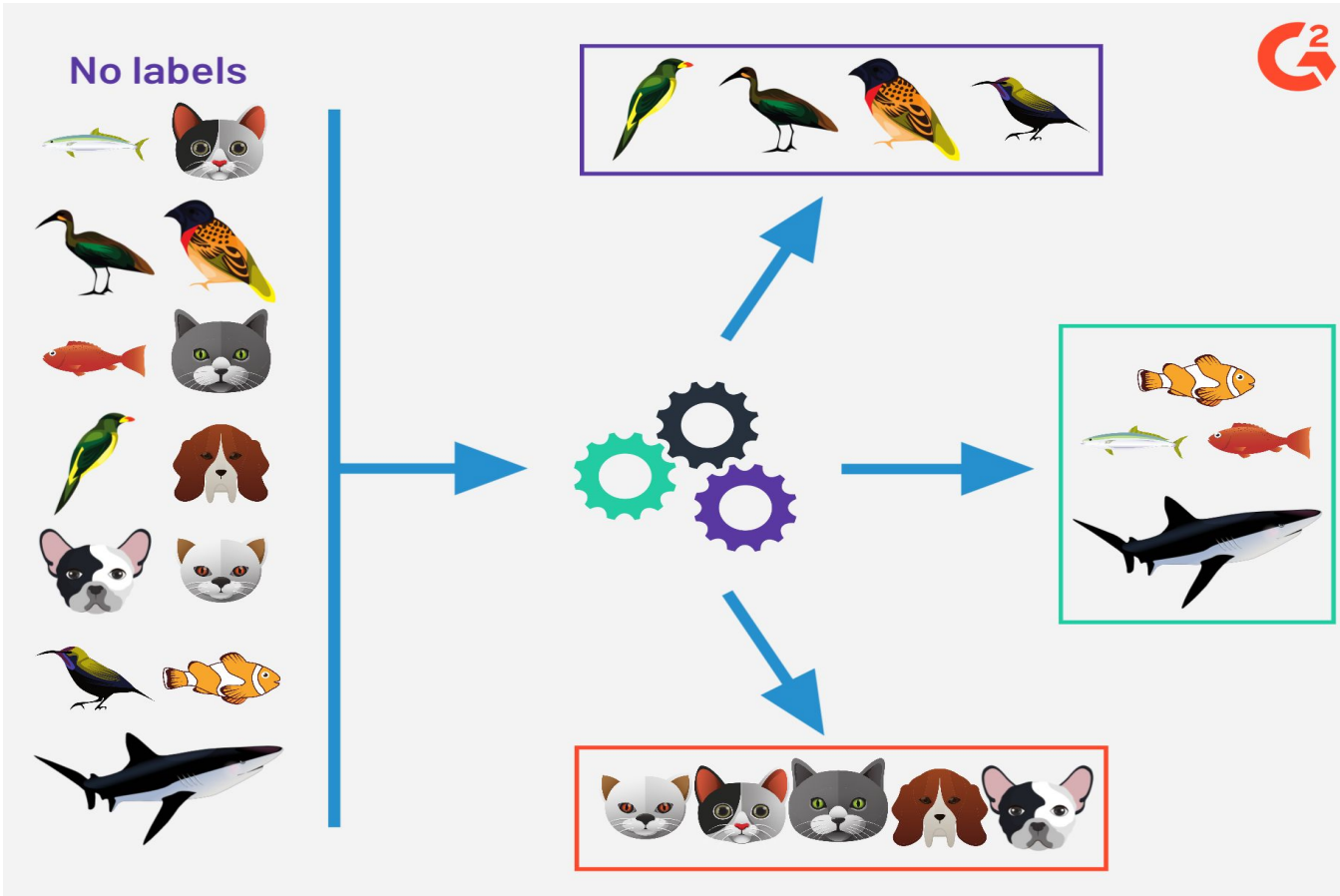
Examples:

- Anomaly Detection
- Clustering of Movies
- Market Segmentation
- Astronomical Data Analysis





Supervised Learning

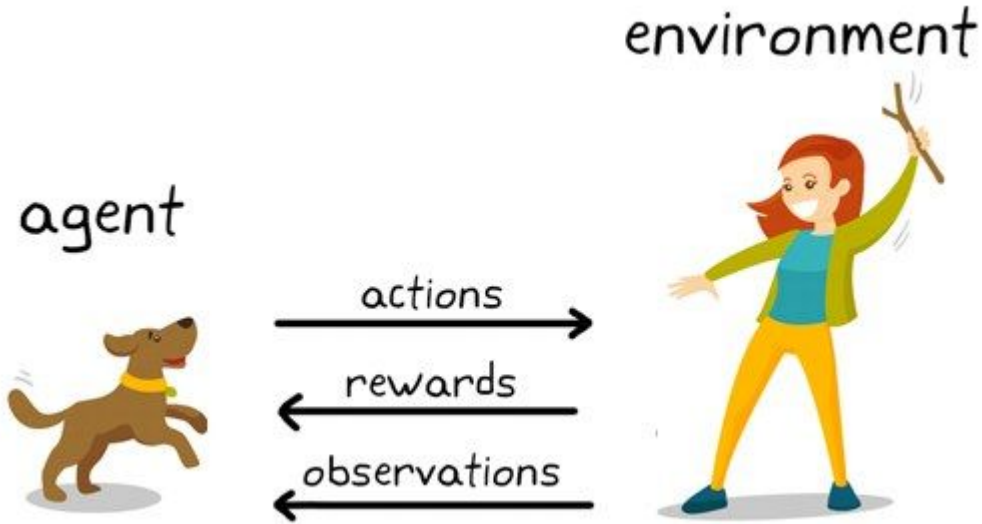


Unsupervised Learning

Reinforcement Learning

Reinforcement Learning(RL) is a type of machine learning technique that enables an agent to learn in an interactive environment by trial and error using feedback from its own actions and experiences.

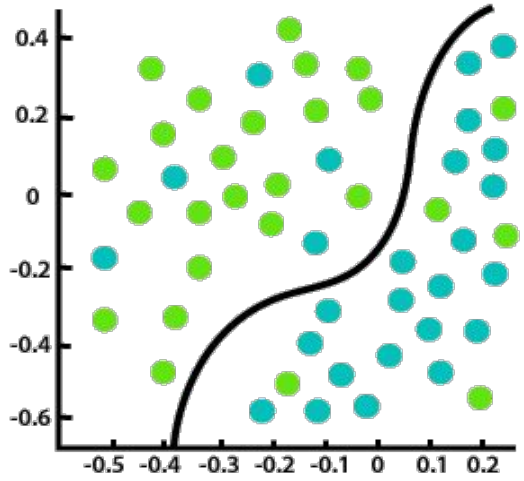
Basically, it is “Learning from Mistakes”. RL uses **rewards and punishment** as signals for positive and negative behaviours.



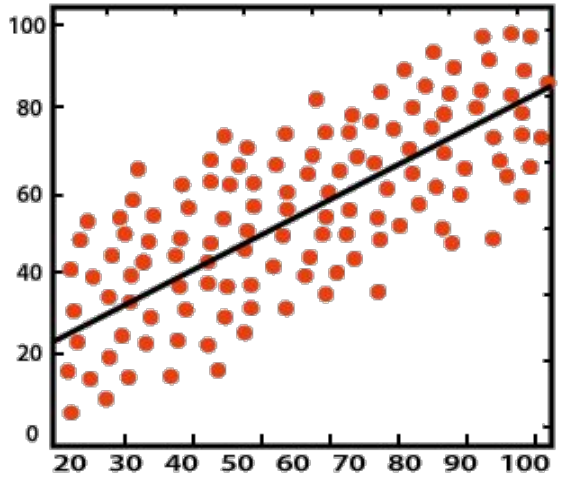
Classification Vs Regression

They are the 2 types of algorithm in supervised learning.

The main difference between Regression and Classification algorithms is that - **Regression Algorithms** are used to **predict continuous values** such as price, salary, time,etc. While **Classification Algorithms** are used to **predict/classify discrete values** such as Male/Female, True/False, Cat/Dog/Rabbit/Parrot,etc.



Classification



Regression

Bhot Jyada ho gaya hai ab, Baki ka baad me batayenge.