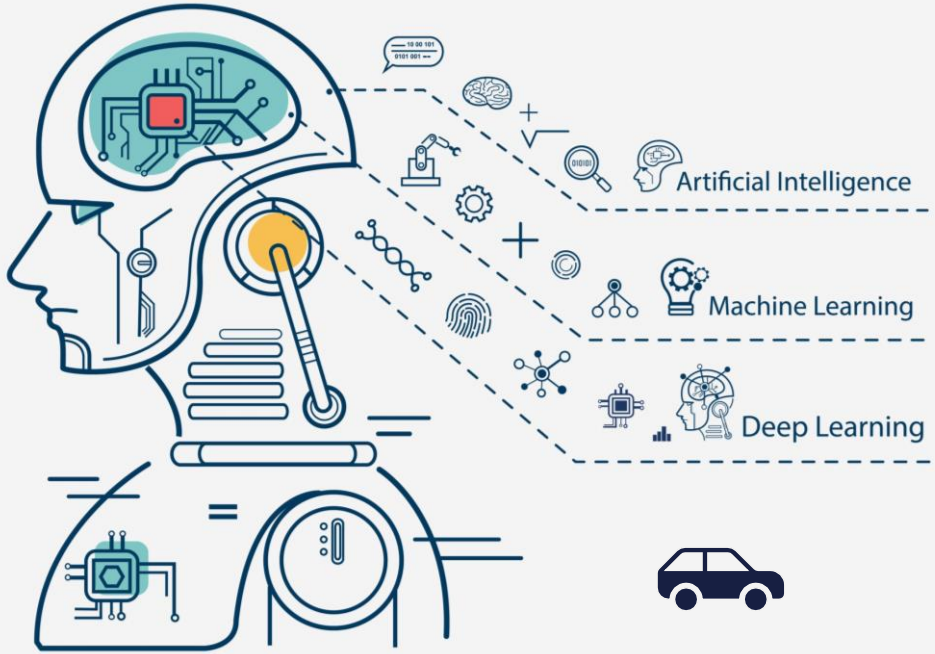
APSSDC

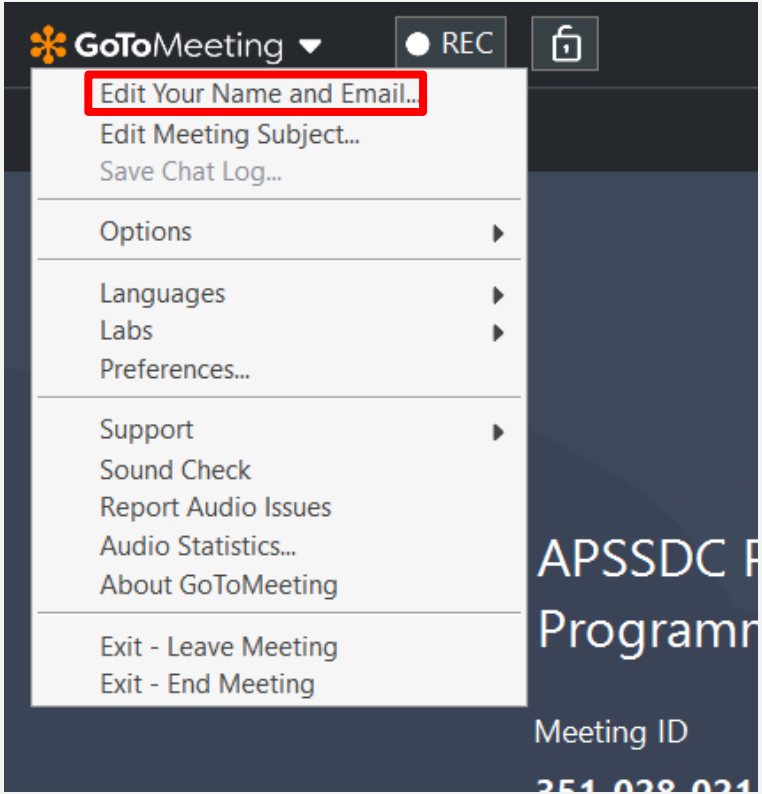
Andhra Pradesh State Skill Development Corporation



MACHINE LEARNING USING PYTHON

For Attendance and Verification Purpose

RollNo-Name-CollegeCode/ CollegeName And RegisteredEmail ID

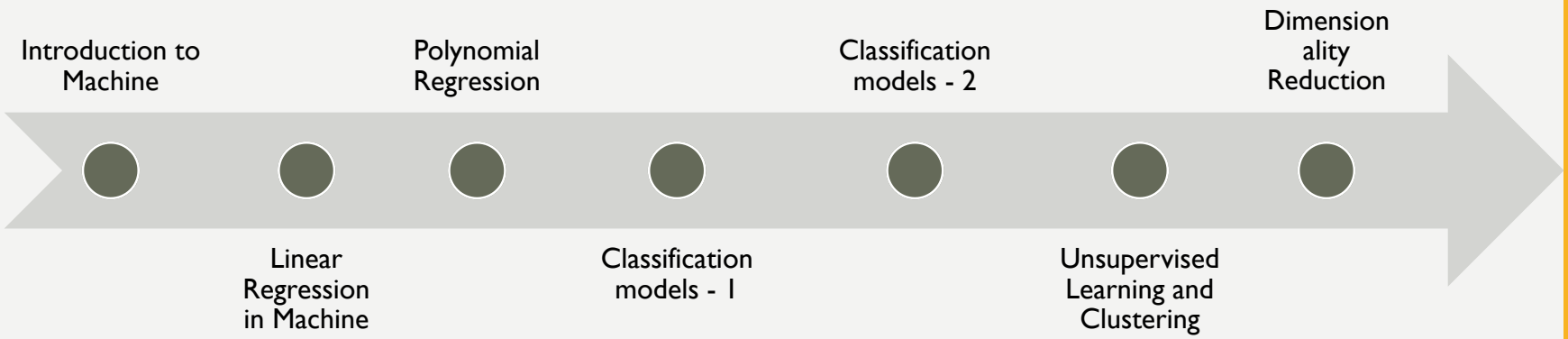


By Anil Kumar APSSDC

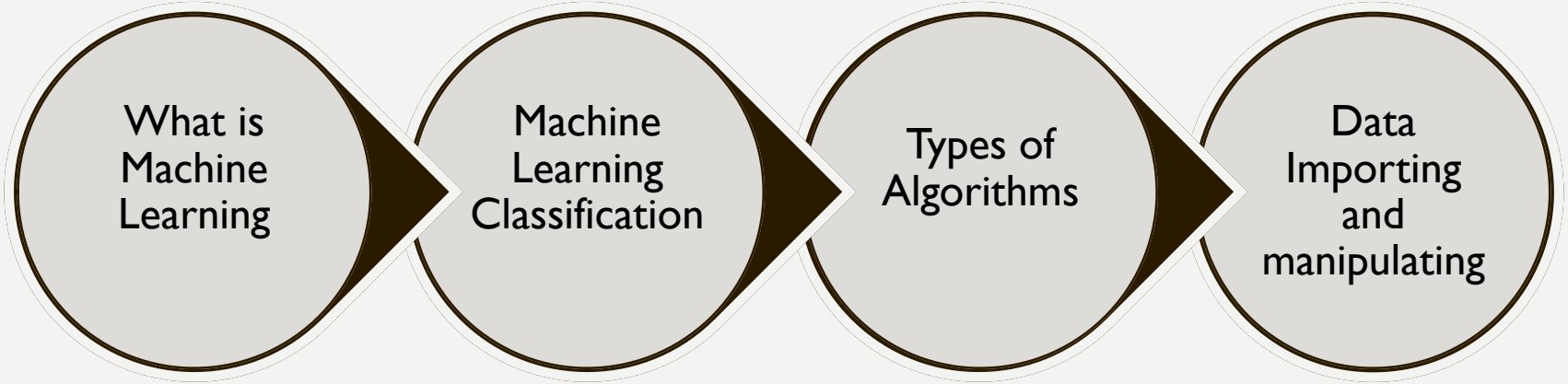
SESSION RESOURCES

http://bit.ly/apssdc-ml-eb4

MACHINE LEARNING USING PYTHON AGENDA



DAY1 AGENDA


What is Machine Learning
Machine Learning Classification
Types of Algorithms
Data Importing and manipulating

WHY ARE YOU ATTENDING THIS TRAINING PROGRAM

PREREQUISITES

1. **Python Programming**
   - Jupyter Notebook Environment
2. **Data Analysis Concepts:**
   - Data Manipulation using NumPy
   - Data Analysis using Pandas
   - Data Visualizations using Matplotlib & Seaborn
   - Data Preprocessing techniques using Sklearn

QUIZ

Color	Shape	Weight	Size	What is it?/ Target
Red	Love Symbol	100grms	2.5”	
Red	Love Symbol	18grms	1.375”	
Green	Love Symbol	150grms	2.7”	
Red	Love Symbol	223grms	3.25”	

QUIZ

Color	Shape	Weight	Size	What you can do?
Red	Love Symbol	100grms	2.5”	Apple
Red	Love Symbol	18grms	1.375”	Strawberry
Green	Love Symbol	150grms	2.7”	Apple
Orange	Circle	223grms	3.25”	Orange
green	curved	75grms	3”	banana
Orange	Oval	150grms	3.5”	mangoes
green	circular	80grms	2.5”	guava
red	oval	550grms	5”	Water Melon
green	circular	5grams	0.5”	grapes
red	oval	50grms	2”	Raspberries

QUIZ

Color	Shape	Weight	Size	What is it?
Red and White color Dots	Love Symbol	1000grms	2.5”	

WHAT IS THIS FRUIT?

WHAT MACHINE LEARNING ?

"A computer program is said to learn from experience(input data) **E** with respect to some class of tasks(Target) **T** and performance measure **P**, if its performance at tasks in T, as measured by P, improves with experience E."

— Tom Mitchell, Professor at Carnegie Mellon University

WHAT IS **ARTIFICIAL INTELLIGENCE, MACHINE LEARNING** AND **DEEP LEARNING**

ARTIFICIAL INTELLIGENCE

Artificial Intelligence (**AI)** is the science of making things smart. Can be defined as:

"Human intelligence exhibited by machines"

A broad term for getting computers to perform human tasks. The scope of AI is disputed and constantly changing over time.

AI: COMMON USE CASES

- Object recognition
- Speech recognition / Sound detection
- Natural Language Processing / Sentiment analysis
- Creative (e.g. Style Transfer – Learning to draw an image in the style of an artist)
- Prediction – given some inputs, what is the expected output for unseen examples
- Translation between languages
- Restoration / Transformation – e.g. taking an image and using ML to figure out what should be there, or generating faces based on what it knows face to be.
- Some AI Examples

MACHINE LEARNING

- Machine Learning (**ML**) can be defined generally as:

"An approach to achieve AI through systems that can learn from experience to find patterns in a set of data"

ML involves **teaching a computer to recognize patterns by example, rather than programming it with specific rules.** These patterns can be found within data. In other words, ML is about creating algorithms (or a set of rules) that learn complex functions (or patterns) from data and make predictions on it –a form of "narrow AI"

DEEP LEARNING

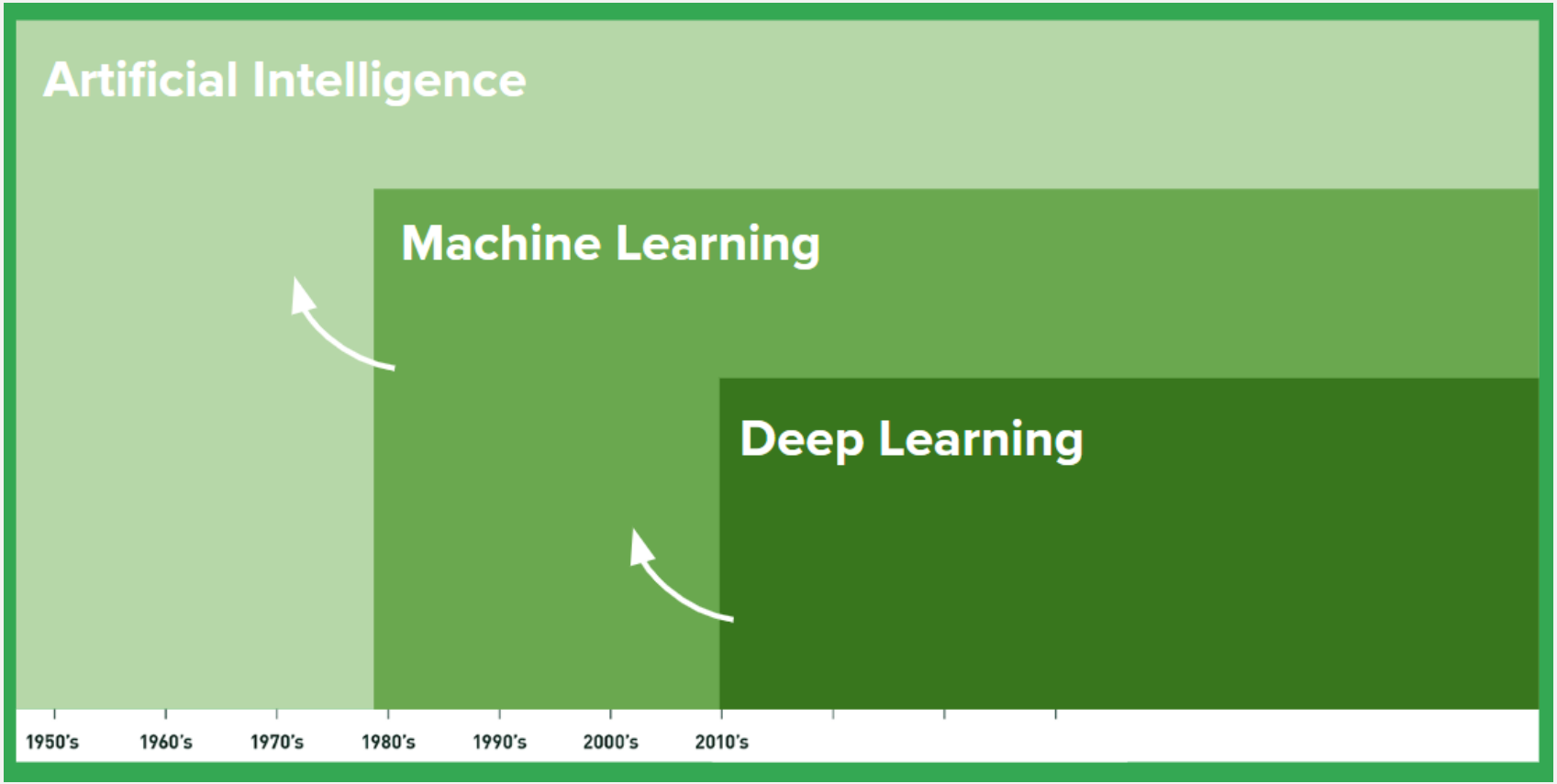
- Deep Learning (**DL** from here on) can be defined generally as:

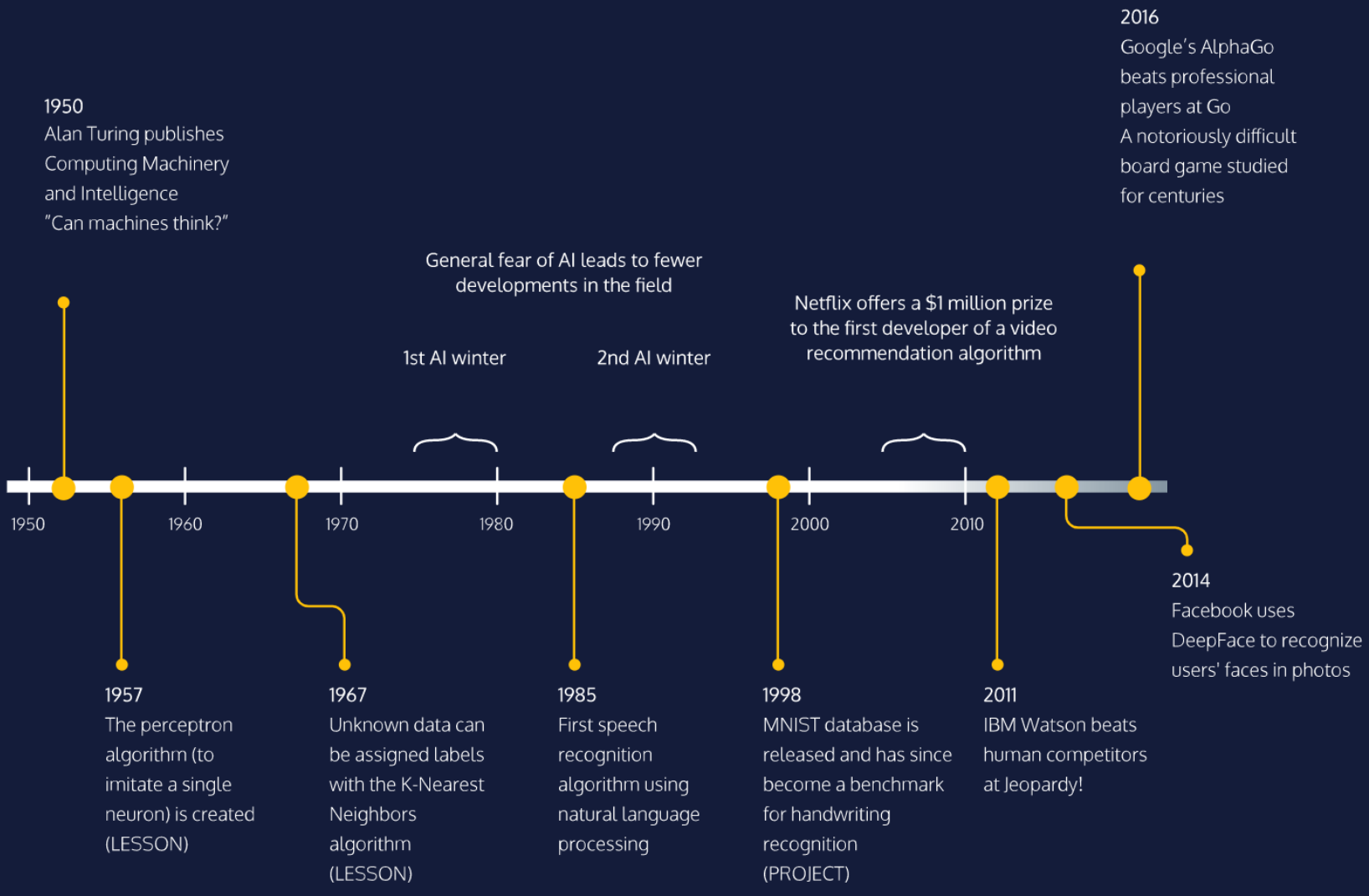
"A technique for implementing Machine Learning"

One such DL technique is a concept known as **deep learning Neural networks (DNNs)** which you may have heard of.

Essentially DL in the context of DNNs is where the code structures you write **are arranged in the layers that loosely mimic the human brain, learning patterns of patterns.**

SUMMARY


Artificial Intelligence
Machine Learning
Deep Learning
1950's
1960's
1970's
1980's
1990's
2000's
2010's


1950
Alan Turing publishes Computing Machinery and Intelligence "Can machines think?"
General fear of AI leads to fewer developments in the field
1st AI winter
2nd AI winter
Netflix offers a $1 million prize to the first developer of a video recommendation algorithm
2016
Google's AlphaGo beats professional players at Go
A notoriously difficult board game studied for centuries
1950
1960
1970
1980
1990
2000
2010
1957
The perceptron algorithm (to imitate a single neuron) is created (LESSON)
1967
Unknown data can be assigned labels with the K-Nearest Neighbors algorithm (LESSON)
1985
First speech recognition algorithm using natural language processing
1998
MNIST database is released and has since become a benchmark for handwriting recognition (PROJECT)
2011
IBM Watson beats human competitors at Jeopardy!
2014
Facebook uses DeepFace to recognize users' faces in photos

FEW OTHER DEFINITIONS

"Machine learning is the hot new thing"

— John L. Hennessy, President of Stanford (2000–2016)

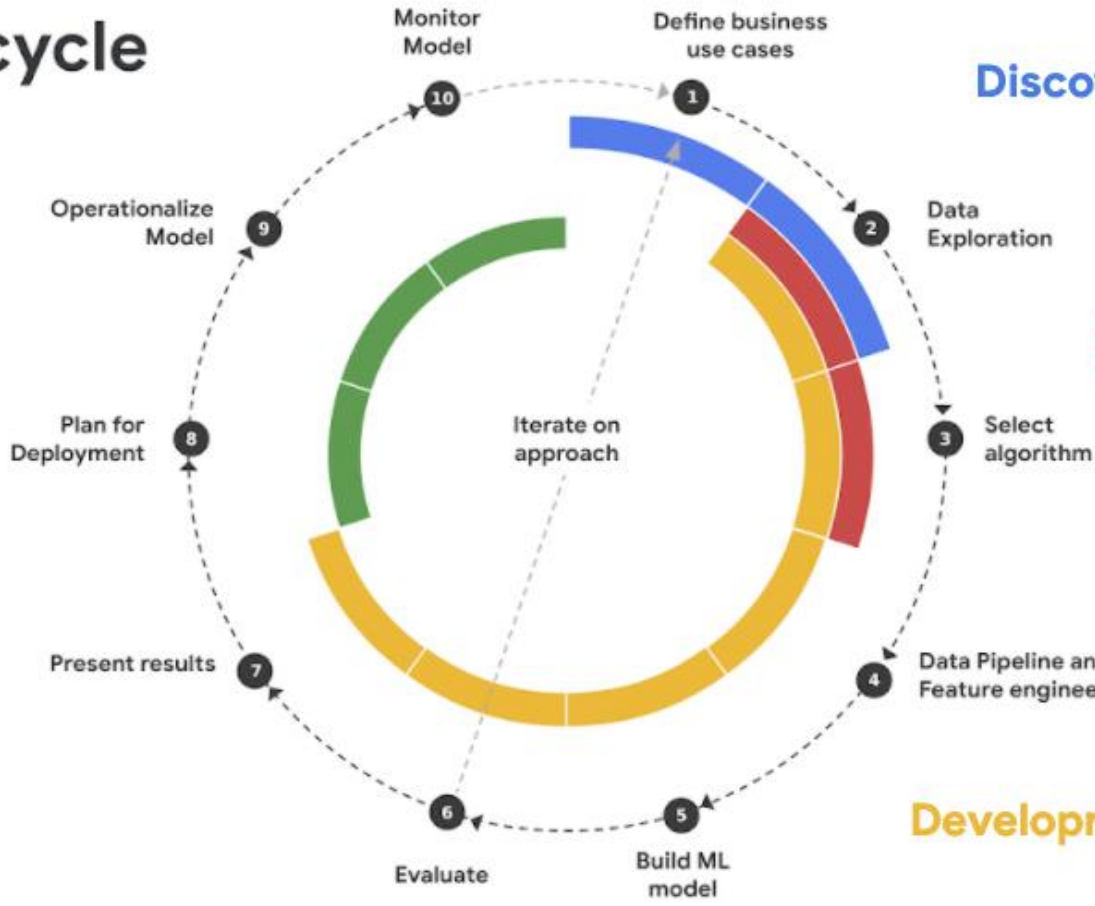
"A breakthrough in machine learning would be worth ten Microsoft"

— Bill Gates, Microsoft Co-Founder

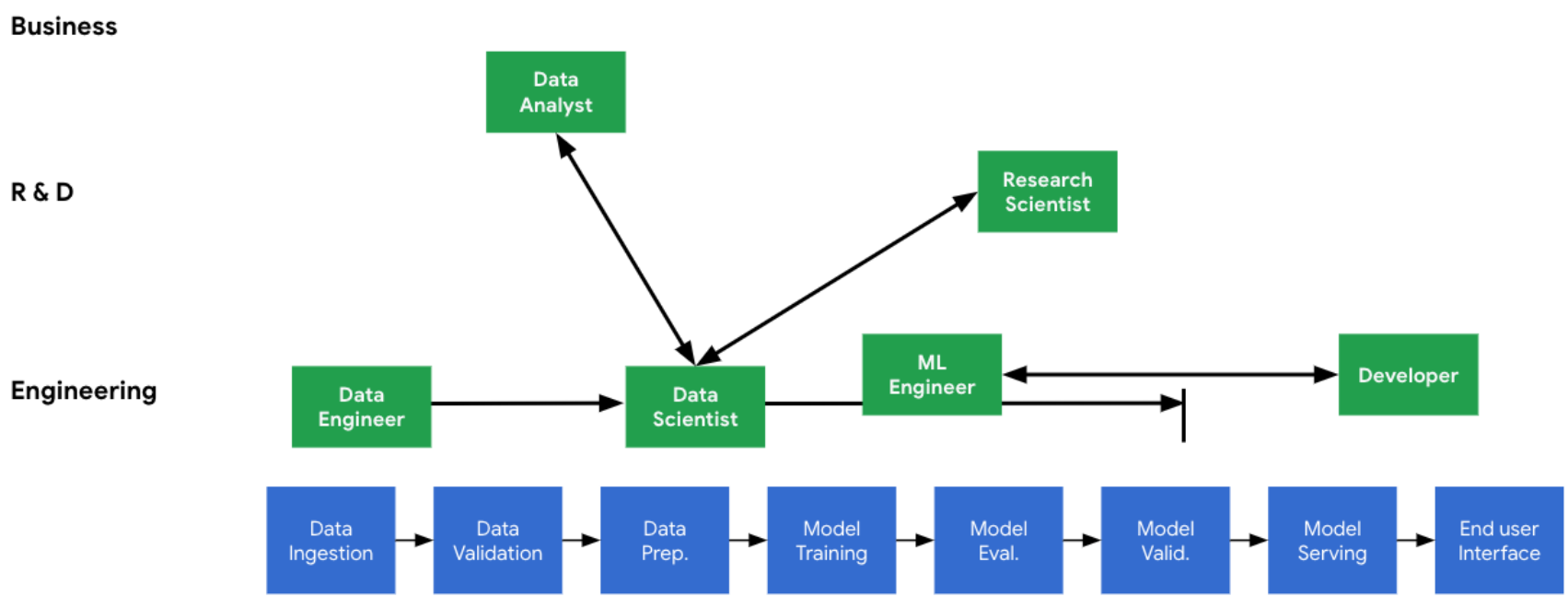
"Machine learning is the field of study that gives computers the ability to learn without being explicitly programmed"

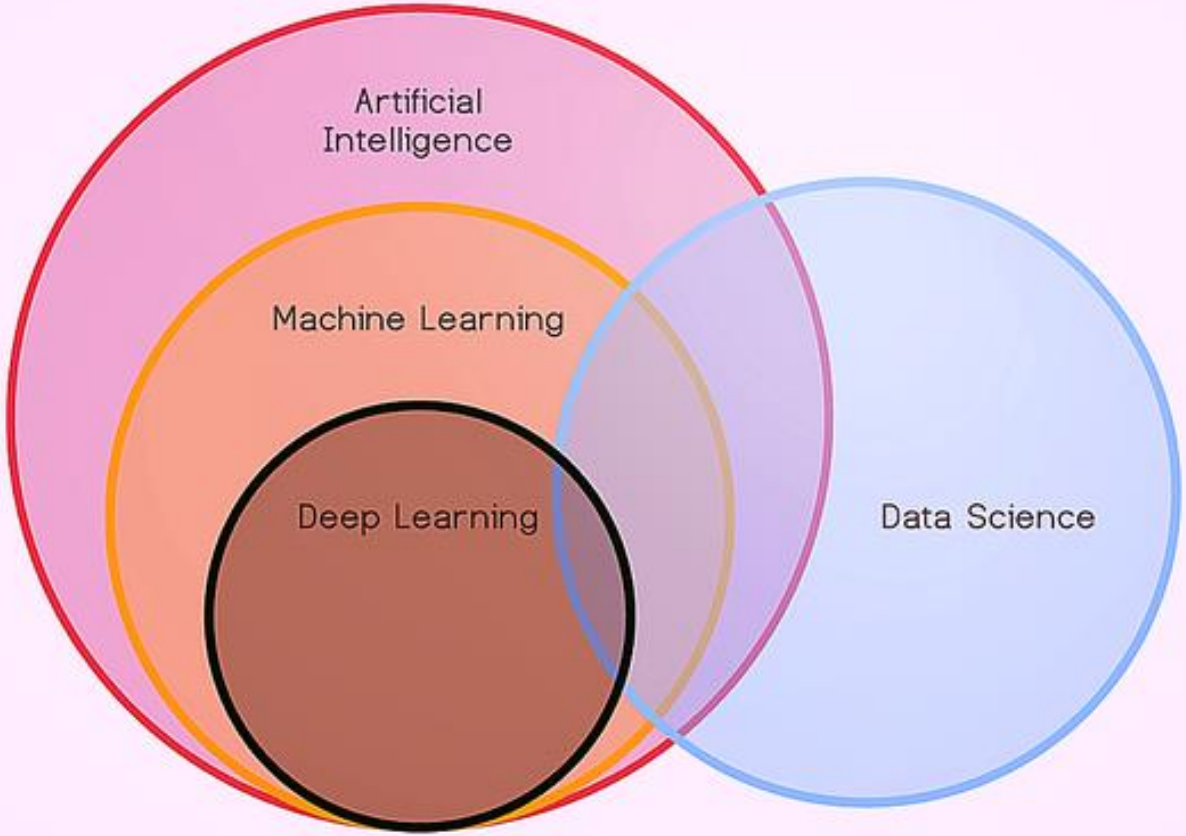
— Arthur Samuel's

ML Lifecycle



THE NEED FOR MACHINE LEARNING DESIGN PATTERNS

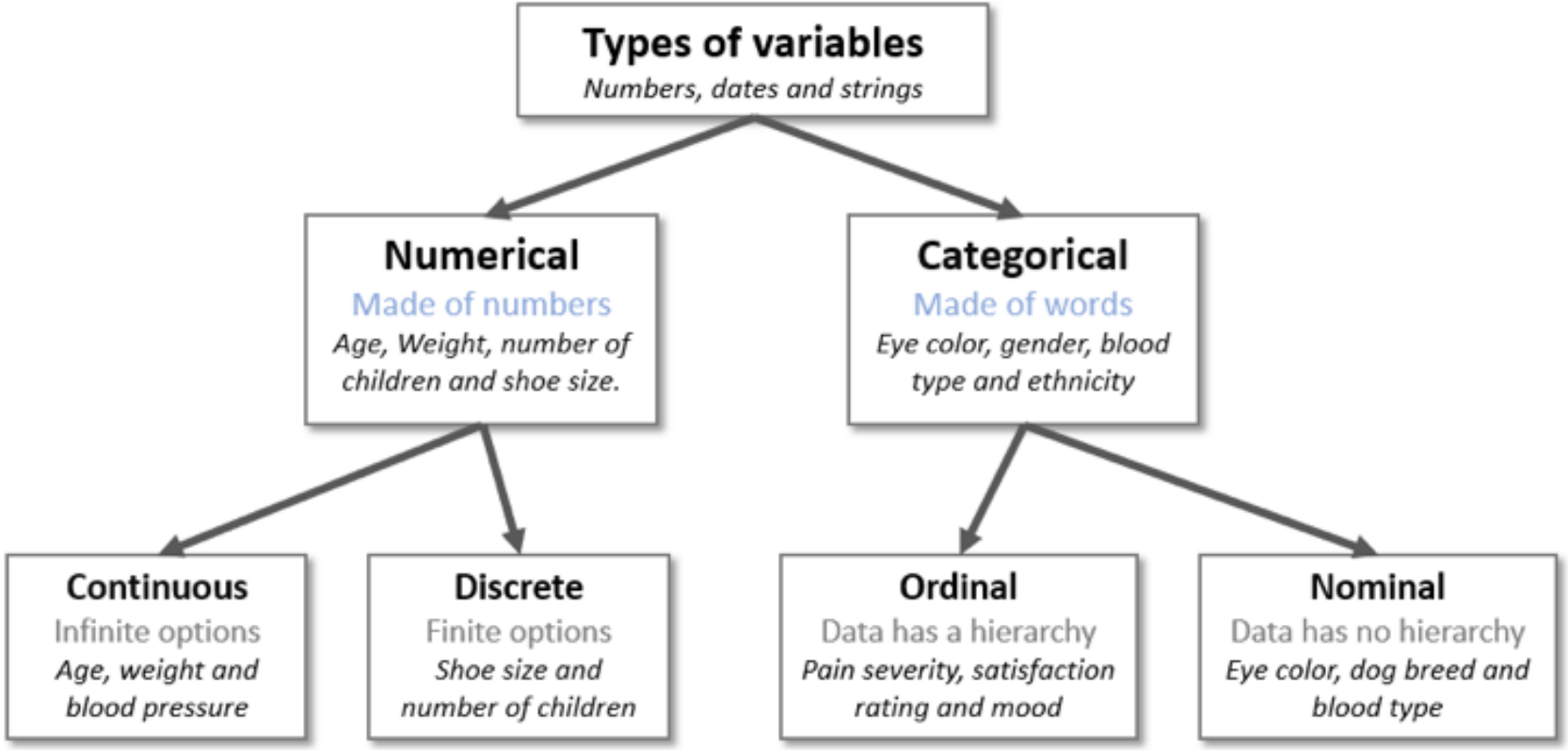



Artificial Intelligence
Machine Learning
Deep Learning
Data Science

DATA CLASSIFICATION

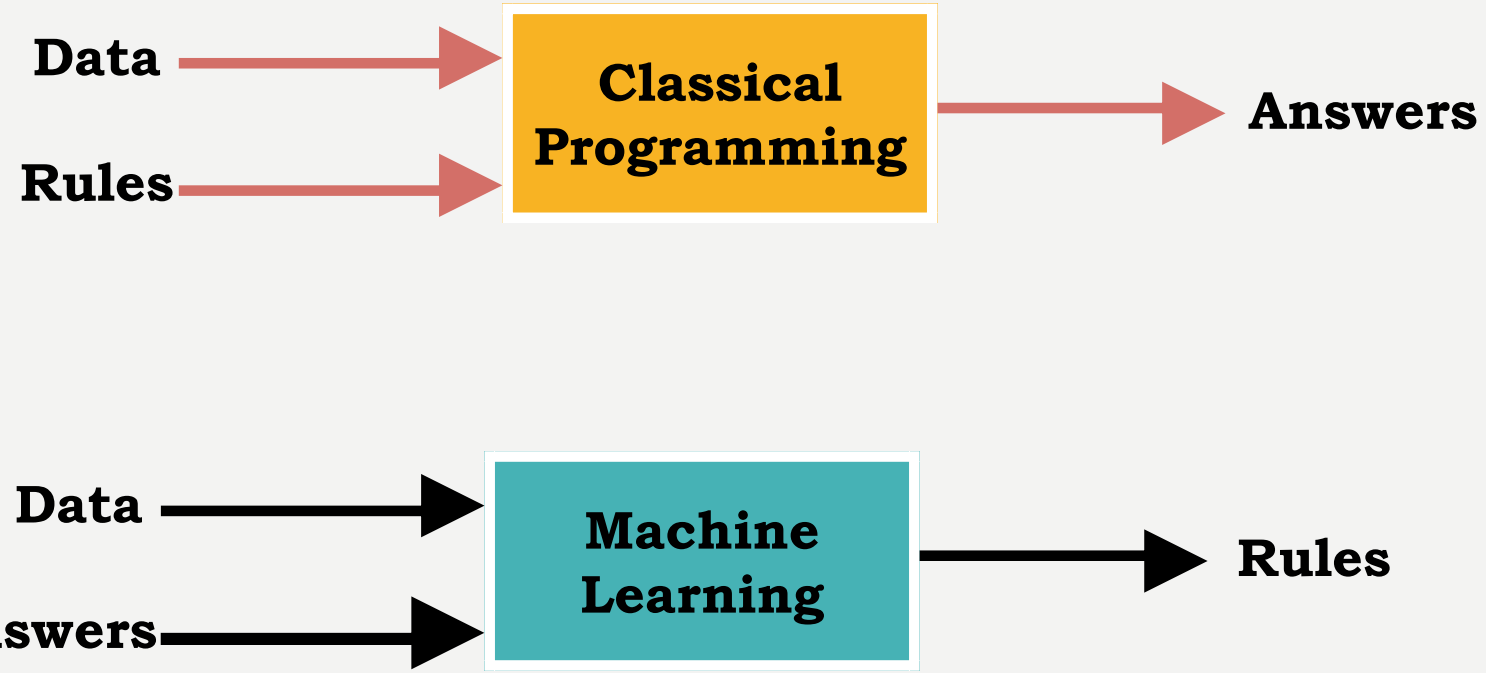
- Structed Data→ DB, Excel, CSV, TSV, Spreadsheets, HTML tables,….
- Unstructured Data →Audio, Video, Doc, PDF, PPT, TXT
- Semi-Structured →JSON, XML, HTML
- {key:value}

TYPES OF VARIABLES

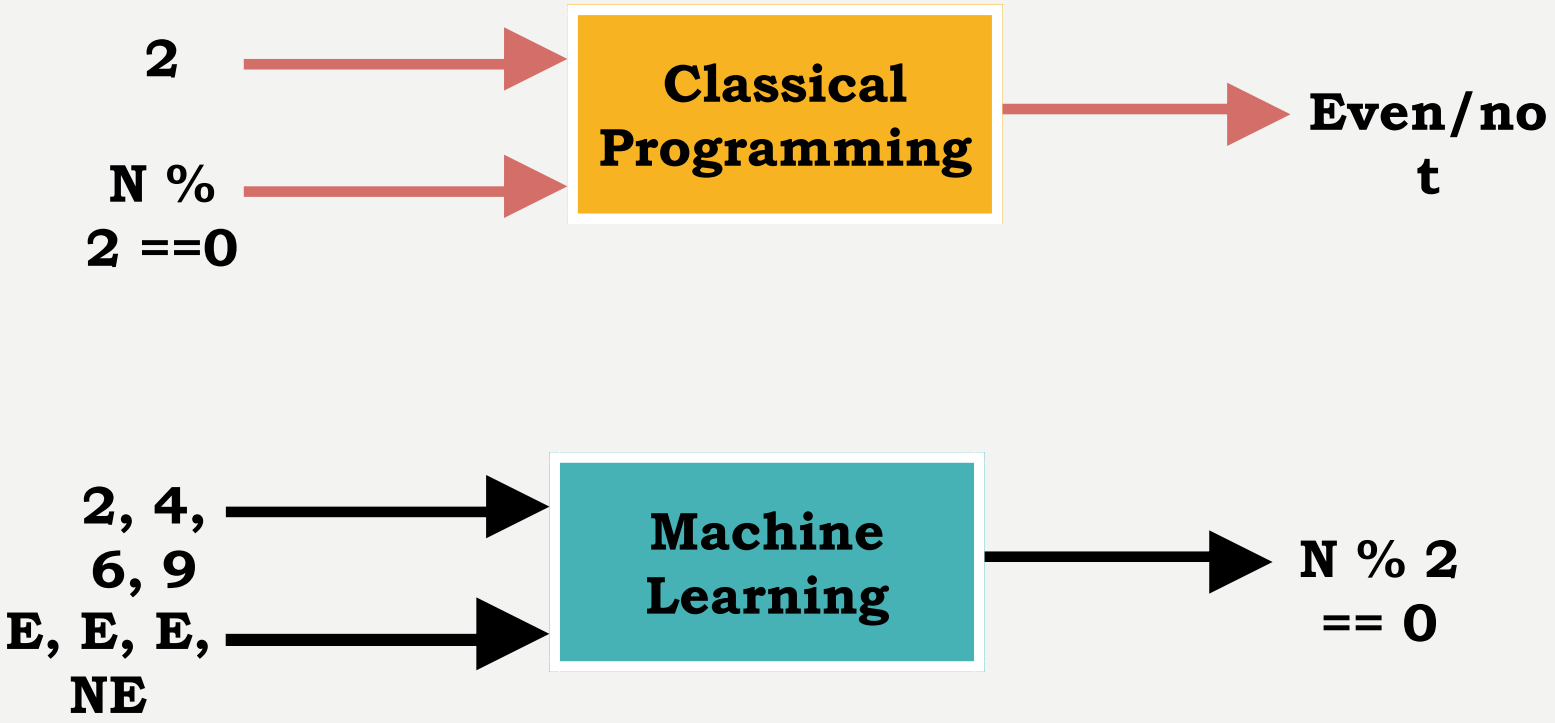


https://en.wikipedia.org/wiki/Statistical_data_type

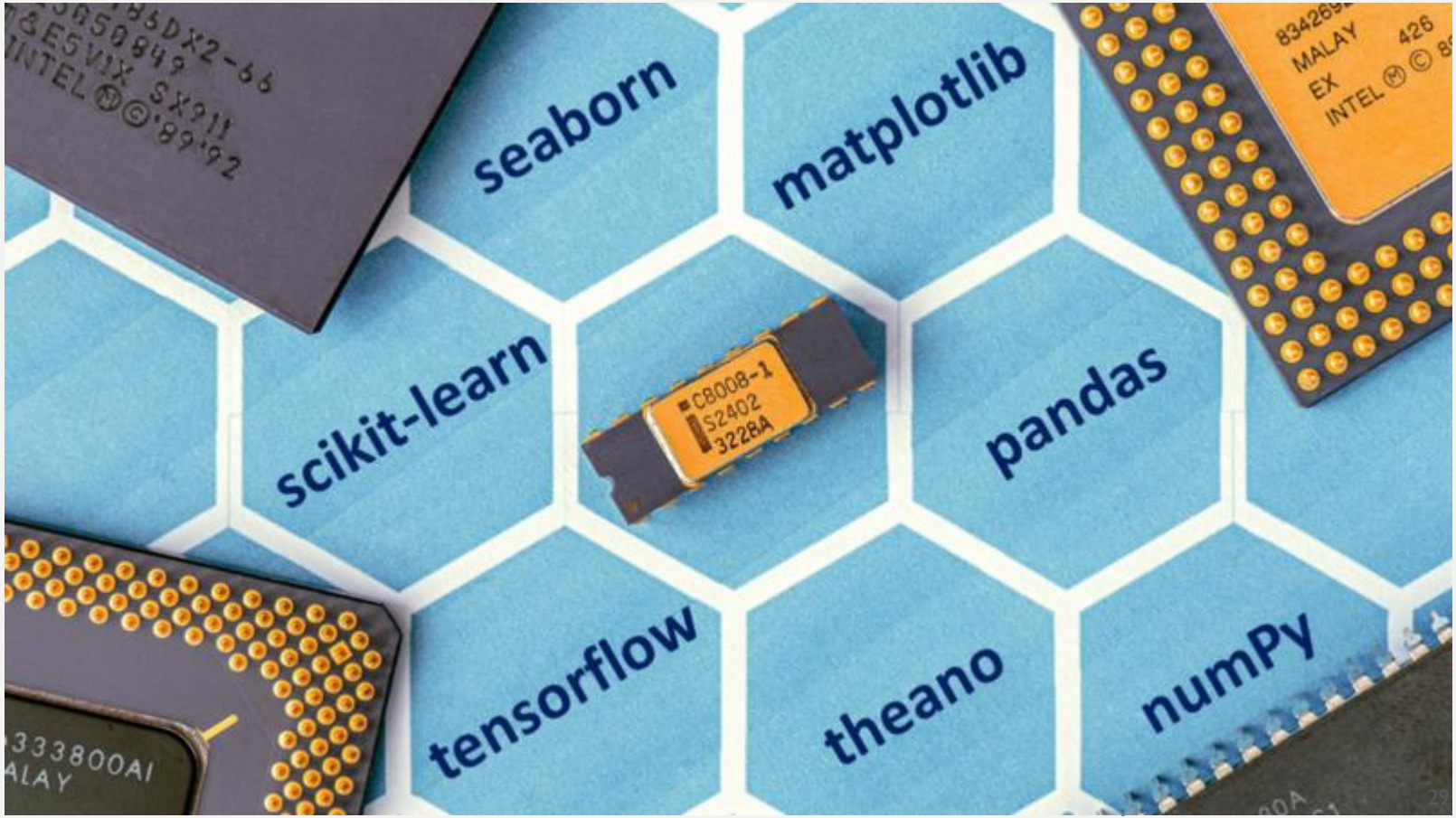
CLASSICAL PROGRAMMING VS MACHINE LEARNING



CLASSICAL PROGRAMMING VS MACHINE LEARNING

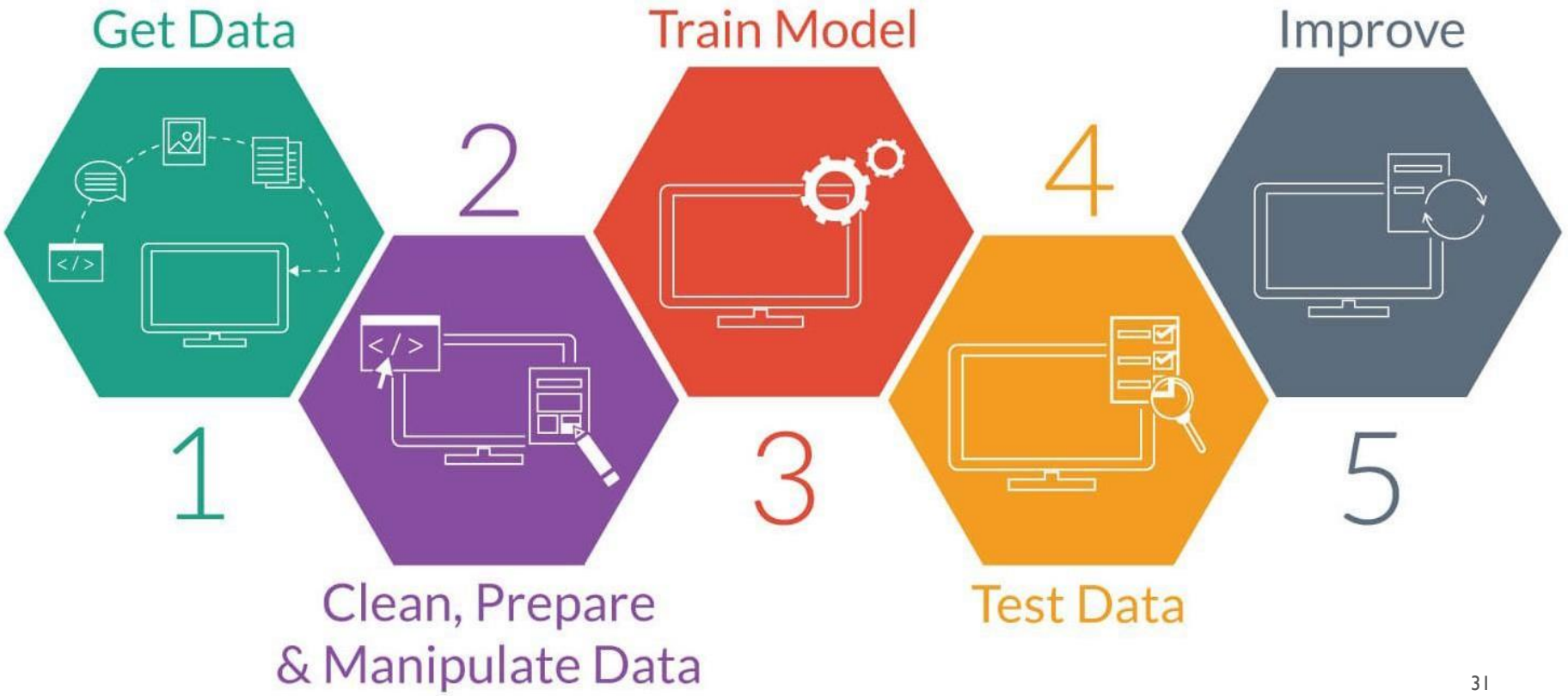


PACKAGES FOR ML IN PYTHON



HOW TO CHOOSE DATA TO TRAIN THE MODEL

MACHINE LEARNING PROCESS



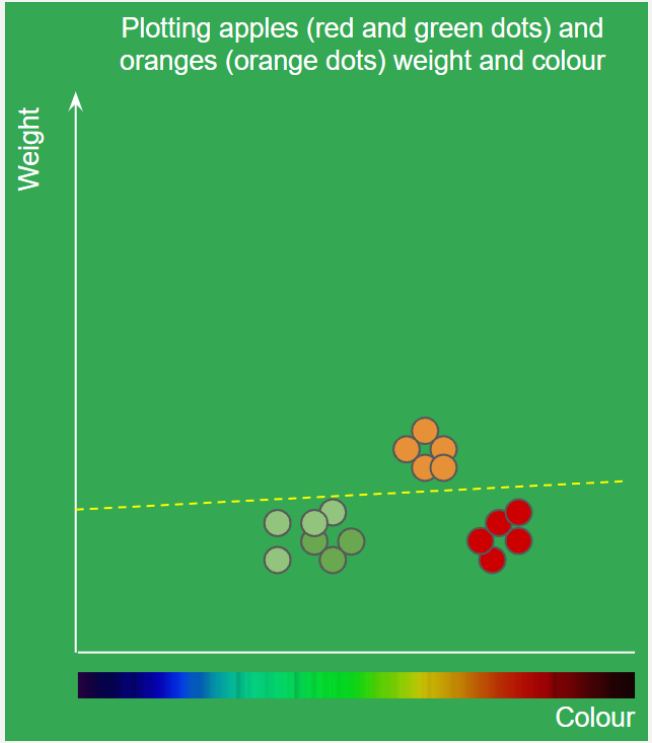
FEATURES / ATTRIBUTES

- **Features (aka attributes) are used to train an ML system.** They are the properties of the things you are trying to learn about.

FEATURES / ATTRIBUTES

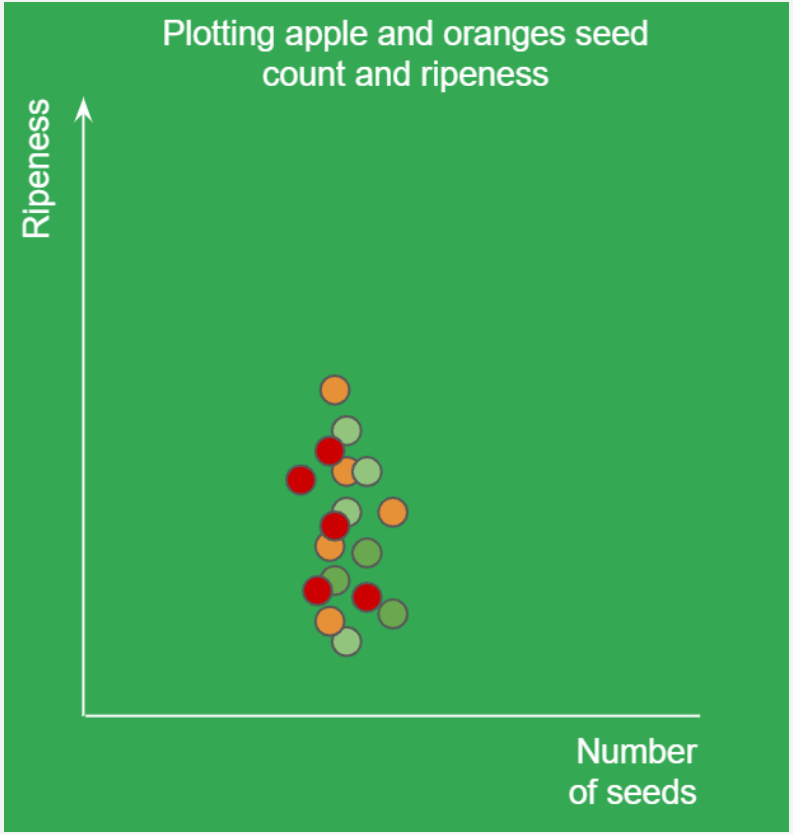
Taking fruit as an example. Features of a fruit might be weight and color. 2 features, would mean there are 2 dimensions. A 2D system may be plotted on a graph if features are represented in a numerical way.

In the plot on the right, the ML system can learn to split the data up with a line to separate apples from oranges. This **can now be used to make future classifications when we plot new points the system has not seen (anything above is orange, below is apple)**



FEATURES / ATTRIBUTES

- **Choosing useful features can have a big impact on the quality of the ML system.** Some features may not be useful enough to separate the data points.
- In this example we take bad features of fruits(ripeness and seed count) that do not allow us to learn any distinguishing factors for the fruit.



WHAT ML CANNOT PREDICT STUFF IT DOESN'T KNOW ABOUT

Lets say you teach an ML system about animals like this:

Number of Legs, Color, Weight, Animal:

- 4, Black, 10KG, Dog
- 2, Orange, 5KG, Chicken

If you now present it with a Cow: 4 legs, black, 200KG it would predict "Dog". This is because it only knows about dogs and chickens and this was the closest match.

HOW ML SYSTEMS ARE TRAINED (LEARNING STYLE)

MACHINE LEARNING TYPES

Supervised Learning

- Makes machine Learn explicitly
- Data with clearly defined output is given
- Direct feedback is given
- Predicts outcome/future
- Resolves classification and regression problems

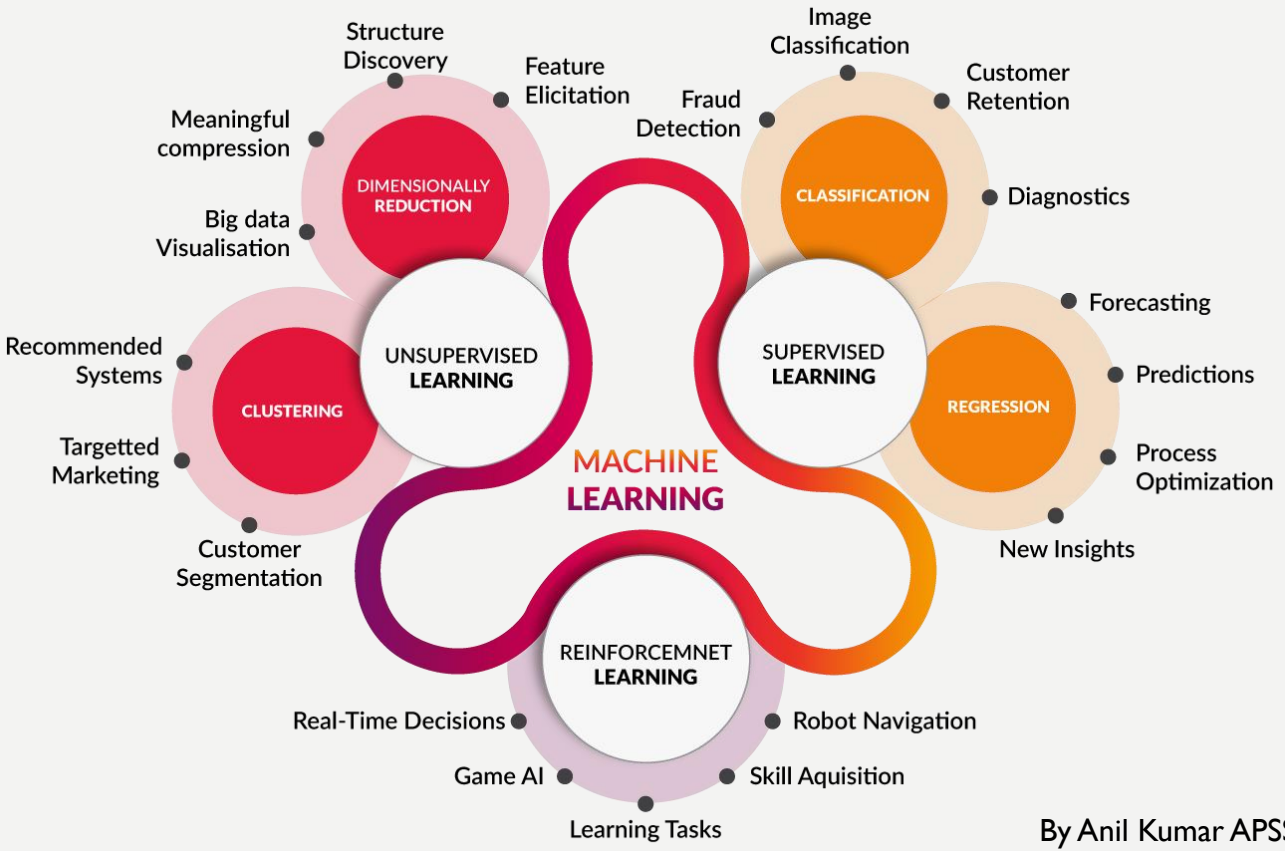
Unsupervised Learning

- Machine understands the data (Identifies patterns/structures)
- Evaluation is qualitative or indirect
- Does not predict/find anything specific

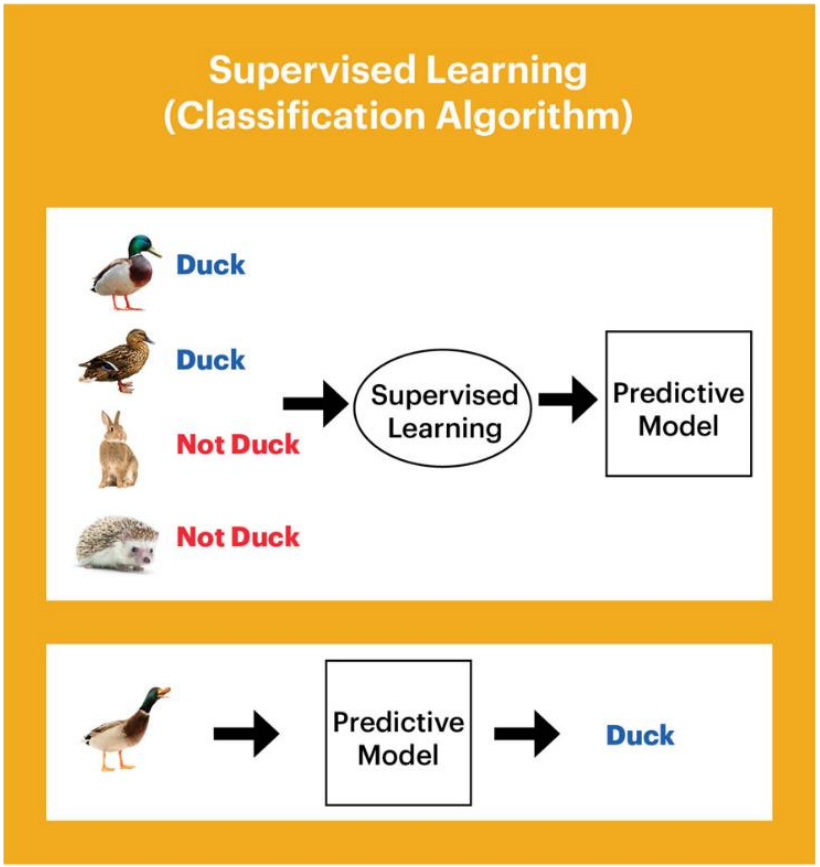
Reinforcement Learning

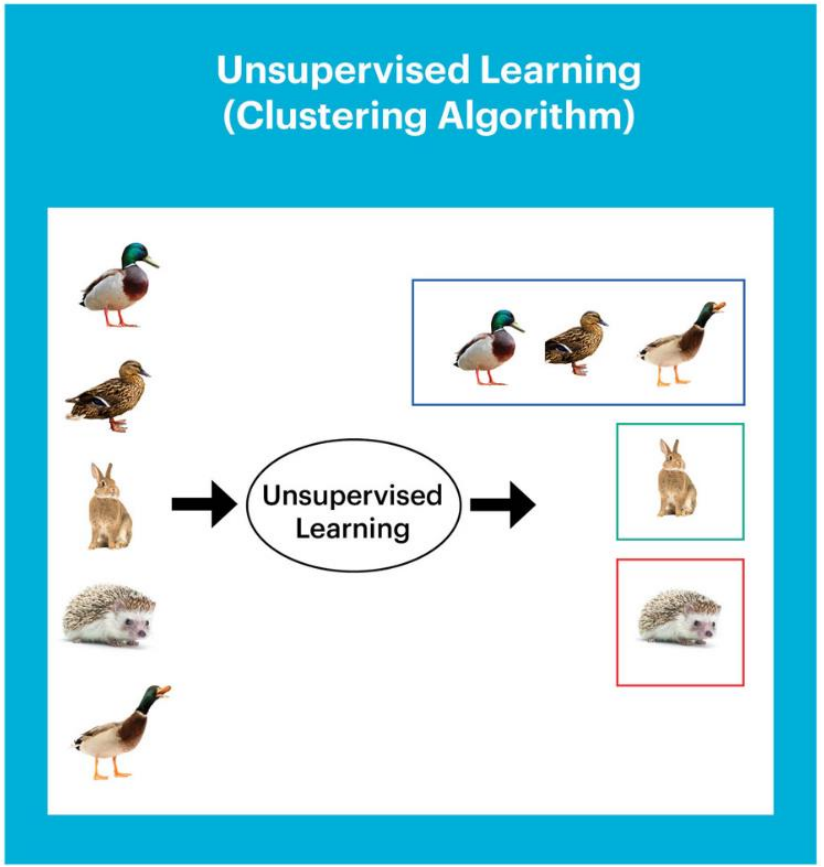
- An approach to AI
- Reward based learning
- Learning form +ve & +ve reinforcement
- Machine Learns how to act in a certain environment
- To maximize rewards

MACHINE LEARNING CATEGORIES



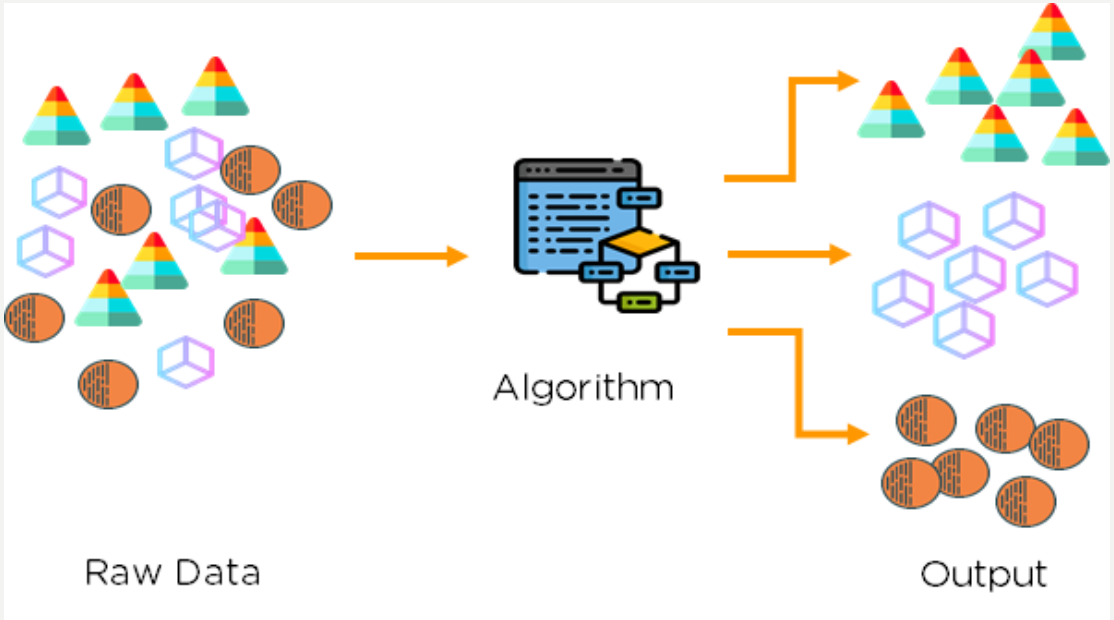
SUPERVISED VS UNSUPERVISED





UNSUPERVISED LEARNING

Unsupervised learning model learns through observation and finds structures in the data. When the model is feed data, it automatically finds patterns and relationships in the data by creating clusters in it. What it cannot do is adding labels to the cluster. Like the picture shown below.



MACHINE LEARNING ALGORITHMS SUPERVISED

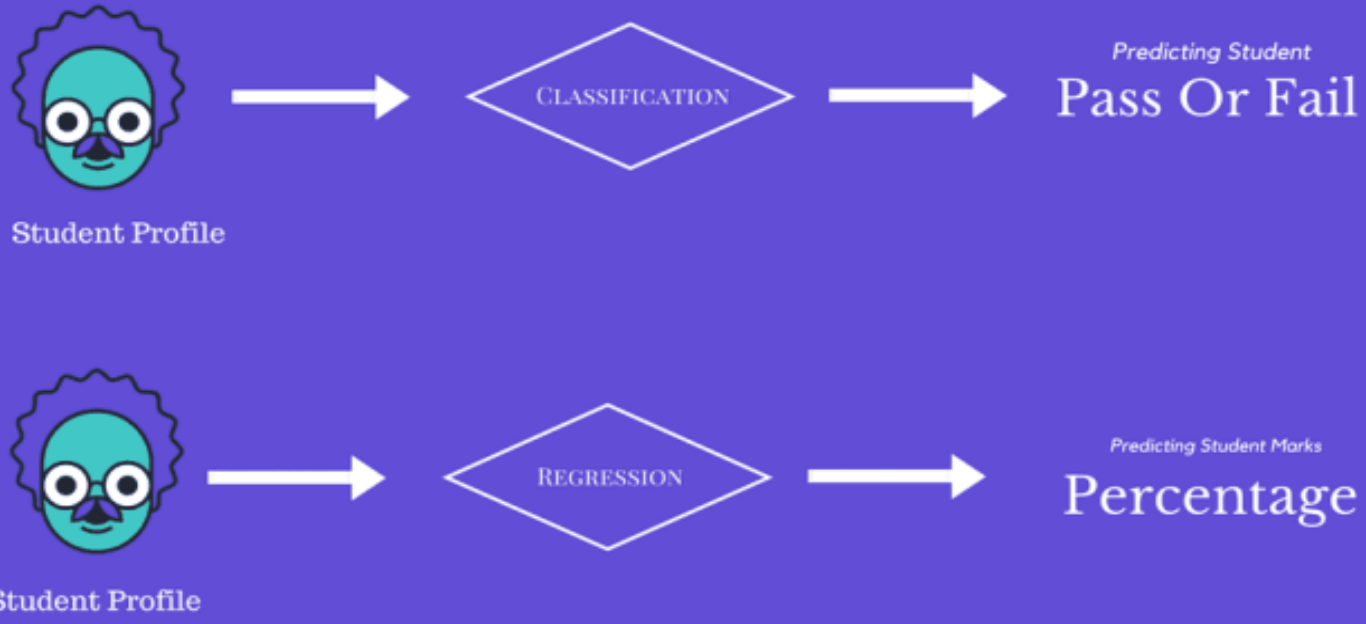
Regression

- Linear Regression
  - Simple Linear Regression
  - Multi Linear Regression
- Polynomial Regression
  - Polynomial Regression
  - Multi Polynomial Regression

Classification

- Linear Classifiers
  - Logistic Regression
- K - Nearest Neighbors
- Decision Trees
- Random Forest
- Support Vector Machines

CLASSIFICATION VS REGRESSION



UNSUPERVISED

Clustering Types

- Hierarchical clustering
- K-means clustering
- DBSCAN
- Spectral clustering

Dimensionality Reduction

- Principal Component Analysis
- Independent Component Analysis
- randomized SVD

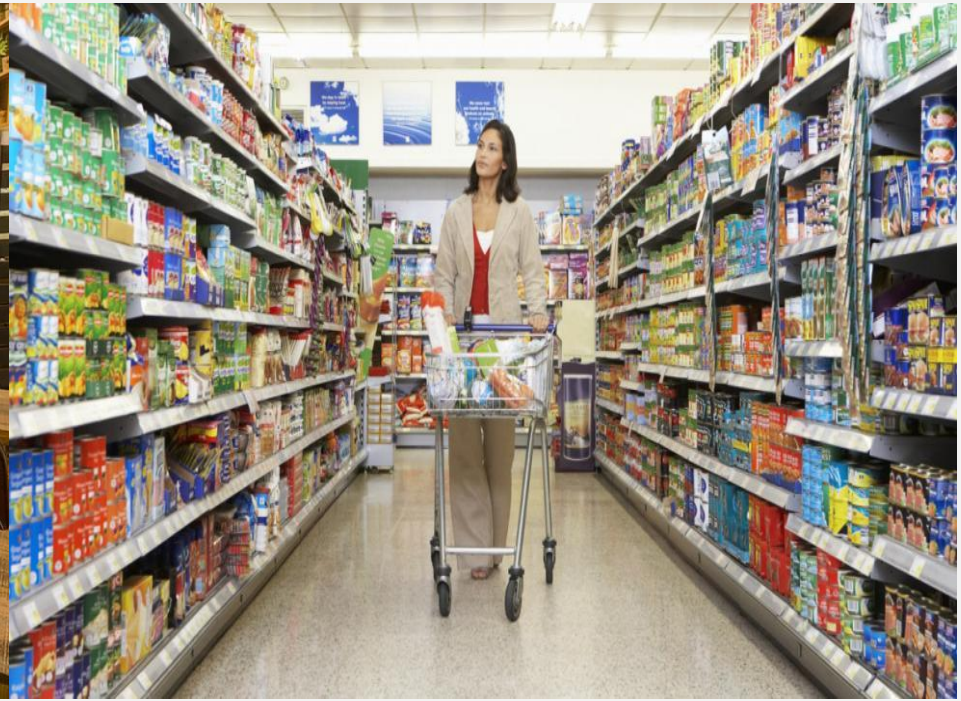
CLASSIFICATION

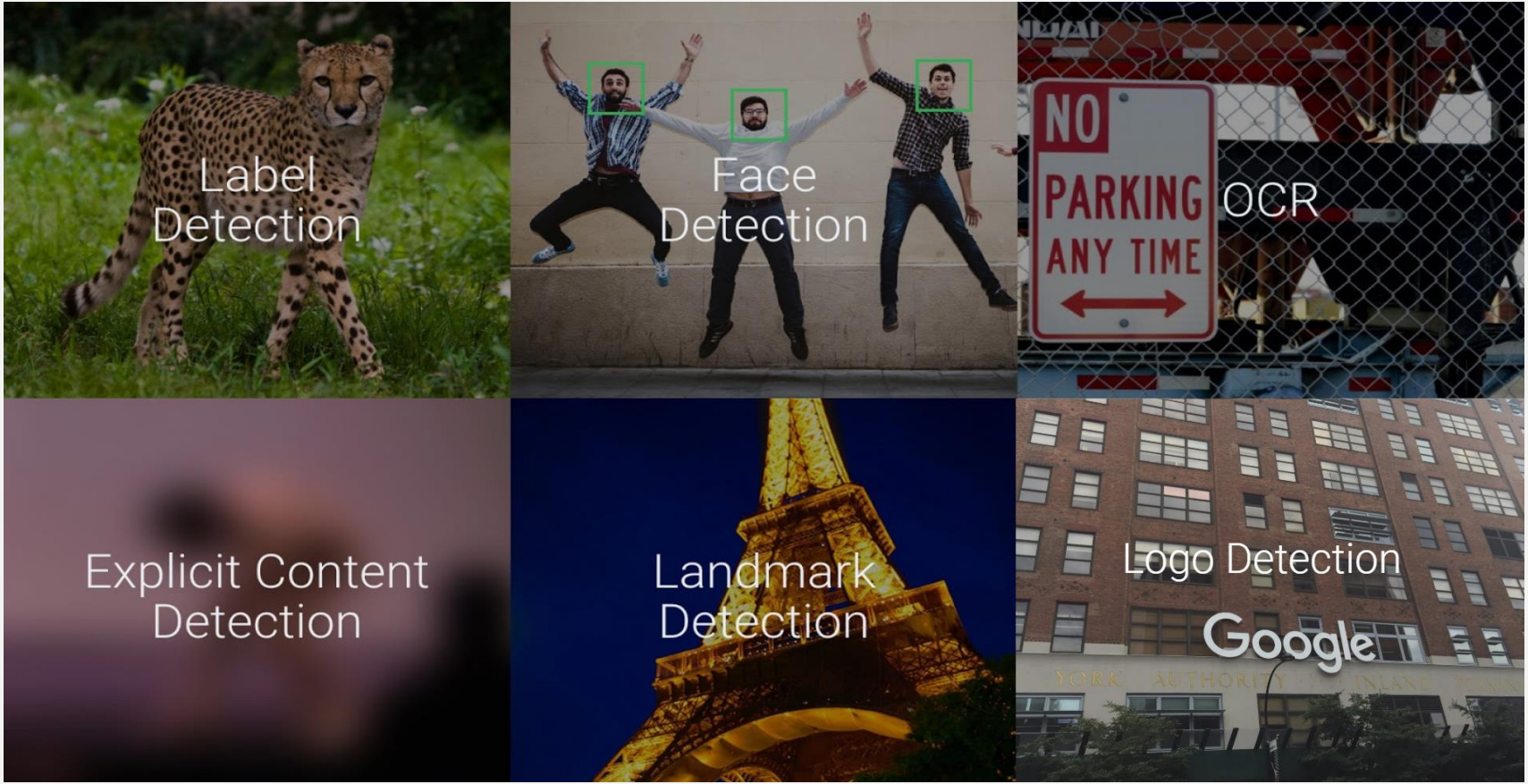
FRAUD DETECTION

HOUSE PRICE PREDICTION

STOCK PREDICTION

CUSTOMER PREDICTION




Label Detection
Face Detection
NO PARKING ANY TIME
OCR
Explicit Content Detection
Landmark Detection
Logo Detection
Google

REFERENCES

- Machine Learning in 45 minutes by Jason Mayes, Senior Creative Engineer at Google
  - **Video:** https://www.youtube.com/watch?v=X4I9QmcSEYo
  - **Slides**: https://goo.gl/fGJ8HJ