What is Artificial Intelligence?

Artificial Intelligence (AI) is the branch of computer science that focuses on giving machines or computers the ability to think as intelligently as humans and in some cases better than humans, learning from a lot of data.

The goal of AI is to capture the collective intelligence of humans and do a given task better than any individual human can ever do.
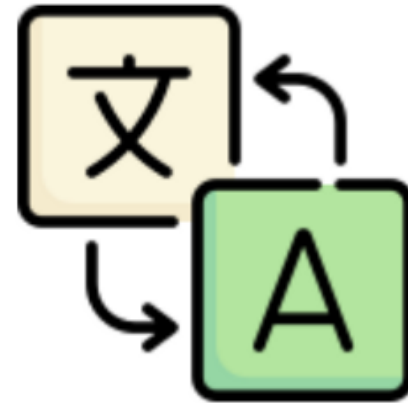
AI applications in the modern-day world

Self driving cars

Language Translation

Detecting credit card Fraud

Artificial voices (Siri, Google home)

Recommendation Engines

Facial Recognition

What is Data Science?

Data Science is a comprehensive process that involves data collection, data cleaning, data visualization, and using various statistical or AI techniques to solve a problem. Artificial Intelligence techniques are a part of the data science process.

Data Science = Data Collection / Cleaning/ Transformation/ Visualization + Statistics + Applied AI
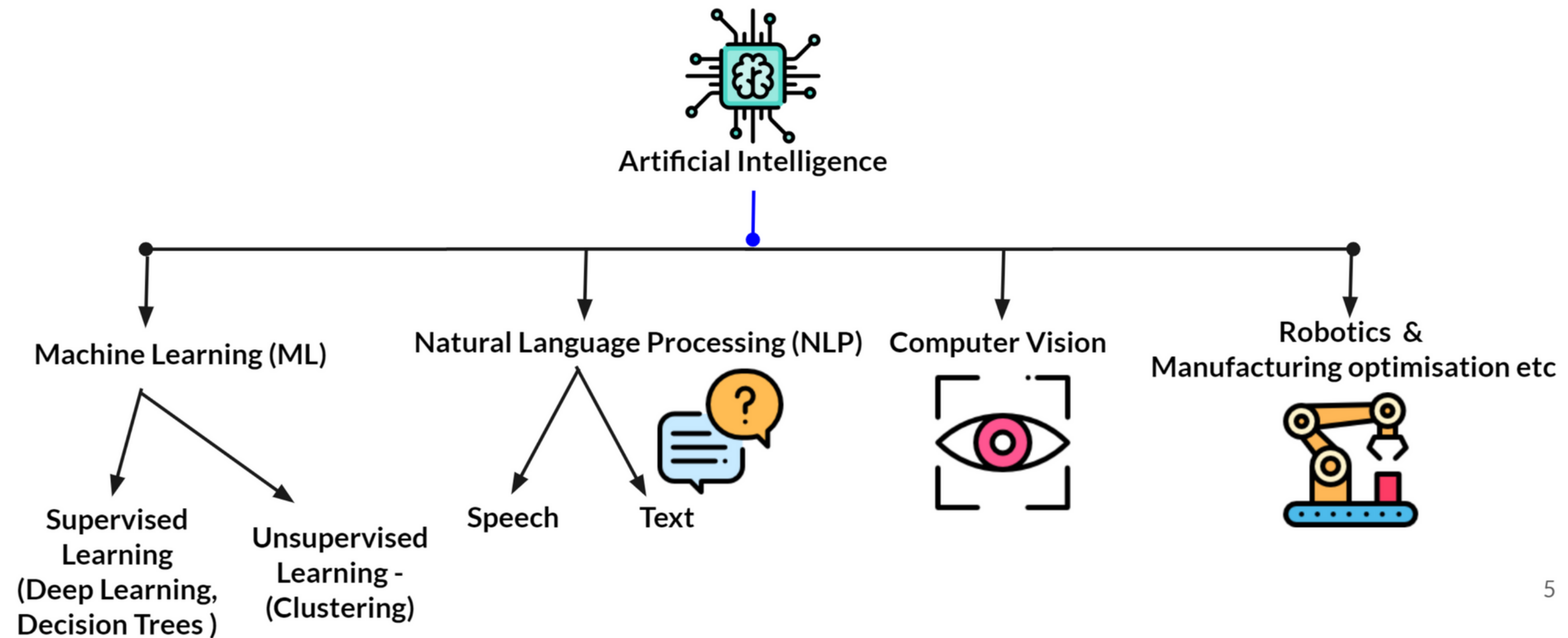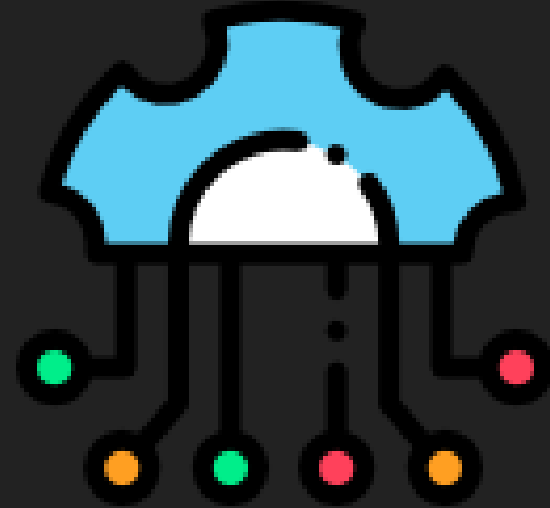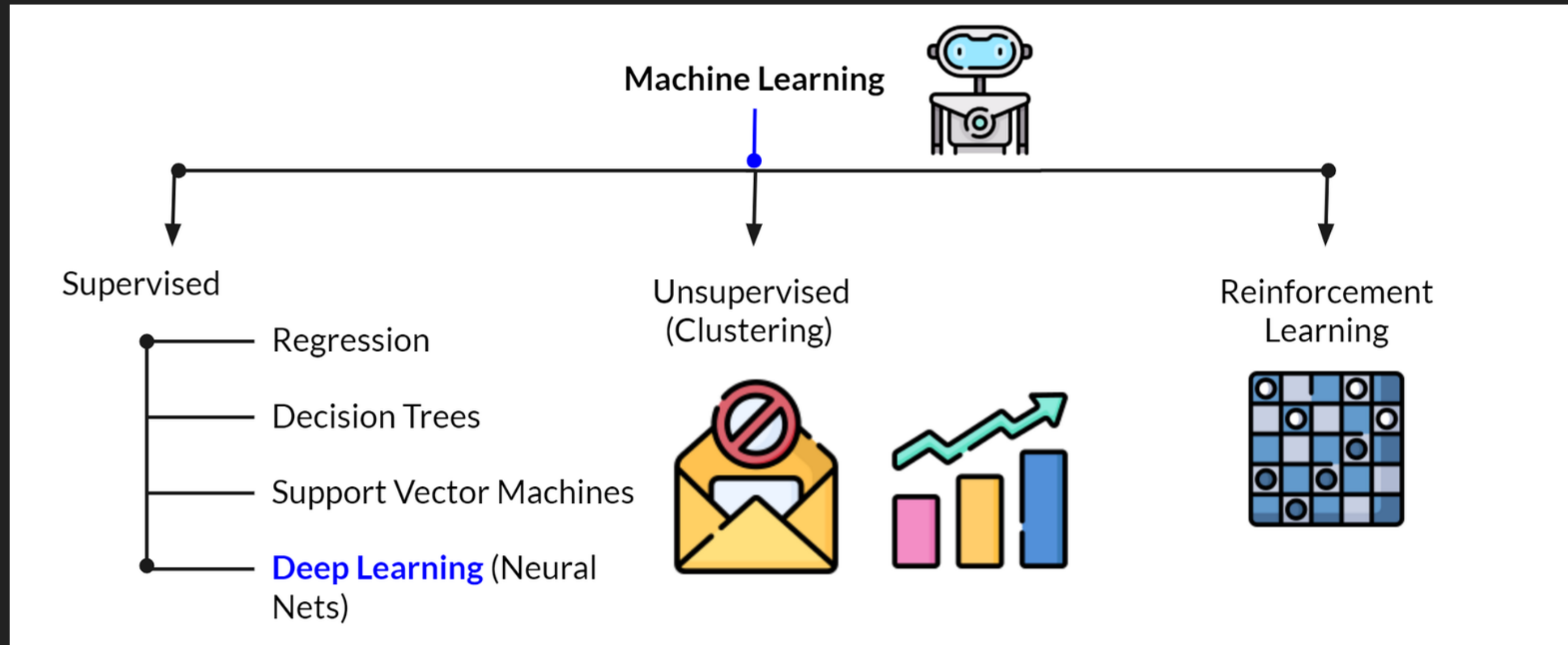
Components of AI

1. Components of AI — Machine learning (ML)

Machine Learning is a subfield of AI that uses algorithms to automatically learn how to perform a given task without being explicitly programmed with rules.

1.1 Components of Machine Learning (ML)

Machine learning has 3 main branches under it —
Supervised learning, Unsupervised Learning, and
Reinforcement Learning.

Let's take the example of how a small kid learns and apply that
to understand these different sub-branches of Machine
learning.

Supervised learning

Assume that you have a fruit basket with several kinds of fruits. First, you show each fruit to the kid and tell him/her what it is called. Eg: Apple, Banana, Orange, Pomegranate, etc

Then you give a new fruit basket and ask him/her to identify (classify) the fruits in it. This is called supervised learning. You provided labels (fruit names) with training examples (fruits) initially and the kid learns. Then you use his/her learning to classify the fruits in a new fruit basket automatically.

Supervised learning Contd..

Under supervised learning, there are several kinds of algorithms like decision trees, support vector machines, deep learning (neural nets), etc. You can assume these algorithms are like different brains. Each of them has its own learning capabilities and complexities.

Identifying credit card fraud, predicting house prices, etc are examples of supervised learning where you use historical knowledge from training to predict the outcome for a new sample.

Unsupervised learning

Take the same problem as above. If you give a fruit basket and ask the kid to separate fruits into different groups without giving any initial knowledge of what each fruit is called, that is called unsupervised-learning (clustering).

In this case, the kid uses his/her intuition to cluster the fruits based on shape, color, etc. Here there are no explicit labels (fruit names) given beforehand for each of the fruit in the basket.

Unsupervised learning Contd

Identifying customer segments in shopping, spam vs non-spam email filtering, etc are examples of unsupervised learning.

Giving a training dataset with labels (names) vs just giving data to cluster into a fixed number of categories is the main difference between supervised and unsupervised learning.

Reinforcement learning

If you let the kid learn a game by playing it but not explicitly telling any rules, it falls under the category of reinforcement learning. You give a reward for every right action taken and after several attempts, the agent (kid or machine) will learn to do the task automatically.

Teaching machines to play games like Alpha Go, teaching robots to do a certain task automatically, etc are examples of reinforcement learning.

1.2 Special Focus — Deep Learning (DL)
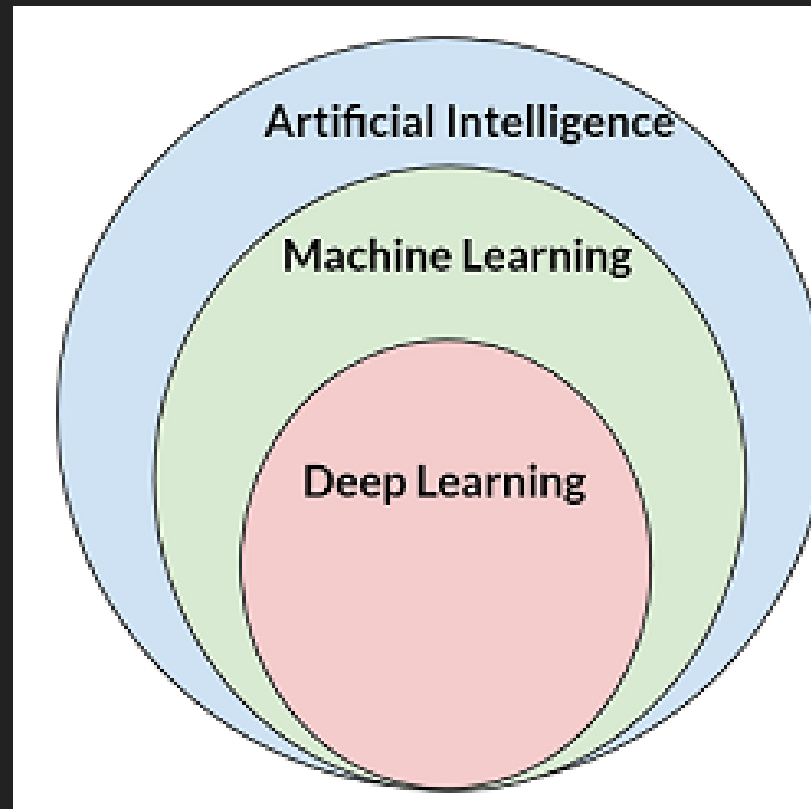
Deep learning is a part of machine learning that uses a set of algorithms called Artificial Neural Networks inspired by the human brain.

Deep Learning (DL) contd..

A simple neural network

input layer   hidden layer   output layer
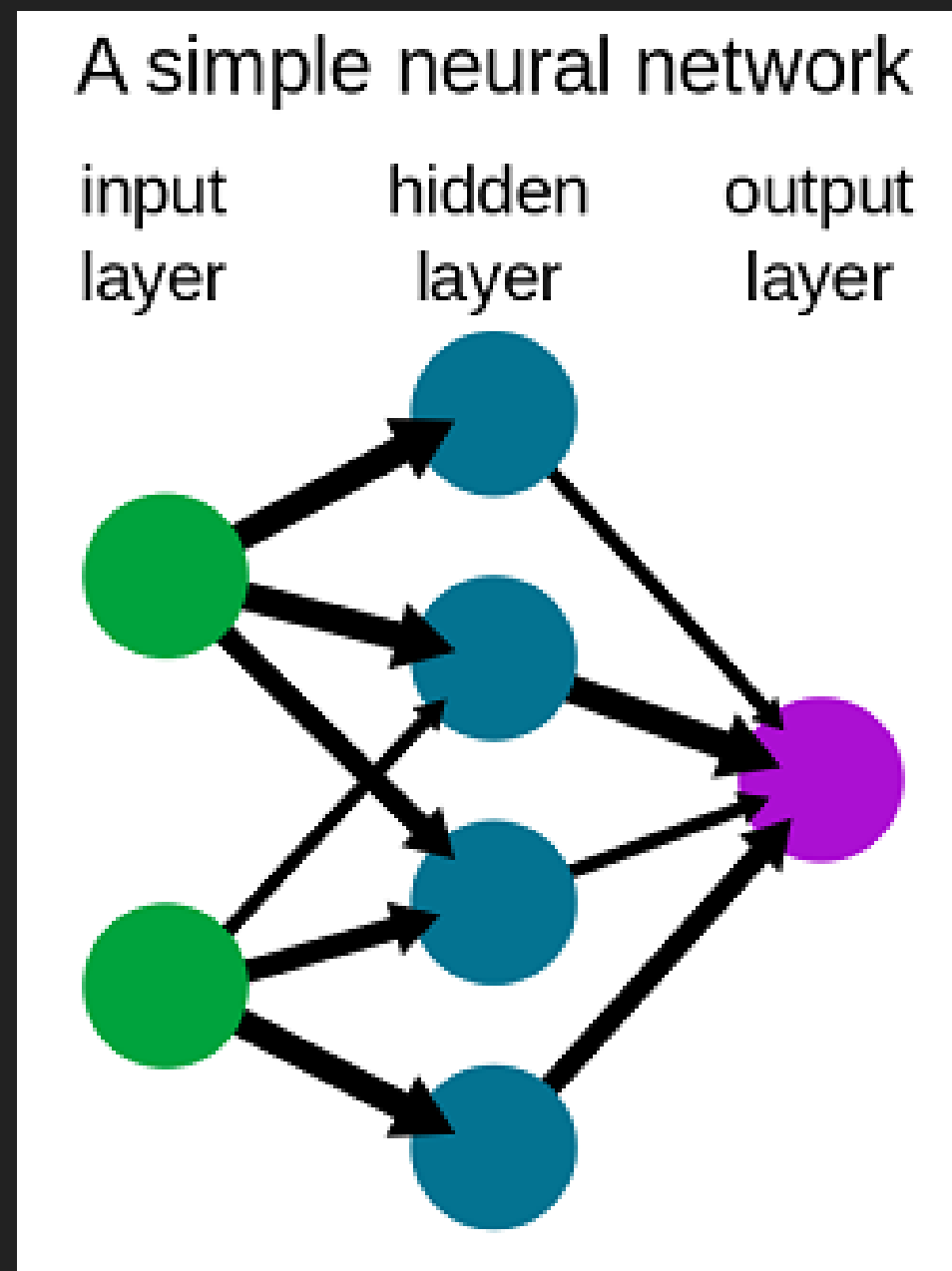
It is the closest algorithm that tries to mimic the human brain. Just like the human brain has neurons, there are artificial neurons that form a network in deep learning. Each artificial neuron is just a mathematical function that takes a weighted combination of inputs and produces an output.

Deep Learning (DL) contd..

What used to be another algorithm called Neural Networks under Machine Learning, rose to fame rebranding itself as Deep Learning because of modern-day GPU computing power.

Now, most of the AI/ML problems are primarily solved with deep learning. Hence the special focus.

2. Components of AI — Computer Vision
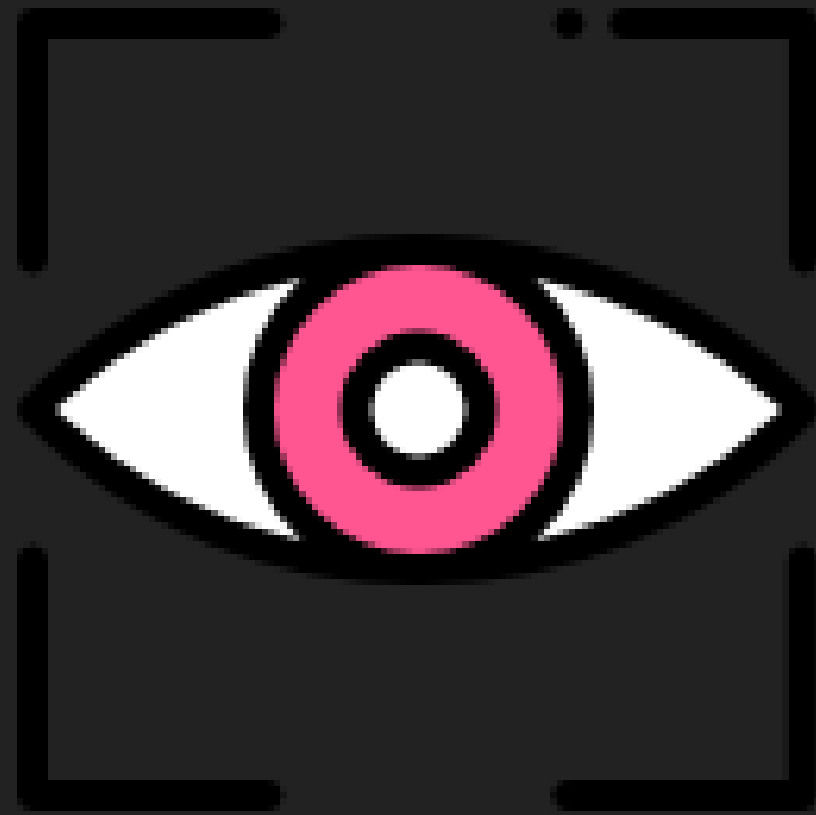
Computer Vision is a subfield of AI that uses algorithms to understand images and videos, the same way a human eye does.

Computer Vision Applications

Face detection and Recognition

Optical Character Recognition

Automatic tagging of image

Image generation (GAN)

Virtual Reality

Drone Terrain Mapping

3. Components of AI — Natural Language Processing

Natural Language Processing is a subfield of AI that uses algorithms to understand, interpret, and manipulate human language (text and speech).

Natural language Applications

Voice assistants (Alexa, Siri, Google Home etc)

Question answering systems

Text summarization algorithms

Chatbots

Sentiment Analysis

Machine Translation