Artificial Intelligence

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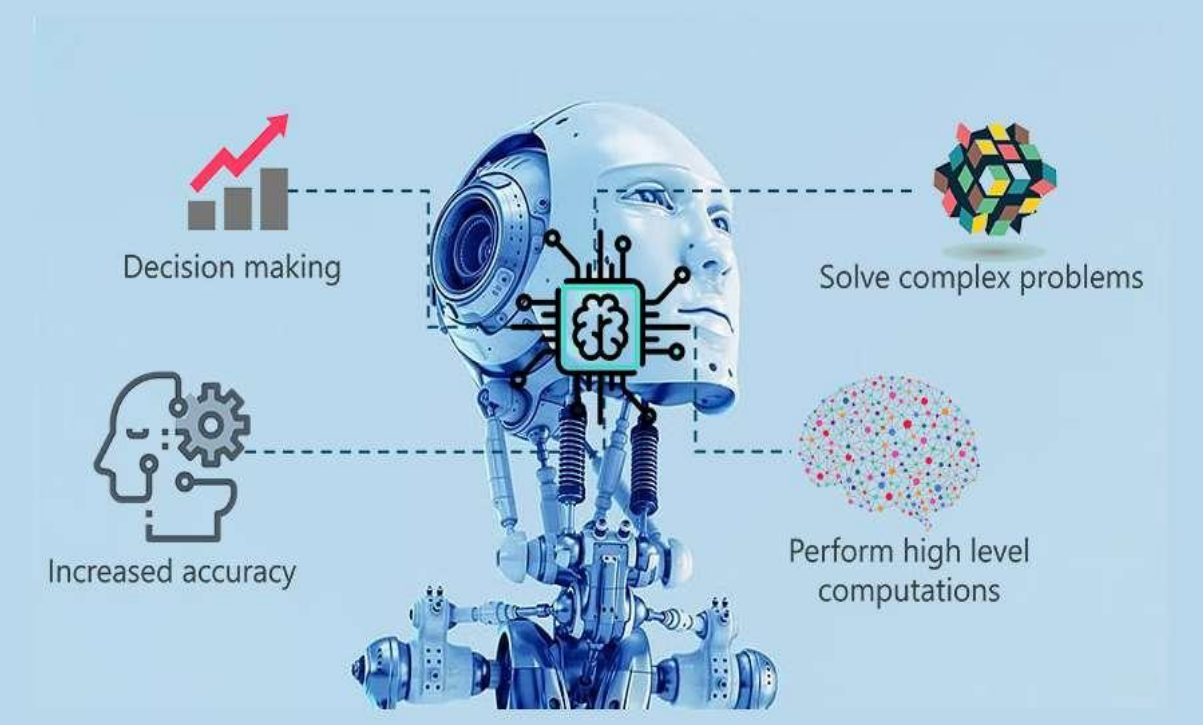
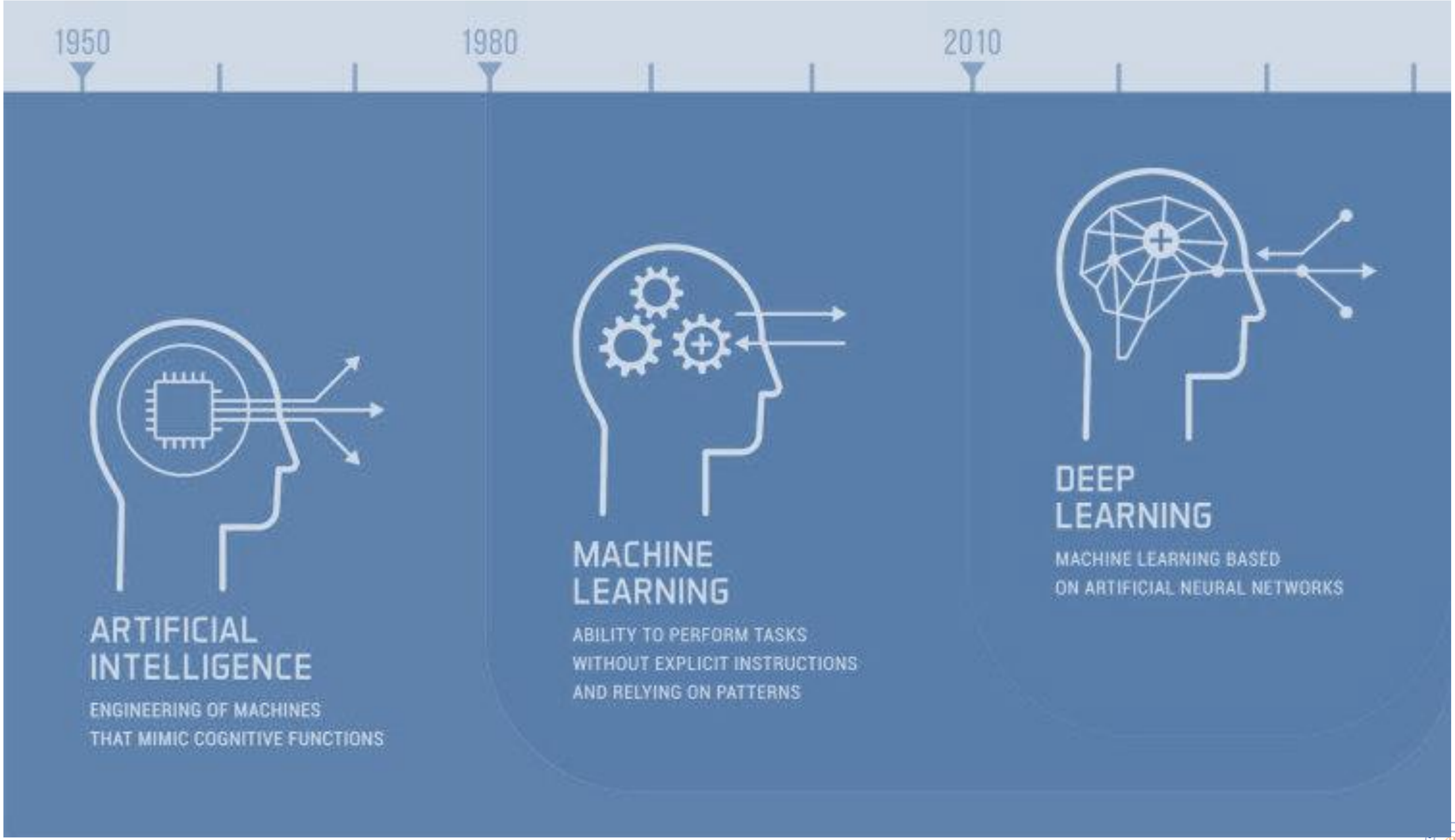
What is Artificial Intelligence

The theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.



Artificial intelligence **is a field, which combines computer science and robust datasets, to enable problem-solving**.

Artificial Intelligence History



ARTIFICIAL INTELLIGENCE

ENGINEERING OF MACHINES THAT MIMIC COGNITIVE FUNCTIONS

MACHINE LEARNING

ABILITY TO PERFORM TASKS WITHOUT EXPLICIT INSTRUCTIONS AND RELYING ON PATTERNS

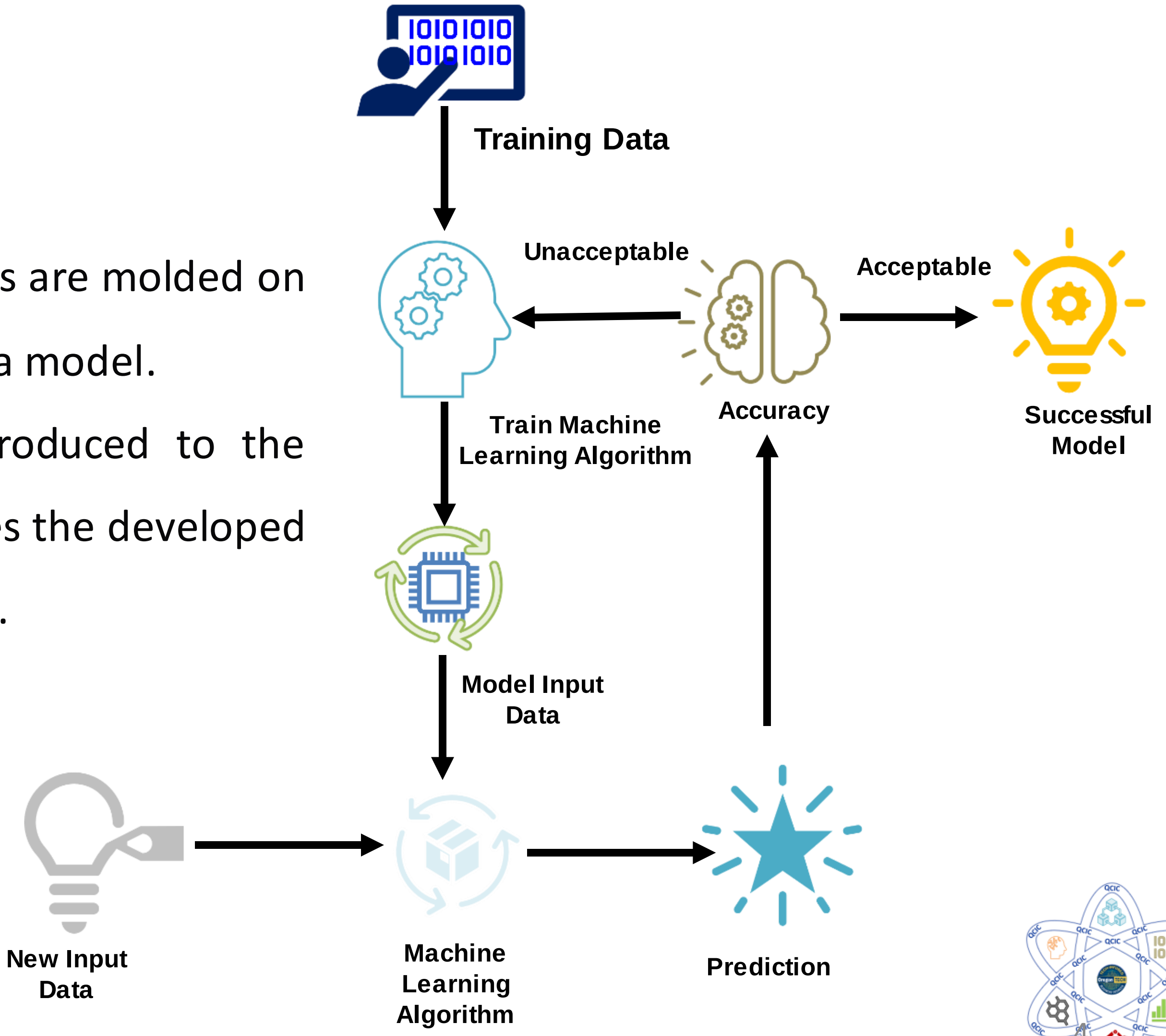
DEEP LEARNING

MACHINE LEARNING BASED ON ARTIFICIAL NEURAL NETWORKS

https://www.5gworldpro.com/blog/2022/08/15/artificial-intelligence-vs-machine-learning-vs-deep-learning-whats-the-difference/

How Machine Learning Works

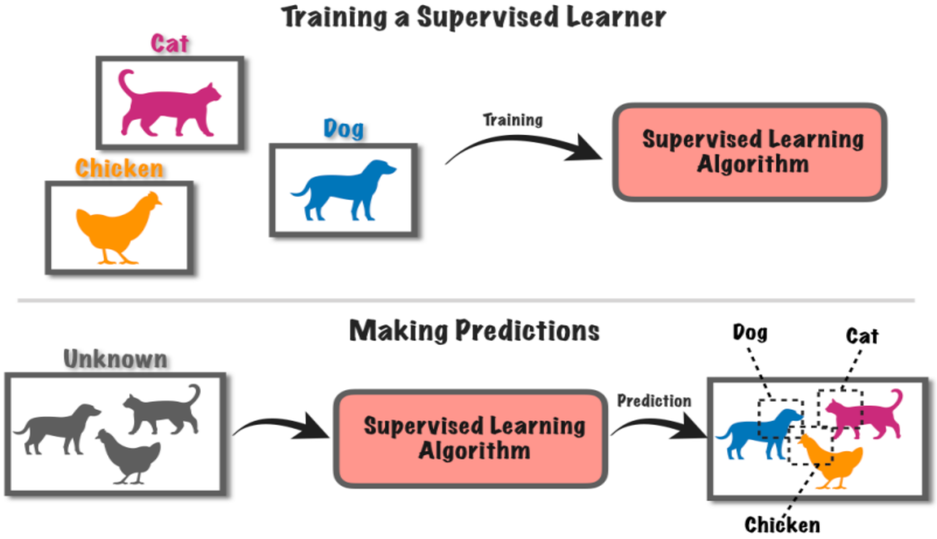
- Machine learning algorithms are molded on a training dataset to create a model.
- As new input data is introduced to the trained ML algorithm, it uses the developed model to make a prediction.



Type of Machine Learning - 2

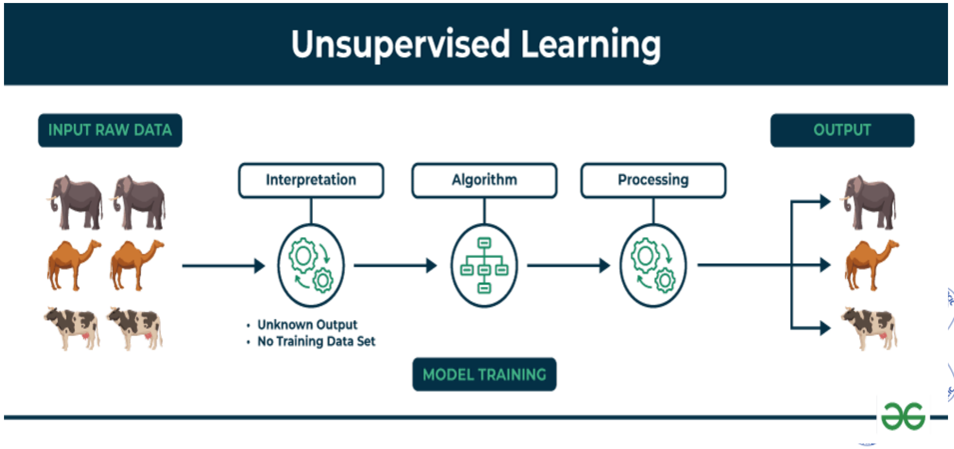
Supervised

Training with labeled data includes desired outputs


Training a Supervised Learner
Cat
Chicken
Dog
Training
Supervised Learning Algorithm
Making Predictions
Unknown
Supervised Learning Algorithm
Prediction
Dog
Cat
Chicken

Unsupervised

Training unlabeled data does not include desired outputs



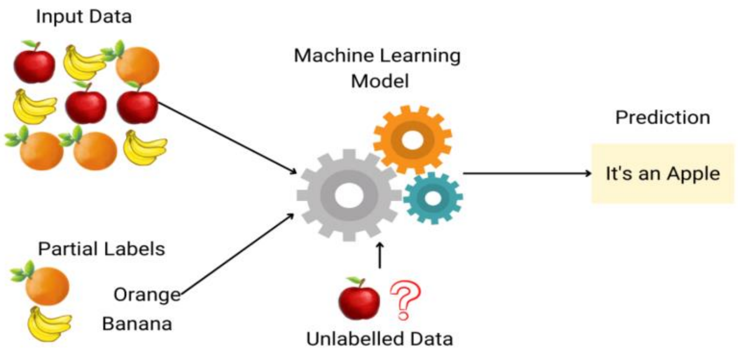
Labeled Data: Cat, Dog, Chicken

Unlabeled Data: Group of Animals

Type of Machine Learning -2

Semi supervised

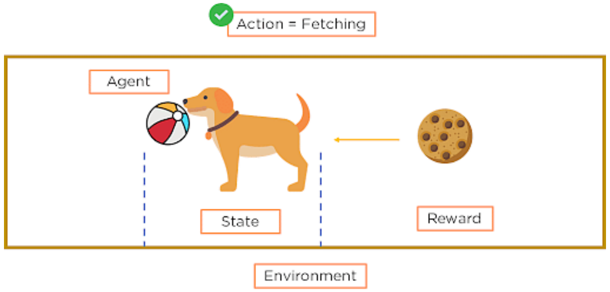
Training partial labeled data includes a few desired outputs



Partial Labeled: Train the system with partial labeled data, not complete Machine will find the fruit from the group of fruits.

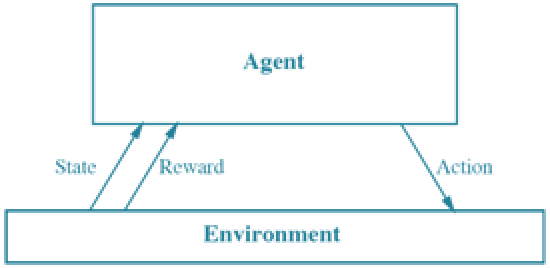
Reinforcement

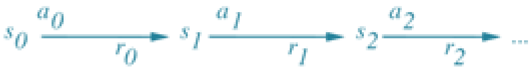
Rewards from sequence of actions

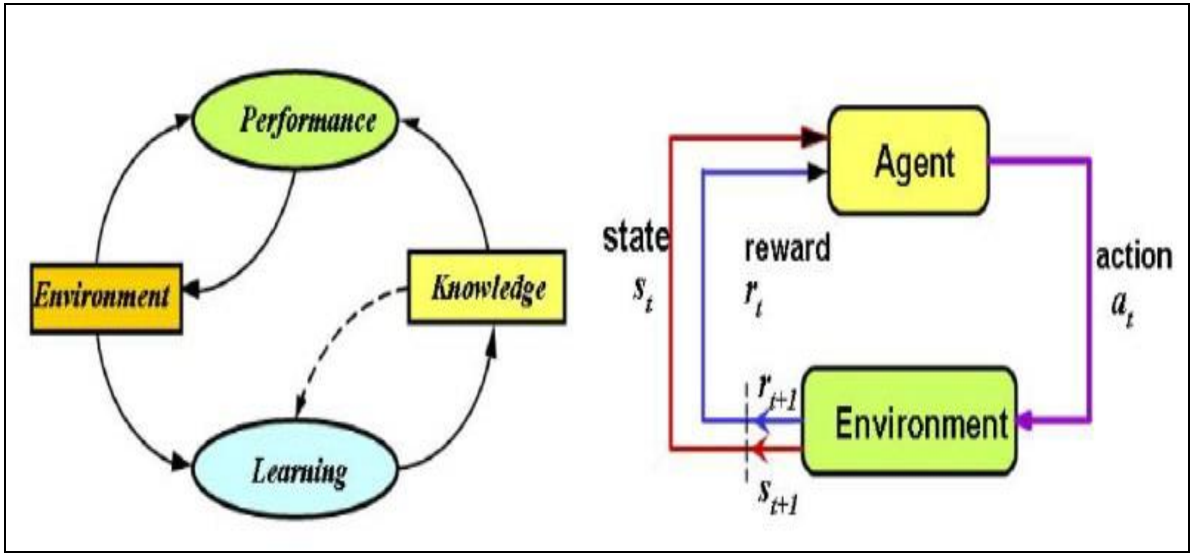


Reinforcement Learning

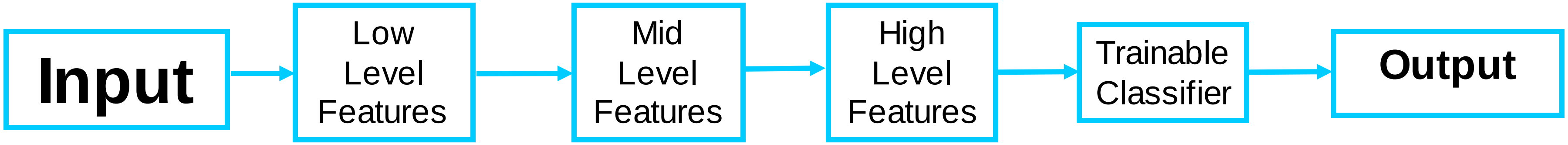
- **Policy**: what to do
- **Reward**: what is good
- **Value**: what is good because it *predicts* reward
- **Model**: what follows what




$s_0 \xrightarrow[r_0]{a_0} s_1 \xrightarrow[r_1]{a_1} s_2 \xrightarrow[r_2]{a_2} \cdots$



Deep Learning



Input

Low Level Features

Mid Level Features

High Level Features

Trainable Classifier

Output

- **Image**

  Pixel → Edge → Texture → Motif → Part → Object

- **Text**

  Character → Word → Word-group → Clause → Sentence → Story

Deep Learning Process

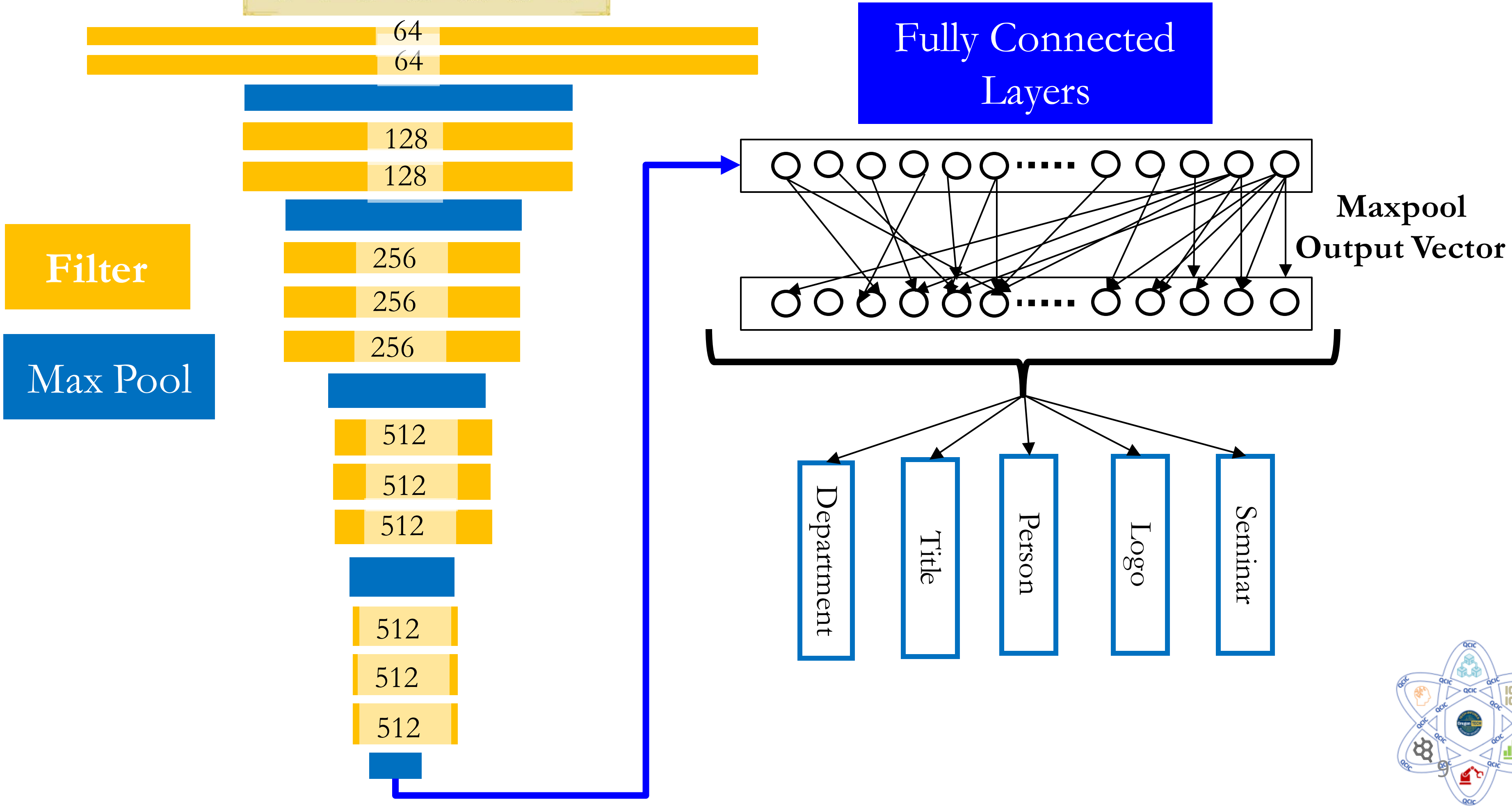
Feature Extraction Architecture

Short Term Course
on
"EMERGING TRENDS ON INTERNET OF THINGS WITH EXPERIMENTAL LEARNING"
February 22nd to 27th, 2021
Organized By
Department of
Electronics and Communication Engineering
National Institute of Technology Sikkim
Ravangla, South Sikkim, India, -737139
Website: www.nitsikkim.ac.in
Under the Aegis of
TEQIP-III, NPIU
MoE, Govt. of India

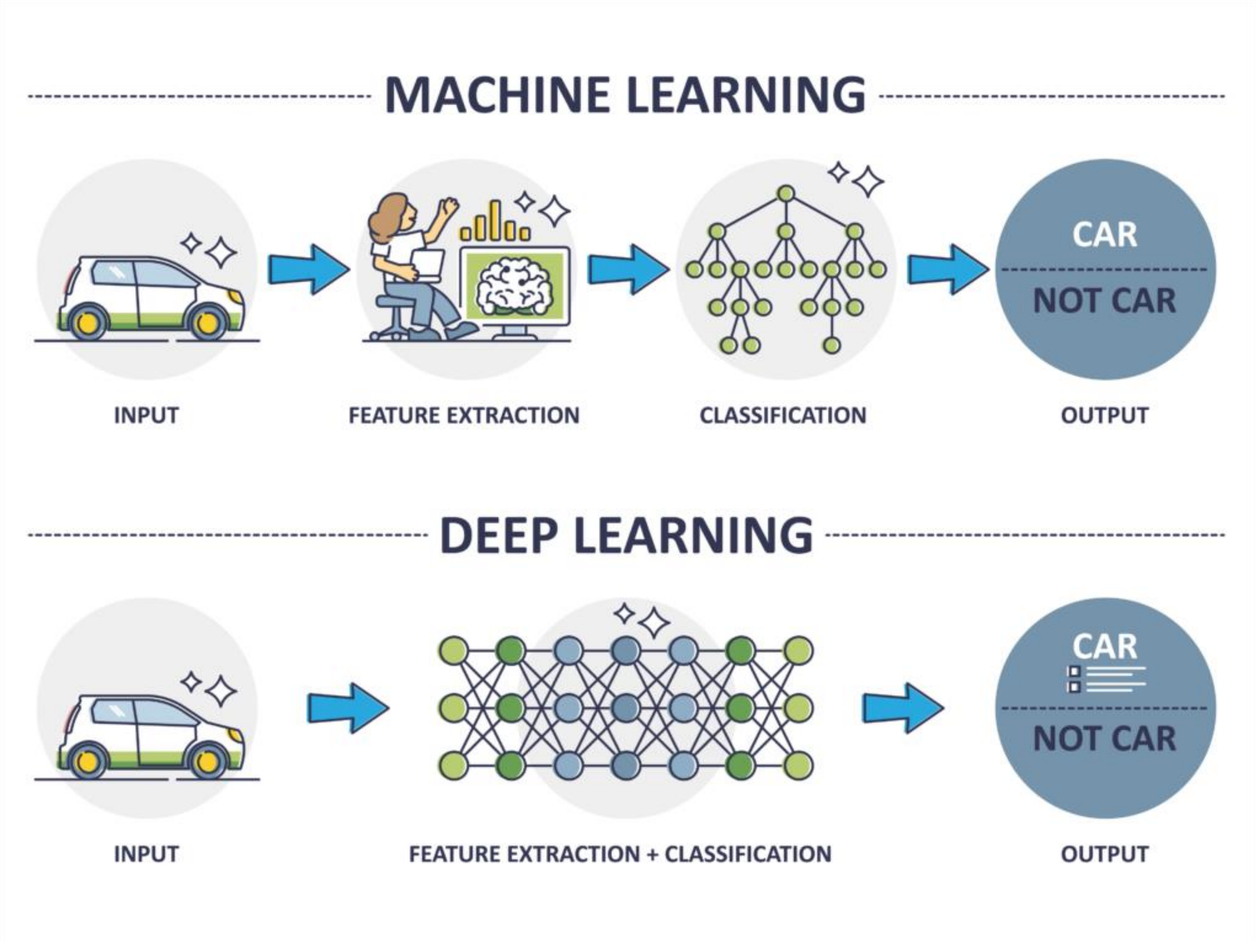
TEQIP-3

Distinguished Speakers

Prof. M. C. Govil, Prof. Brejesh Lall, Prof. Dhananjay Singh, Dr. Naveen Singh Rajput, Dr. Pilli Emmanuel Shubhakar, Dr. Amit Singhal, Dr. Madhusudan Singh



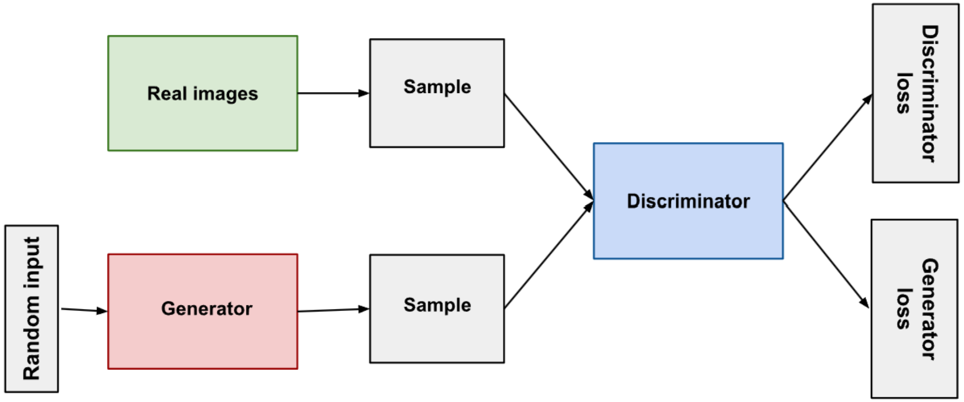
Machine Learning Vs. Deep Learning

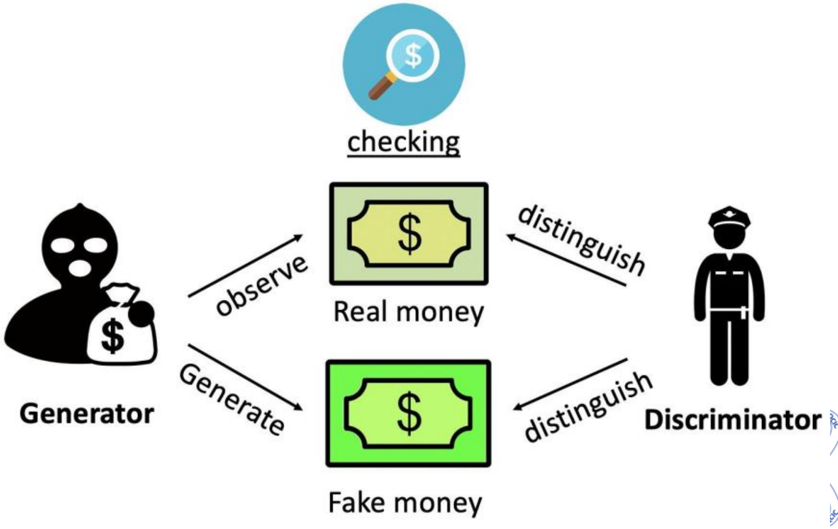


https://www.ait.de/en/deep-learning/

Generative Models

- Type of Machine learning models that can generate something new (image/text) after learning from a set of existing (image/text) data.
- **Generative Adversarial Networks (GAN)** : used for generating images/texts
- GAN has two important components :
  - Generator
  - Discriminator



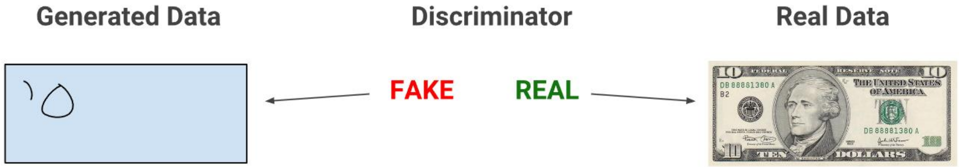


Generative Adversarial Networks GAN

- Discriminator : The **discriminator** learns to distinguish the generator's fake data from real data. The discriminator penalizes the generator for producing implausible results.

- Generator : The **generator** learns to generate plausible data. The generated instances become negative training examples for the discriminator.

- When training begins, the generator produces obviously fake data, and the discriminator quickly learns to tell that it's fake:



Generated Data

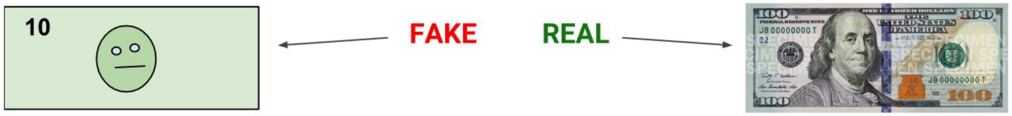
Discriminator

Real Data

FAKE

REAL

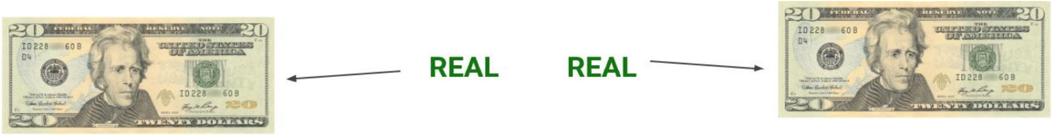
- As training progresses, the generator gets closer to producing output that can fool the discriminator:



FAKE

REAL

- Finally, if generator training goes well, the discriminator gets worse at telling the difference between real and fake. It starts to classify fake data as real, and its accuracy decreases.



REAL

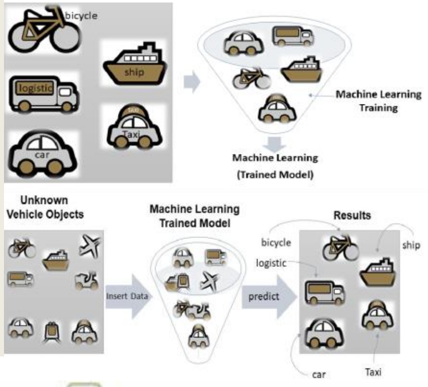
REAL

Source : developers.google.com

AI Overivew

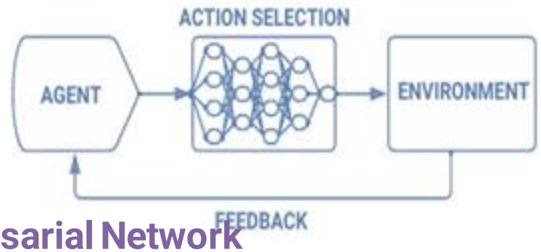
- Artificial Intelligence (AI) is a multidisciplinary field of science and technology focused on ***creating systems capable of performing tasks that typically require human intelligence***.

- Machine Learning
  - Supervised
  - Unsupervised
  - Semi Supervised



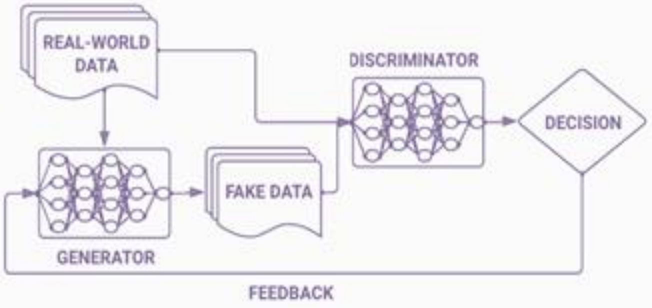
Reinforcement Learning

... from reinforcement learning systems where AI agents learn how to interact with their environments ...



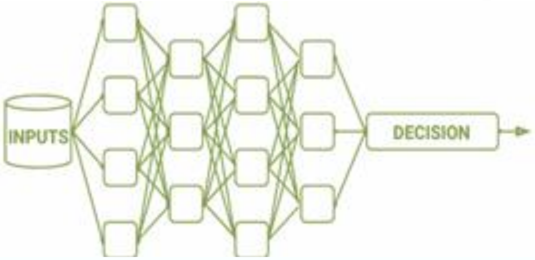
Generative Adversarial Network

... to GANs, where a generator learns how to produce outputs that can fool a discriminator ...



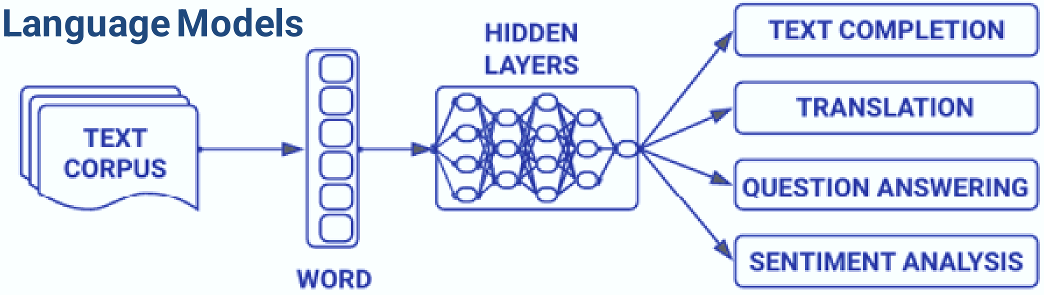
Deep Learning

Deep learning is a general AI architecture modelled off of neural networks. It can be adapted for many tasks ...



Large Language Models

... to massive natural language models that can perform a wide range of language-related tasks.

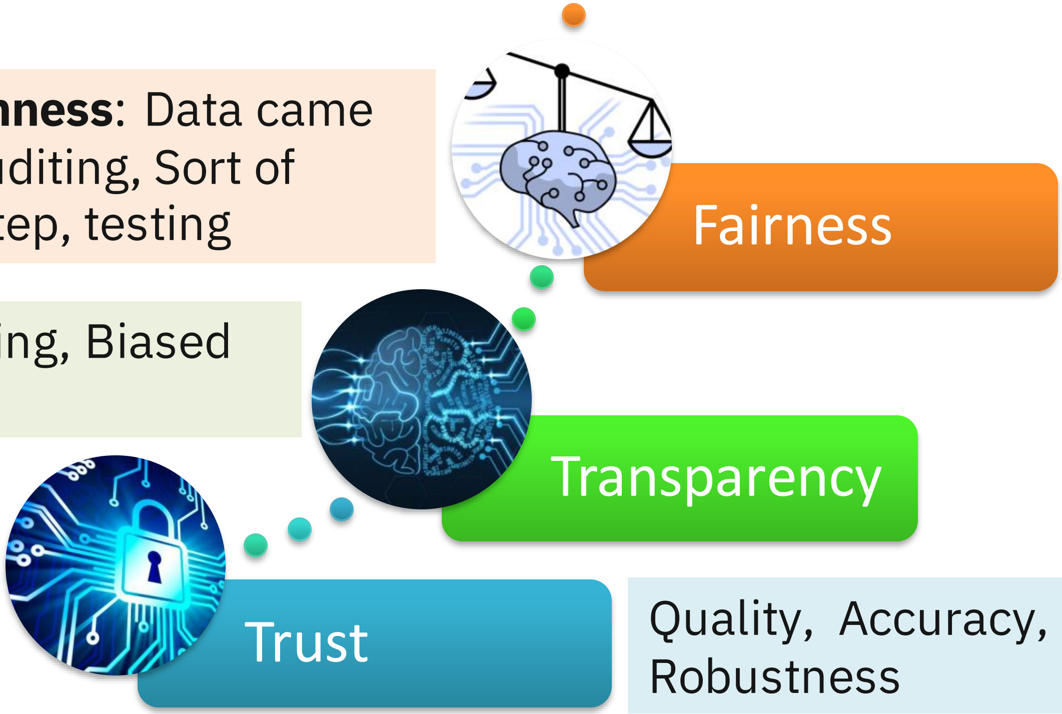


Trustworthy AI

Generative AI Challenges

Lake of Openness: Data came from, data auditing, Sort of processing step, testing

Issues: Stereotyping, Biased data, etc.



Quality, Accuracy, Reliability , Robustness

AI Hallucination

AI Bullying

AI Copyright

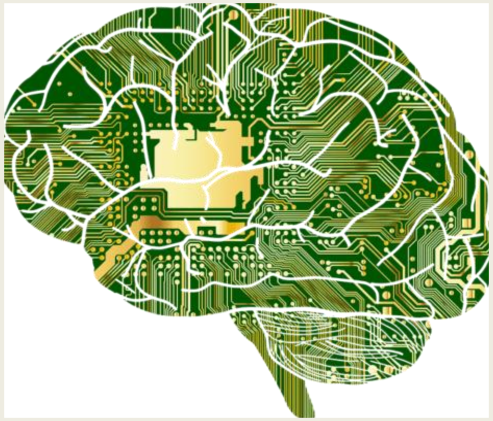
Privacy

Trustworthy AI

AI Governance

- A cross-functional working group oversees and advances the program.
- We leverage our existing ISO-certified data privacy and security risk management processes.

Foundation AI



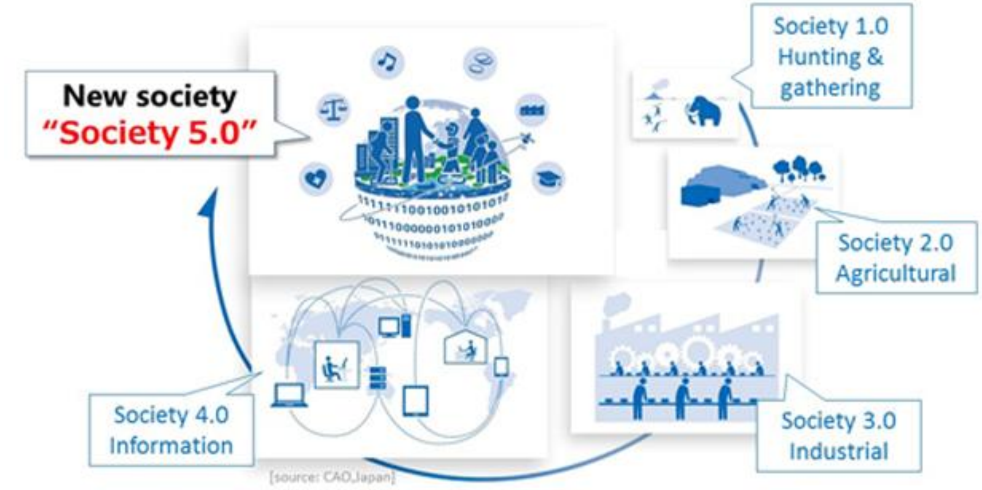
- Foundation models are general-purpose technologies that can support a diverse range of use cases.
- Building foundation models is often highly resource-intensive, with the most expensive models costing hundreds of millions of dollars to pay for the underlying data and compute

Data

- An AI model trained on data that looks real but won't leak personal information ·
- The latest AI safety method is a throwback to our maritime past.

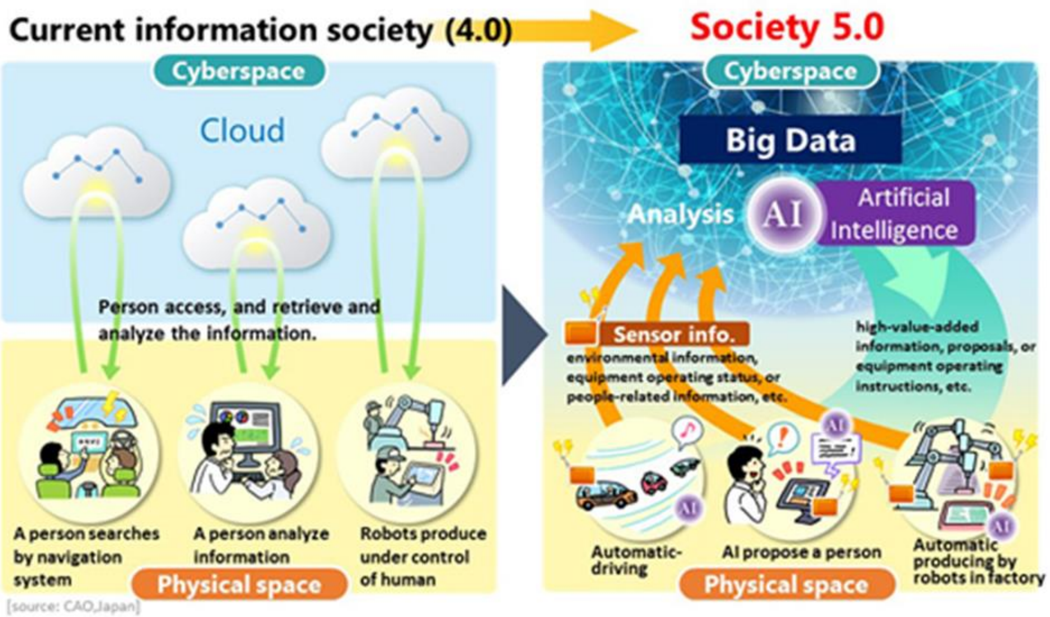
Starts at the beginning (data come from, processing, testing, Deployment

Artificial Intelligence Society



- Society 5.0 was proposed in the 5th Science and Technology Basic Plan as a future society that Japan should aspire to.
- It follows the hunting society (Society 1.0), agricultural society (Society 2.0), industrial society (Society 3.0), and information society (Society 4.0).

- In Society 5.0, however, people, things, and systems are all connected in cyberspace and optimal results obtained by AI exceeding the capabilities of humans are fed back to physical space.
- This process brings new value to industry and society in ways not previously possible.



https://www8.cao.go.jp/cstp/english/society5_0/index.html

THANK YOU