

The background is a dark blue gradient. It features four sets of concentric, nested triangles in the corners, each composed of many thin, light blue lines. The triangles are oriented with their vertices pointing towards the corners of the frame.

Introduction to Machine Learning with Python

By Rami Zouari

Objectives



To Know

What is Machine Learning



To Do

Install Machine Learning tools



To Practice

Create a working Machine
Learning model

PLAN

01

Introduction to Machine Learning

Exploring the AI world

02

Machine Learning with Python

Machine Learning, the Pythonic way

03

Project Discovery

???

A decorative graphic on the left side of the slide consisting of multiple concentric hexagonal outlines in a light green color, creating a tunnel-like effect that draws the eye towards the center. The number '01' is placed in the center of the innermost hexagon.

01

Introduction to Machine Learning

Exploring the AI world



Short History

xxxx-1940s

Statistical Analysis

- Statistical methods are discovered and refined.
- These methods are improved constantly during World War 2.

1950s-1960s

Early Artificial Intelligence

- Pioneering machine learning research is conducted using simple algorithms.
- Probability is introduced in machine learning.
- Symbolic AI is introduced.

1970s-1980s

“AI Winter” & later Resurgence

- 'AI Winter' caused by pessimism about machine learning effectiveness.
- Rediscovery of new methods causes a resurgence in machine learning research.

1990s-present

Breakthroughs & Pushing the limits

- Work on Machine learning shifts from a knowledge-driven approach to a data-driven approach.
- Unsupervised Machine Learning become widespread.
- Deep learning becomes feasible.

Artificial Intelligence



what people think it is



what amateur
programmers think it is

Symbolic AI???

```
1
2 // 10,000 if-statements
3
4 if() {
5     if() {
6         if() {
7             if() {
8                 if() {
9                     if() {
10                        if() {
11                            if() {
12                                if() {
13                                    if() {
14                                        if() {
```

what actually it is

ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



1950's 1960's 1970's 1980's 1990's 2000's 2010's

MACHINE LEARNING

Machine learning begins to flourish.



DEEP LEARNING

Deep learning breakthroughs drive AI boom.





Artificial Intelligence

The diagram consists of three nested ellipses. The outermost ellipse is light blue and contains the text 'Artificial Intelligence'. Inside it is a medium blue ellipse containing the text '*Machine Learning*'. The innermost ellipse is dark blue and contains the text 'Deep Learning'. The ellipses are centered on a dark blue background. On the left and right sides of the ellipses, there are decorative patterns of parallel, slightly curved lines in a light teal color, pointing towards the center.

Machine Learning

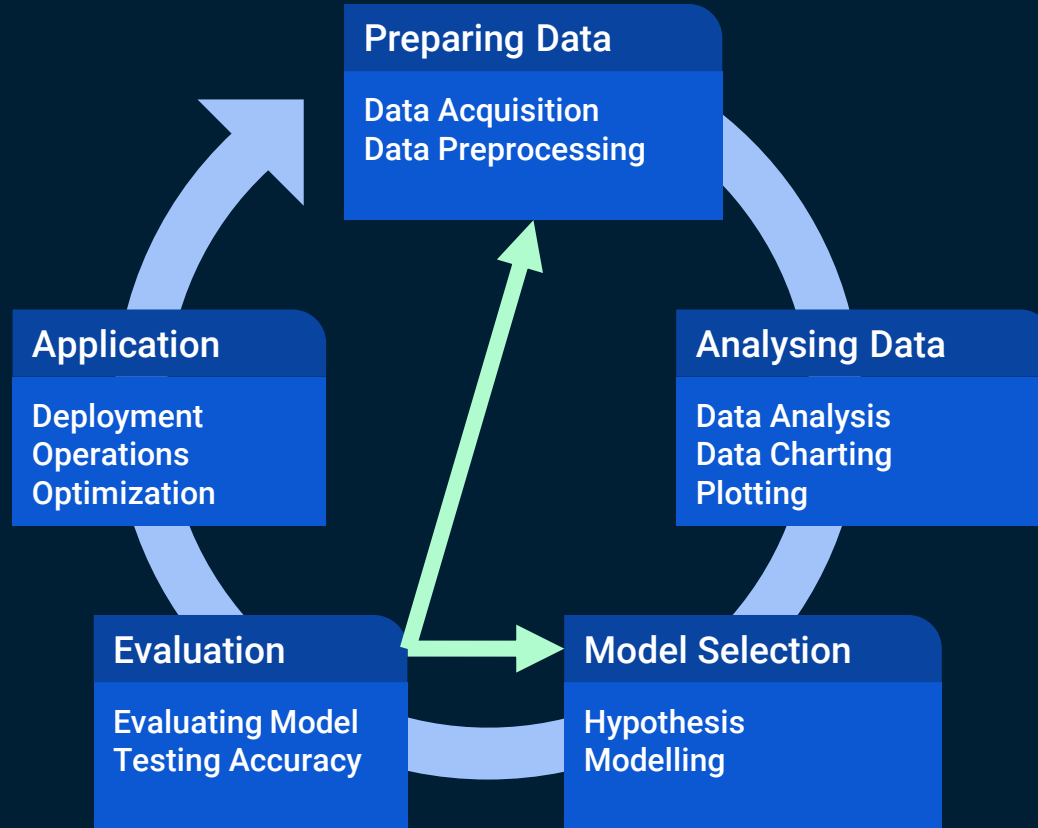
Deep Learning

What is Machine Learning

“Machine Learning algorithms enable the computers to learn from data, and even improve themselves, without being explicitly programmed.”

—Arthur Samuel

Machine Learning Cycle



Preparing Data

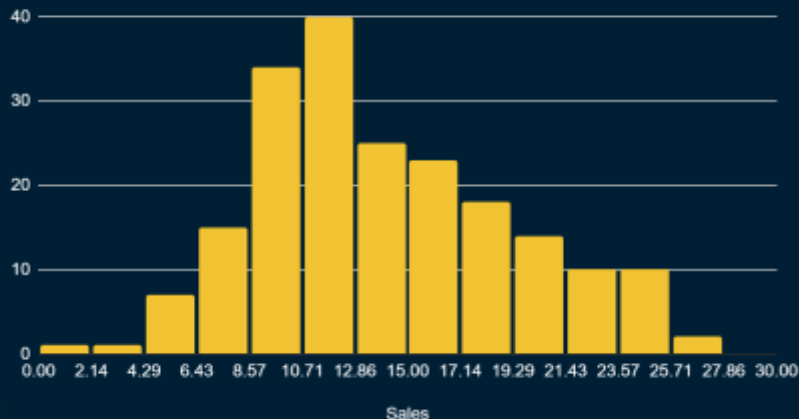
Advertising Dataset:

<u>ID</u>	<u>TV</u>	<u>radio</u>	<u>newspaper</u>	<u>sales</u>
1	230.1	37.8	69.2	22.1
2	44.5	39.3	45.1	10.4
3	17.2	45.9	69.3	9.3
4	151.5	41.3	58.5	18.5
5	180.8	10.8	58.4	12.9
6	8.7	48.9	75	7.2
7	57.5	32.8	23.5	11.8

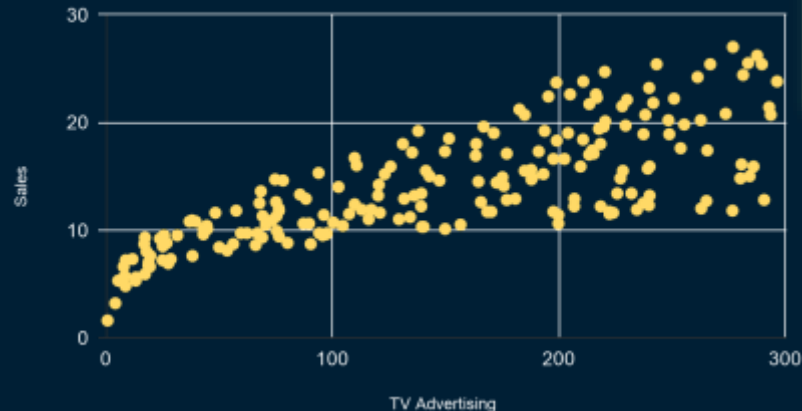
This Data Set is a sequence of observations between TV,radio & newspaper advertising, and sales.

Analysing Data

Histogram of Sales



Relation between TV Advertising & Sales



\$14.02
Average Sales

30 Days
Avg. days on market



74.9%
Sales Increase
this month

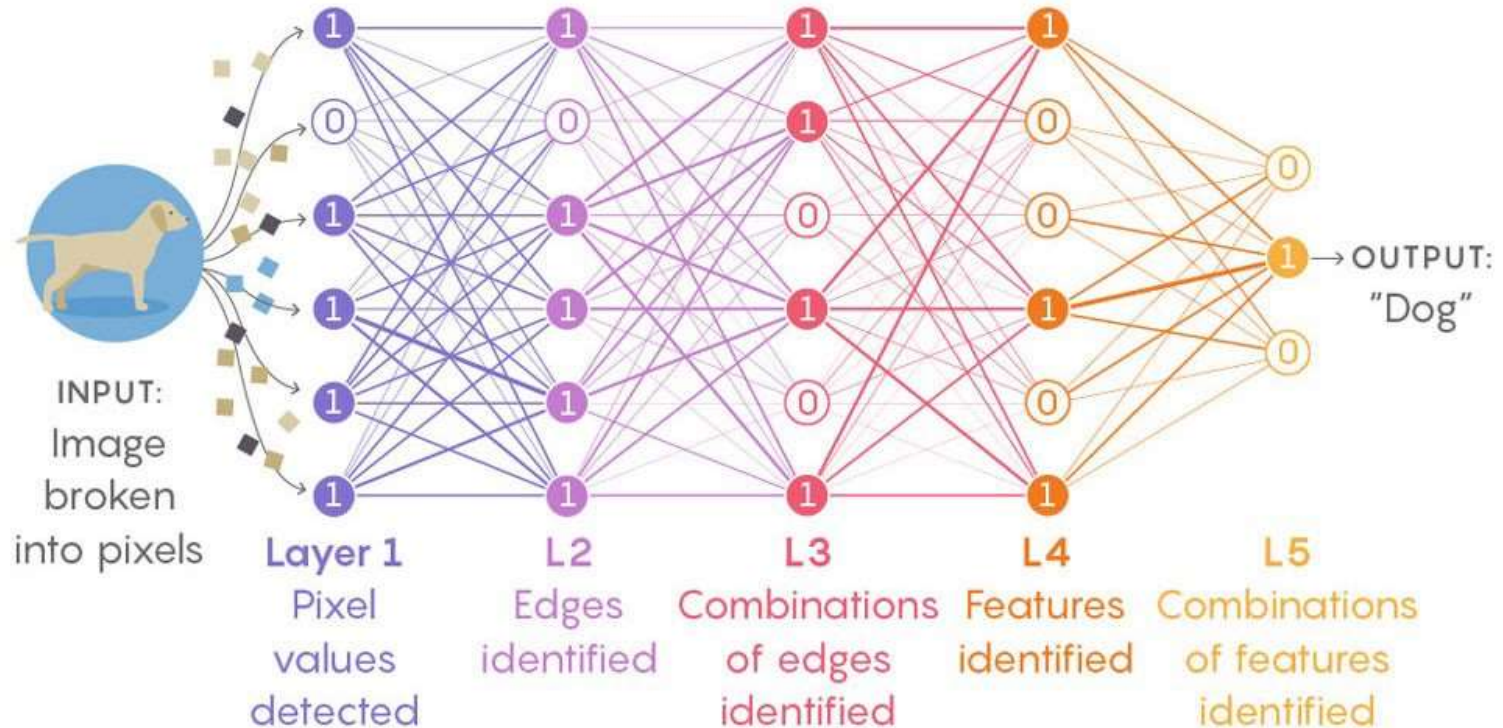


57.3%
People buys from
TV Ads



42%
Markets Don't
have our product

Model Selection

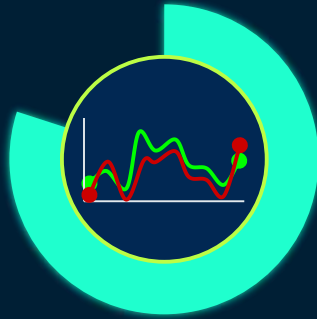


Model Evaluation



90%

Accuracy



0.8

R² Score

Decision



Not Good..

Back to Data Preparation



Can be Improved?

Back to Model Selection



Perfect!

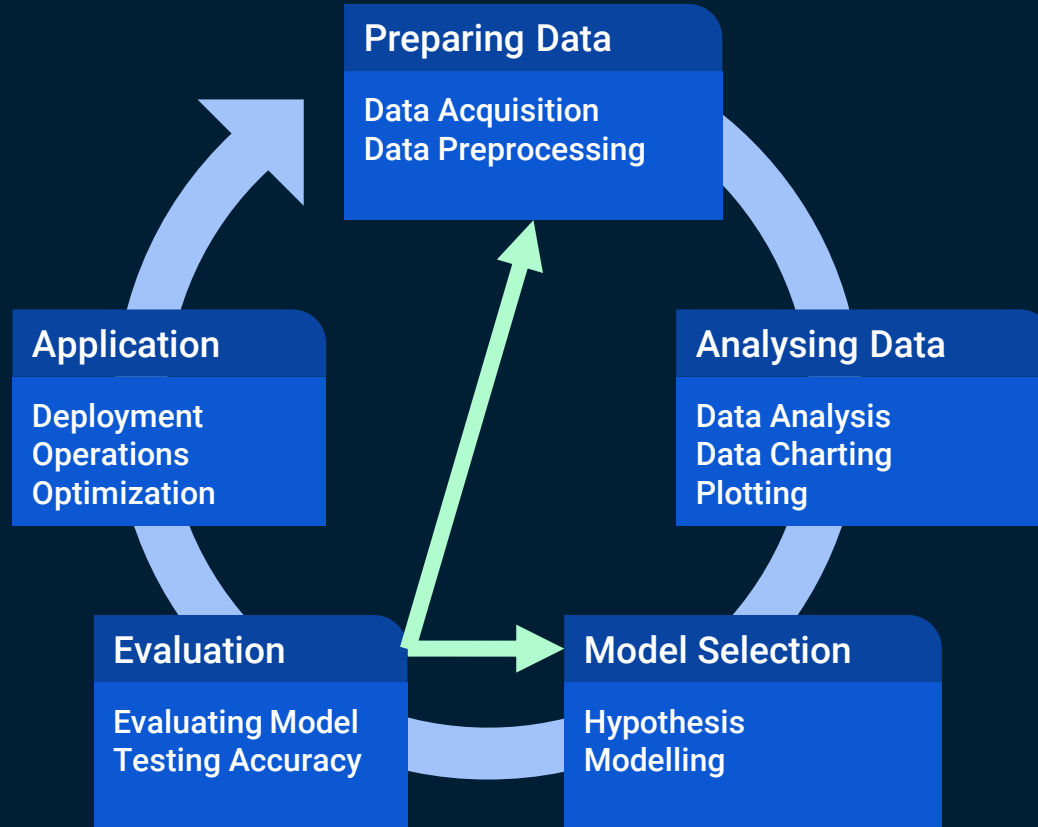
Let's Apply our model

Application

After a successful evaluation of the model, we can integrate it to our application with the full power of AI.



Machine Learning Cycle



Machine Learning Approaches



Supervised Learning

The program is given labeled data.

- Predicting House Sales
- Identifying Sentiment
- Identifying Accident Damage
- Predicting Flight Delay



Unsupervised Learning

The program is given unlabeled data.

- Youtube Recommendation
- Google Search
- Identifying Fake News
- Spam Filter



Reinforcement Learning

The program is interacting with a given environment

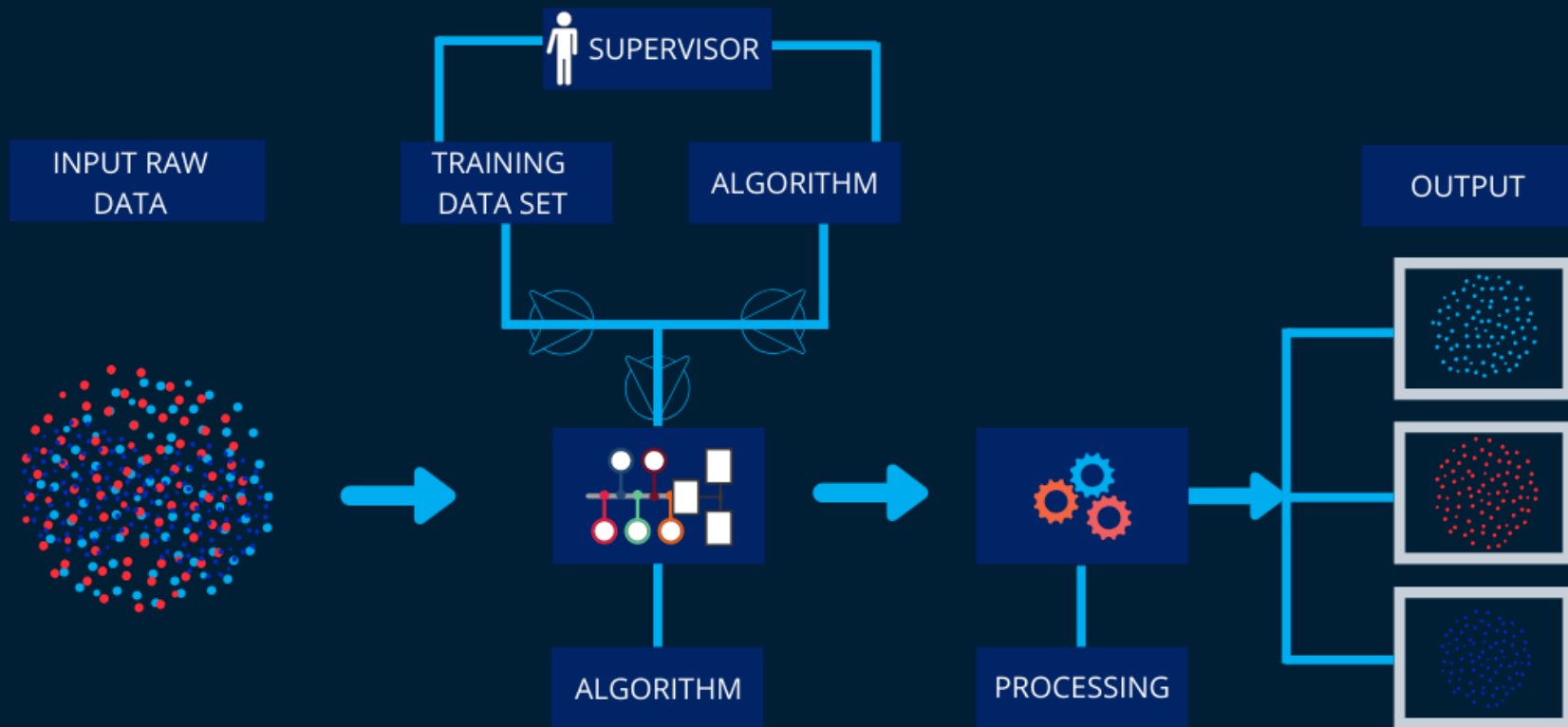
- Chess (Alpha Zero)
- Snake Game
- Self Driving-Car
- Robots



Supervised Learning

1. Regression
 2. Classification
- 

How Supervised Learning Works



Supervised Learning

Regression

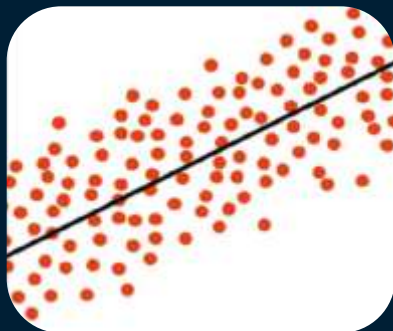
- Used to predict some value
- Example: A flight delay predictor

- The output is “continuous”:

Example: 1.38 2 3.682

- Some Algorithms:

- Linear Regression
- Polynomial Regression
- Random Forest
- Neural Network



Classification

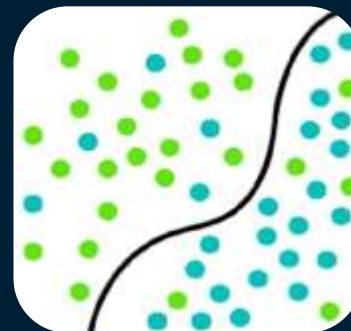
- Used to classify an element in its group
- Example: A Twitter comment classifier

- The output is “discrete”

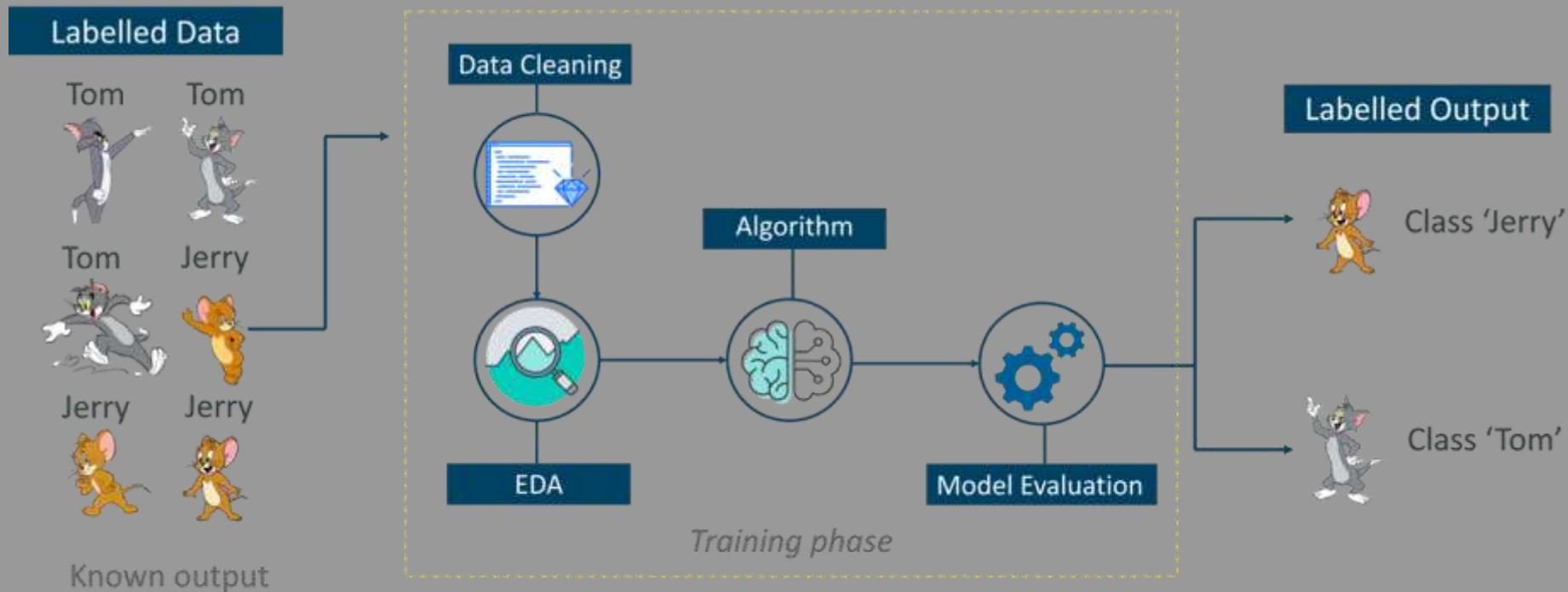
Example: “Dog” “Cat” “Mouse”

- Some Algorithms:

- Logistic Regression
- K-Nearest Neighbours
- Naive Bayes
- Support Vector Machine
- Neural Network
- Decision Tree
- Random Forest



Classification Example



But How Machine Learning really works?

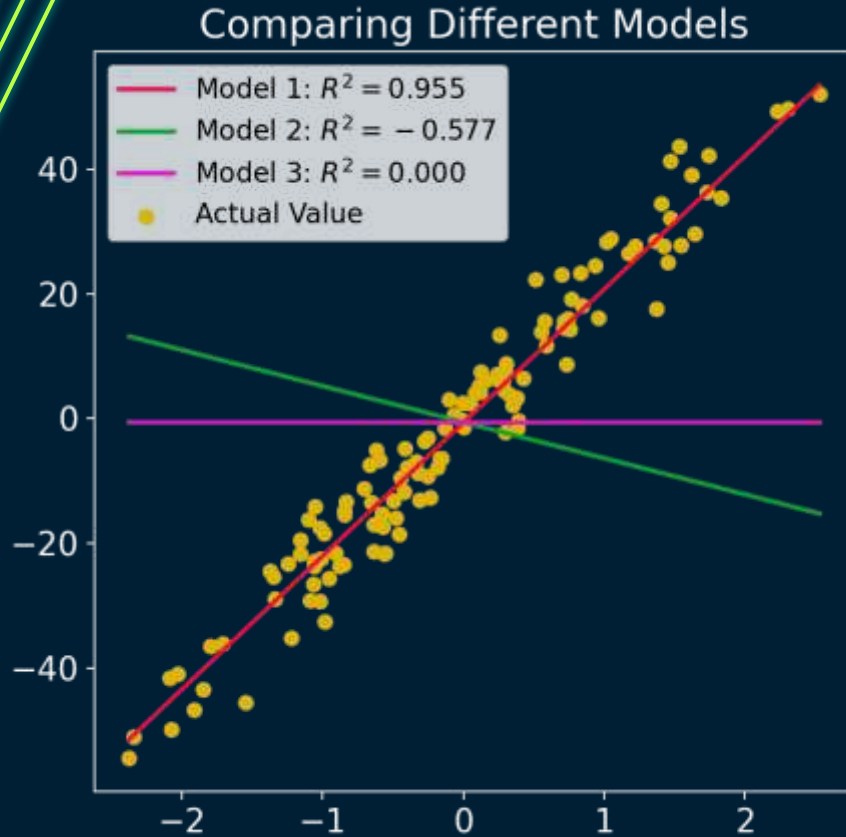
Most Machine Learning algorithms select the most optimal model from a parameterized family of models.

Each algorithm has its associated family of models

A parameter is a variable, can be of type “int” or “float” ...

An optimal model is model that minimises error.

In our case, the optimal model is “Model 1”





Example

$1/A$



Going “Deeper”



Artificial Intelligence

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Machine Learning

Deep Learning

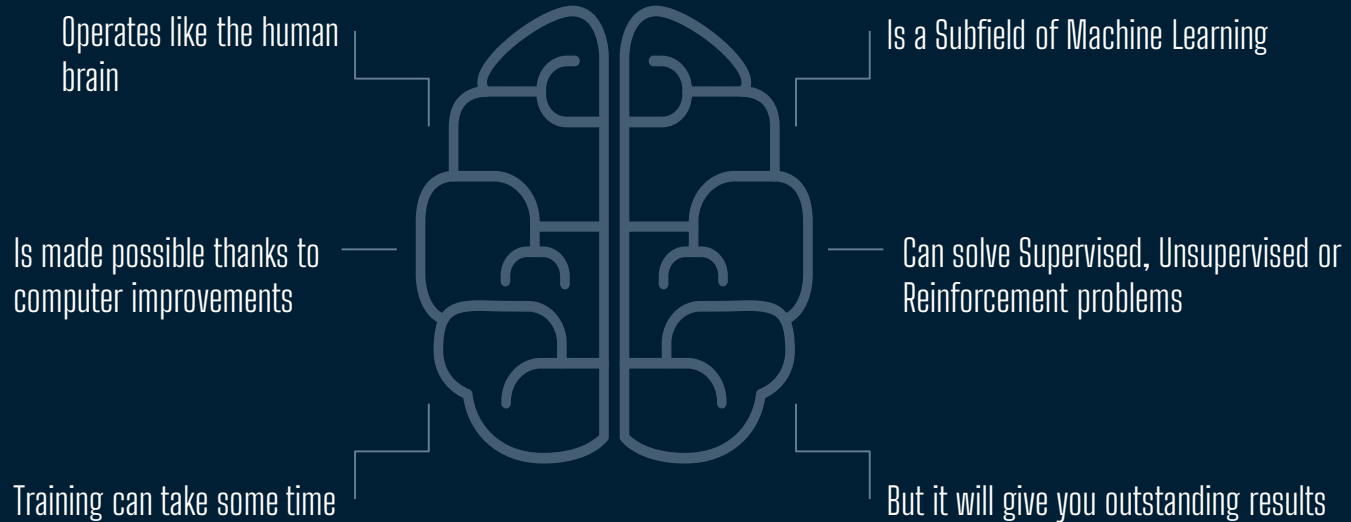


What is Deep Learning

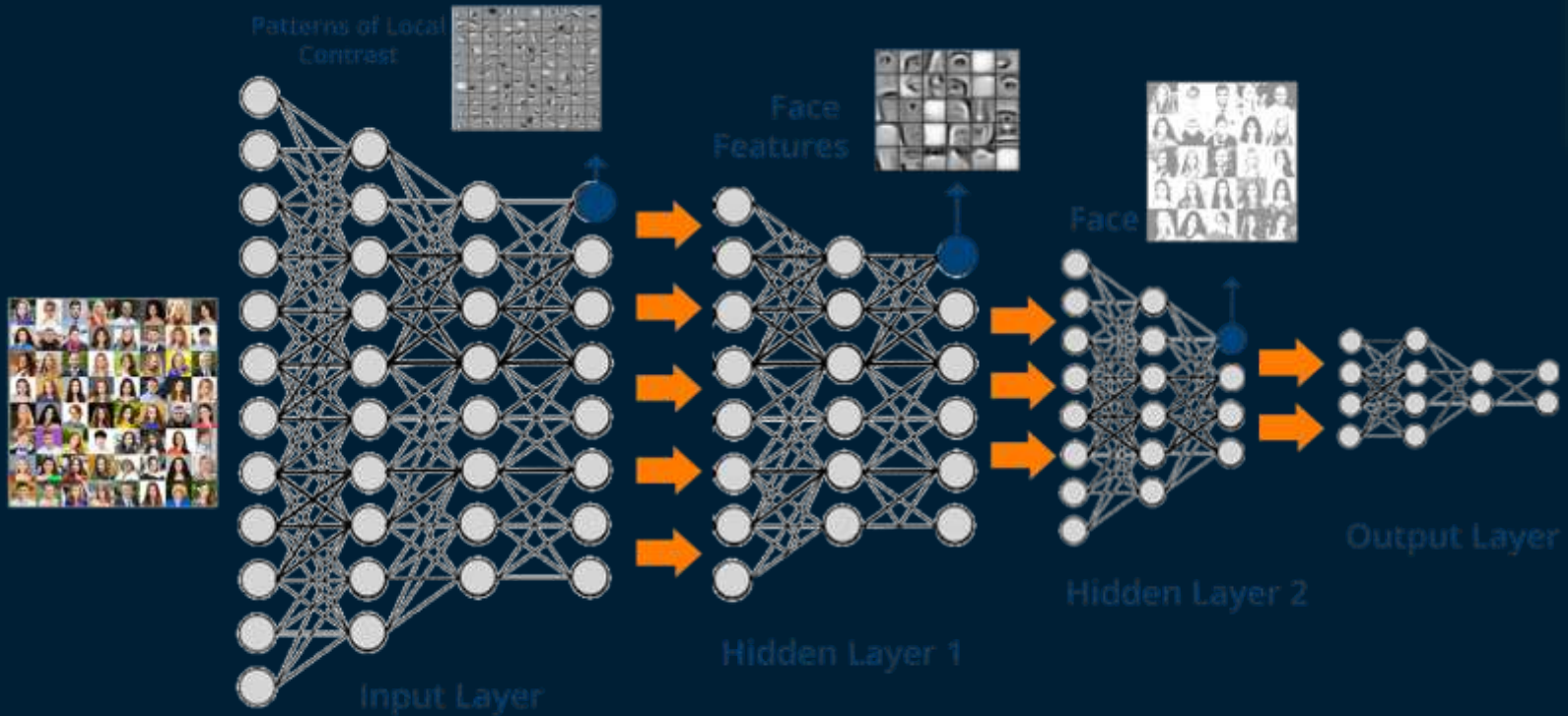
Deep Learning is a machine learning technique that constructs artificial neural networks to mimic the structure and function of the human brain

Deep Learning

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks.



Neural Network Design



What makes it popular?

It gave the possibility to solve complex problems that were intractable by previous Machine Learning Algorithms

When used correctly, it can give almost perfect results

We can interpret each step of the model.

Nothing is perfect...

To train a Deep Learning Model, you need massive computer power, or so much patience

It is prone to Overfitting

In some areas, proven Machine Learning algorithms can easily outclass Deep Learning Algorithms



**Pushing CPUs & GPUs
speed to the limit?**



Example

$1/B$


























A decorative graphic on the left side of the slide consisting of multiple concentric hexagons. The hexagons are outlined in a light green color and are arranged in a way that they appear to recede into the distance, creating a tunnel-like effect. The number '02' is centered within the innermost hexagon.

02

Machine Learning with Python

Machine Learning:
the Pythonic way

Language Comparison: Top 4 used

	Python	Java	C++	C
Easy to Learn			 	
No need to compile			 	 
Powerful Syntax				
Libraries support				
Speed			 	 



python™




**Why not combine the
friendliness of python with the
power and speed of C++?**

Machine Learning with Python

Python

User Friendly	✓
Extensive Documentation (+ StackOverflow Answers + Indian Videos)	✓
Libraries maintained by Experts	✓
State of the Art Algorithms	✓
C++ Under the hood (You won't directly use that monster)	✓



**Now Let's
Prepare for
The Battle**

The Container



ANACONDA®

- Is a distribution of Python for Scientific Computing
- It simplifies Package Management & Deployment

The Soldiers

The marksman



It is a web-based interactive
computational environment for
creating Jupyter notebook
documents

The machine gunner



It is an IDE for Scientific
Programming

The Essential One



- It is a Numerical Library adding support for large multi-dimensional arrays
- NumPy is the fundamental package for Scientific Computing
- It has numerous functions acting on arrays
- It is a building block for many other libraries

The Analysers

The Manipulator



- It is a Data Manipulation & Analysis Library that works on top of NumPy and Matplotlib.
- It offers Data Structures for manipulating Numerical Tables and Time Series.

The Visualiser



- It is a Plotting library that works on top of NumPy.
- It has an Object Oriented API (Recommended), and a Procedural one that resemble MATLAB (discouraged).

The Predictors

The Swissknife



- It is a Machine Learning Library built on top of NumPy
- It features various Regression, Classification and Clustering Algorithms

The 1-Man Army



- It is a symbolic maths library used for machine learning
- It has a particular focus on training of deep neural networks
- It is compatible with NumPy

The Architect



- It is built on top of TensorFlow
- It acts as a user-friendly interface to TensorFlow

The Reinforcement

Le Clairevoyant



It is a library built on top of NumPy aimed at real-time Computer Vision.

The Artist



It is a Visualisation Library built on top of matplotlib that is more user friendly

The Technical



It is a library built on top of NumPy used for Scientific Computing and Technical Computing.



**Time to
Code!**



Example 2



Example 3

A decorative graphic on the left side of the slide consisting of multiple concentric hexagonal outlines in a light green color, creating a tunnel-like effect that draws the eye towards the center.

03

Project Discovery: Face Mask Detection

You can enter a subtitle here
if you need it

About the Project

In this project, we are going to work on a Face Mask detector algorithm and:

1. Analyse it & Improve it
2. Use what we have learnt from this workshop, and the Cloud Computing workshop to deploy it in Microsoft Azure.
3. Set up a Http(s) Server that for every request, answers whether is there a mask detected or not.
4. Test that server on a Barrier





**Thank You
for your
Attention**