Introduction to Machine Learning

What is Machine Learning?

What is Machine Learning ?

- A computer program is said to learn from experience E with respect to some task T and some performance measure P.

- If its performance on T, as measured by P, improves with experience E the machine is learning

Why should an Agent Learn ?

- **The agent designer cannot anticipate all the situations the agent might end up in**
- **The agent designer cannot anticipate changes of the environment over time**
- **It's some times impossible to formulate a logic and then create a program –** human cannot program complex situations
- **It's easy to learn**

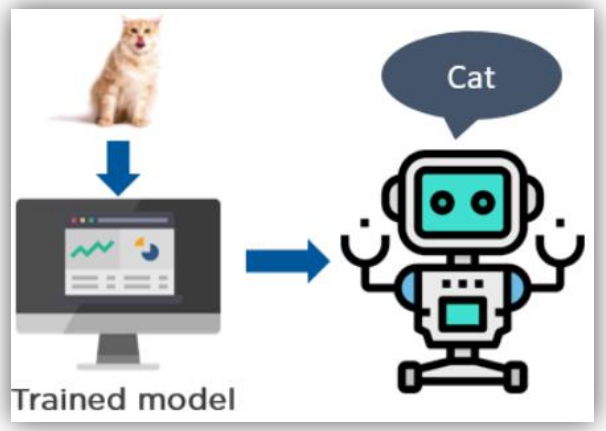
TYPES OF MACHINE LEARNING

Machine Learning can be classified into:

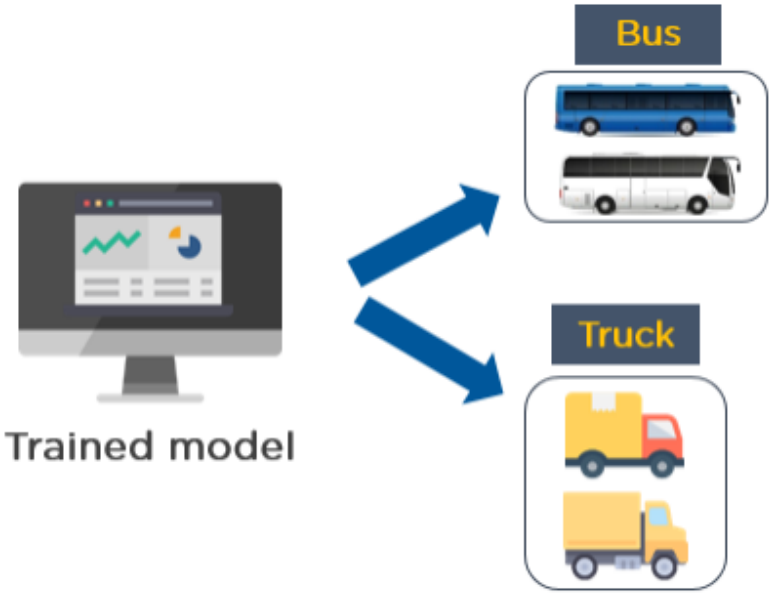
- **Supervised Learning**
- **Unsupervised Learning**
- **Reinforcement Learning**

Supervised Learning

- that uses labeled data to train machine learning models.
- the output is already known
- needs to map the inputs to the respective outputs.
- further classified into two types - **Regression** and **Classification**.
    - Regression: rains on and predicts a continuous-valued response
    - Classifications: attempts to find the appropriate class label



Unsupervised Learning



- That uses unlabeled data to train machines.
- Unlabeled data doesn’t have a fixed output variable.
- The model learns from the data, discovers the patterns and features in the data, and returns the output.
- Unsupervised Learning can be further classified into two types, which are given below:
    - **Clustering**
    - **Association**

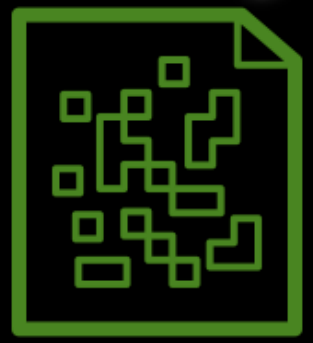
Reinforcement Learning

- Reinforcement Learning trains a machine to take suitable actions and maximize its rewards in a particular situation. It uses an agent and an environment to produce actions and rewards.
- Some of the important reinforcement learning algorithms are:
    - Q-learning
    - Sarsa

Supervised Learning

Train an algorithm to perform classification and regression with a labeled Data Set

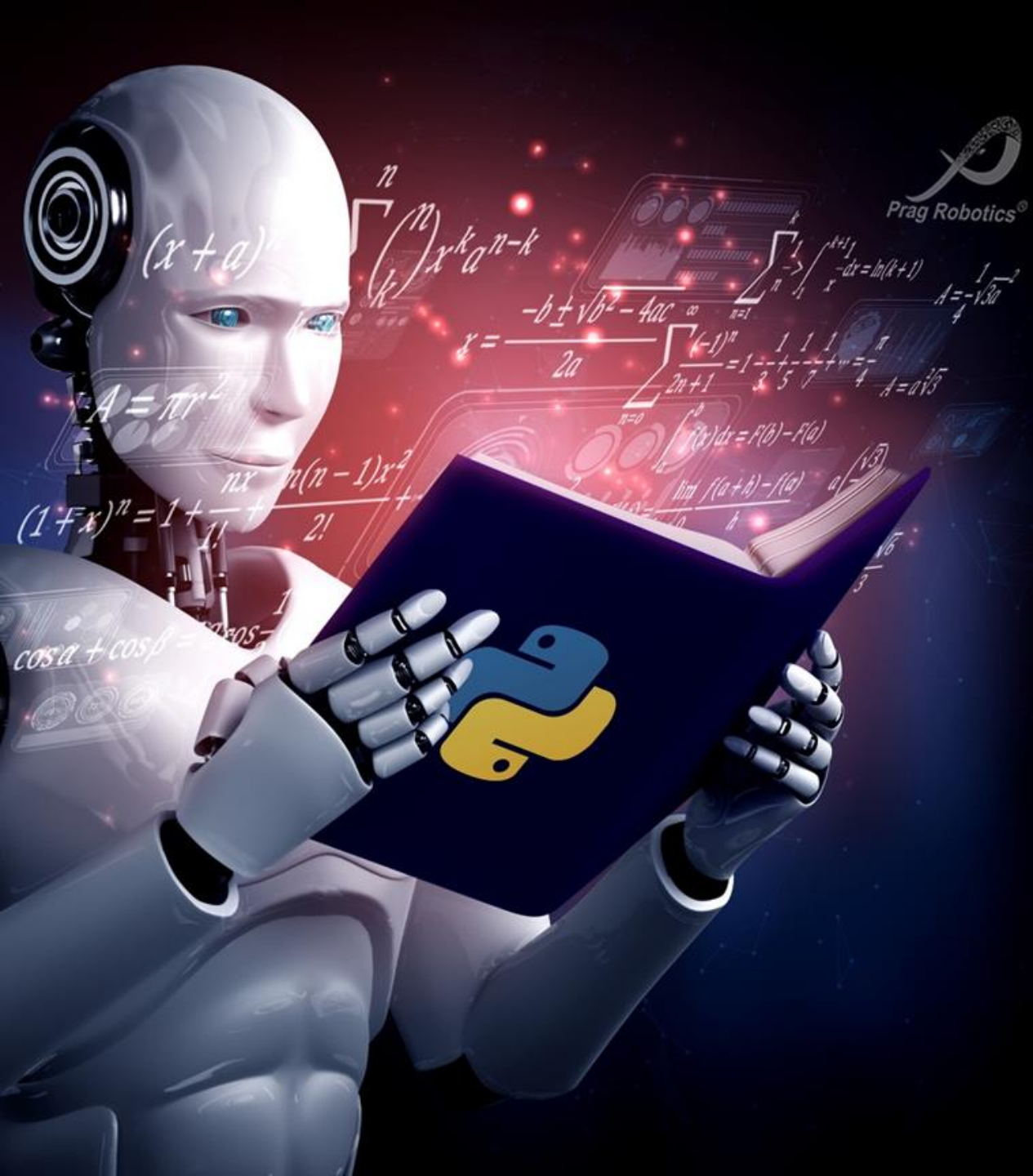
Unsupervised Learning



Train an algorithm to find clusters and associations in an unlabeled Data Set

Reinforcement Learning

Reward and Penalty based Learning System



Tools for Machine Learning

Introduction to Machine Learning

Machine Learning with Python


python
TM

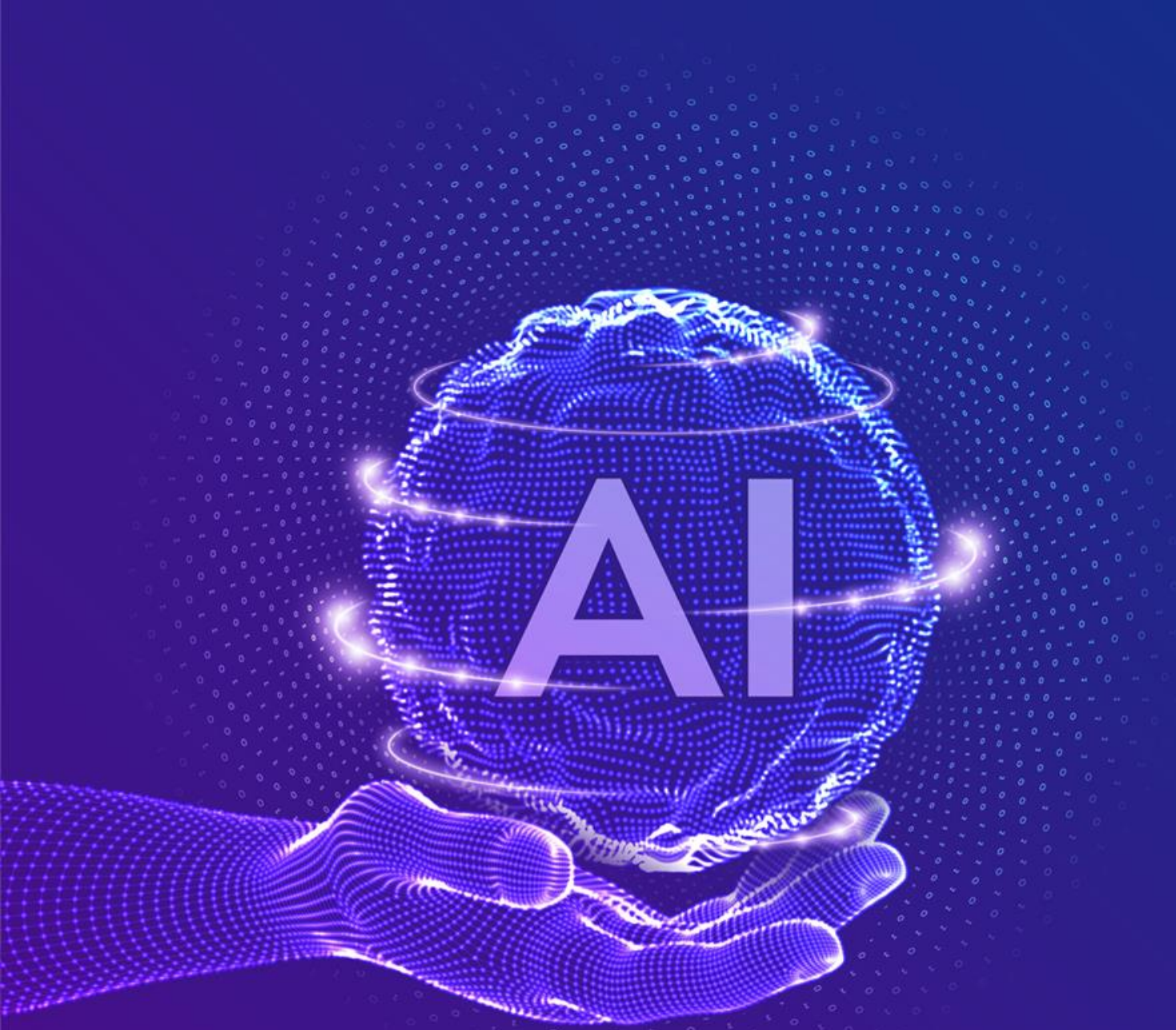

R
R Programming


amazon
web services
Machine
Learning

TensorFlow


Open for Innovation
KNIME

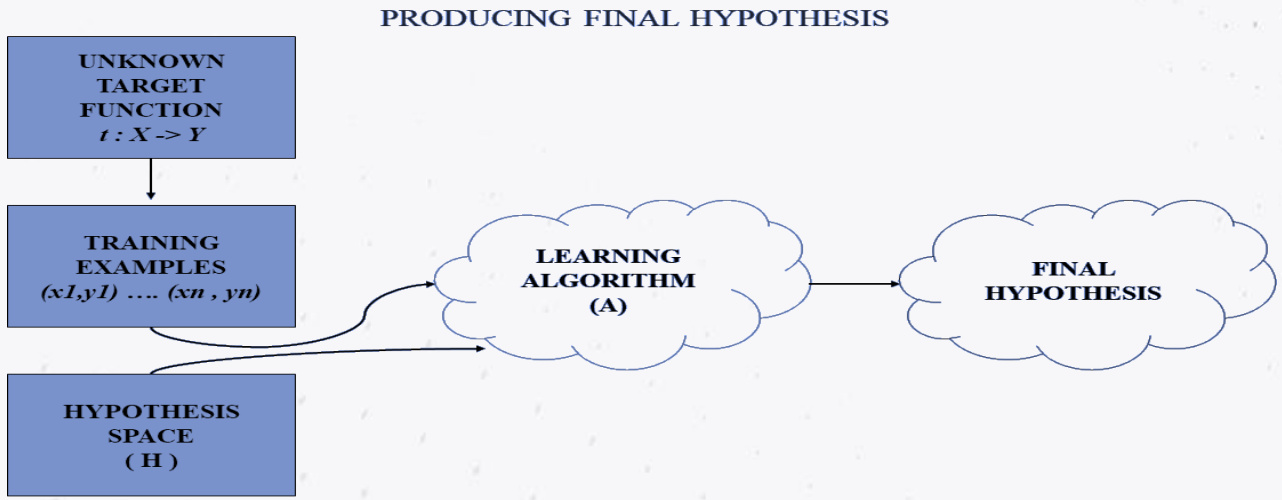

rapidminer

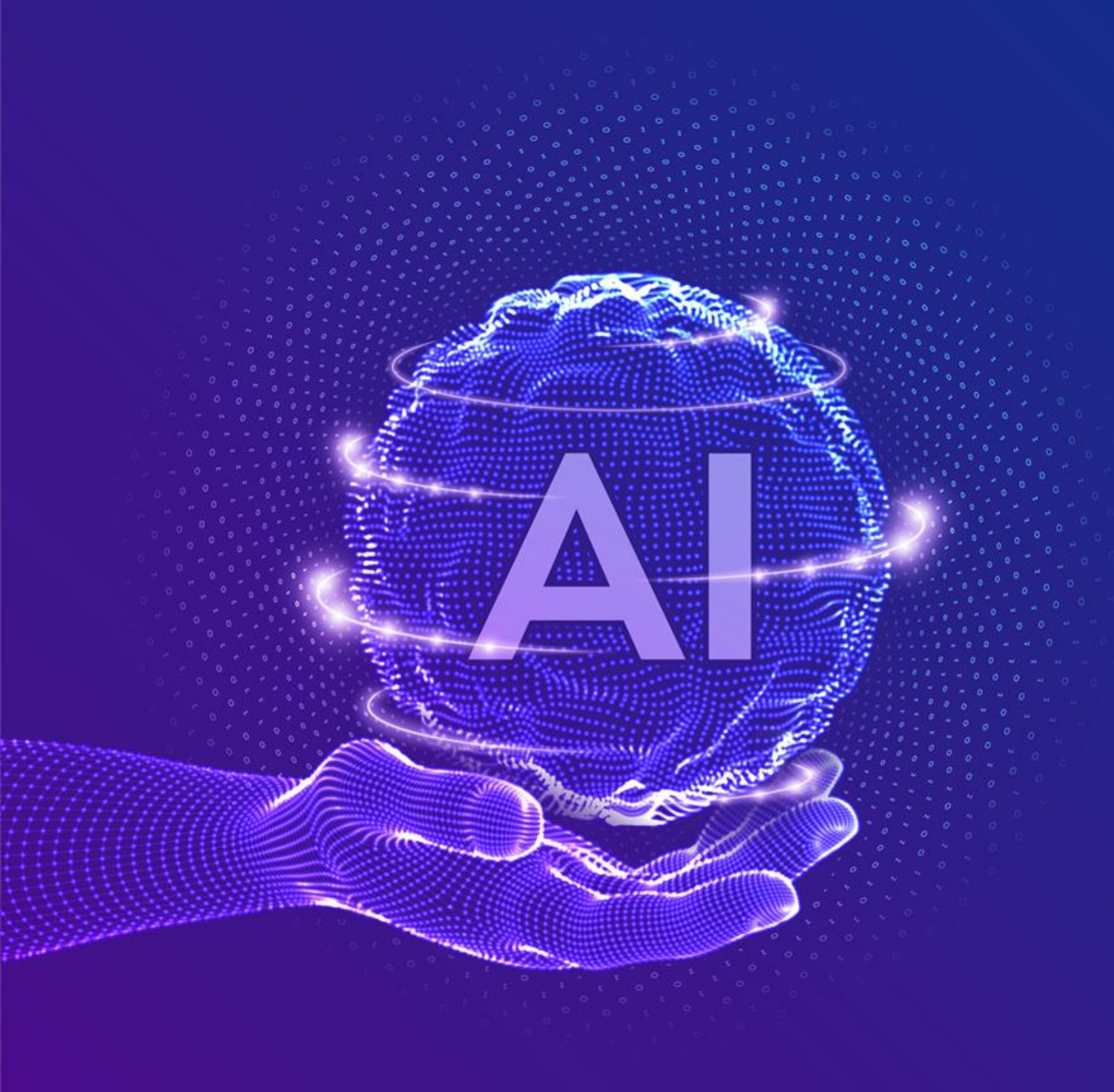


Hypothesis Search

What is Hypothesis?

- ***The hypothesis is defined as the supposition or proposed explanation based on insufficient evidence or assumptions.***
- It is just a guess based on some known facts but has not yet been proven.,
- In most supervised machine learning algorithm, our main goal is to find out a possible hypothesis from the hypothesis space that could possibly map out the inputs to the proper outputs.





LOSS FUNCTION

What is Loss Function?

- *Measures the error between predicted and actual values in a machine learning model.*
- Used to optimize the model during training.
- Examples include mean squared error (MSE), mean absolute error (MAE)
- Used to evaluate model performance.

Introduction to Machine Learning

Application of Machine Learning

Applications of Machine Learning

Recommender Systems

Fraud Detection

Object Detection

Spam Filtering

Medical Diagnostics

Robotics

Automatic Translation

Chat Bots

What is Numpy?

- Numerical Python
- Mathematical library in python
- Can perform,
  - Mathematical and logical operations on arrays
  - Fourier transform and routines for shape manipulation
  - Collection of high-level mathematical functions
- Travis oliphant in 2005

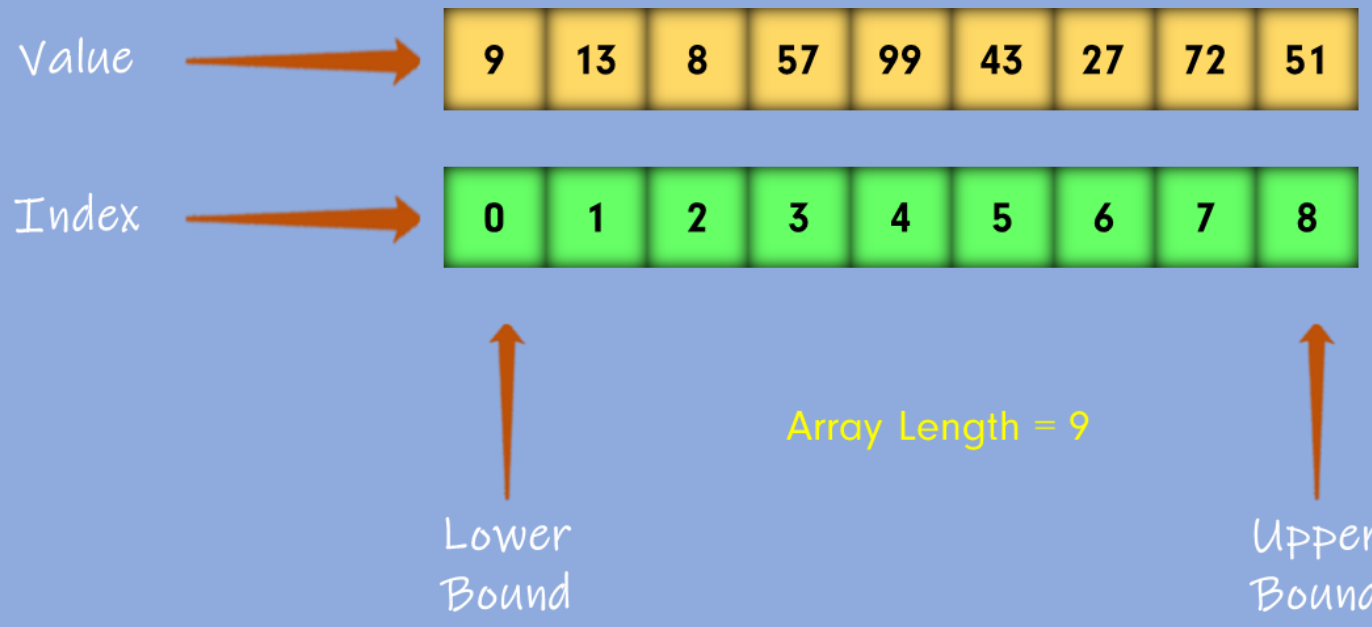
Python Essentials for ML

What is an array?

What is an array?

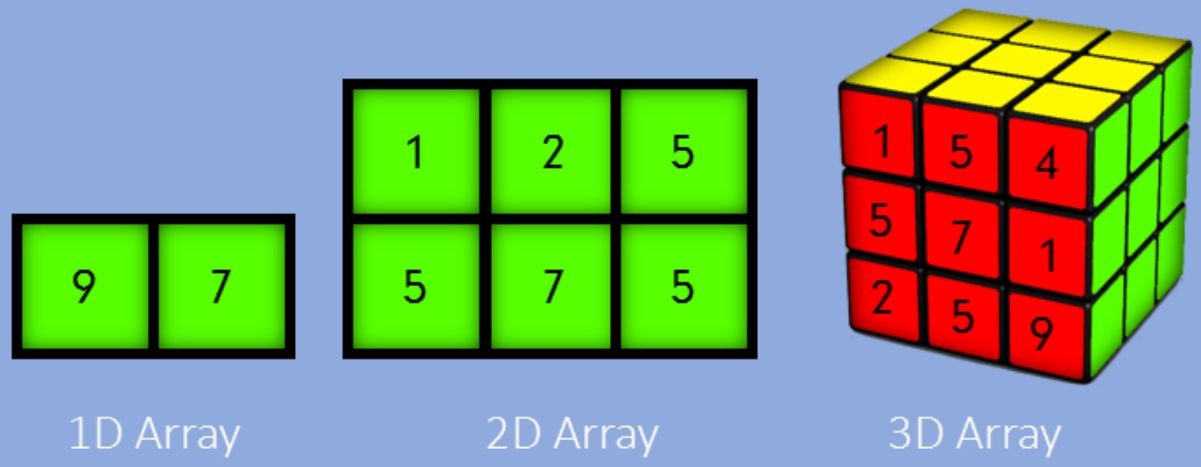
Table of elements

- Same data type
- Indexed by positive integers
- Indexing starts with zero in python



What is an array?

- **Types of array**
  - One dimensional array
  - Two dimensional array
  - n dimensional array
    - Multidimensional container of items
- **Number of dimension and items define the shape**



What is Pandas ?

- Data Manipulation and Analysis
- Data mining library built on Python
- Offers,
  - Data structures
  - Operation for manipulating numerical tables
  - Various formats
  - Merging and joining datasets
  - Time series & more
- Wes McKinney in 2008


Pandas
Essential for
ML
Data cleaning
Data Filtration
Tools for in-memory data structures
Reshaping
Group by engine
Handling missing data
Label based Operations
Exploring and Transforming Data
Fancy slicing
Cluster of domains