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!

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Welcome to PG Program for AI-ML



The curriculum of Machine Learning course is designed by Edureka under the special guidance of **Dr. RBV Subramaanyam**, Professor, Department of Computer Science and Engineering, NITW, Ph.D. (IIT Kharagpur)

Professor's Areas of Expertise: Data Mining, Big Data Analytics, Fuzzy Data Mining, Spatio-Temporal Data Mining, Distributed Data Mining, Graph Databases, Machine Learning

COURSE OUTLINE

Module 1

**Introduction to
Machine Learning**

Supervised Learning -
Regression

Supervised Learning -
Classification

Model Selection & Boosting

- Unsupervised Learning
- Dimensionality Reduction
- Association Rules Mining & Recommendation Systems
- Time Series Analysis



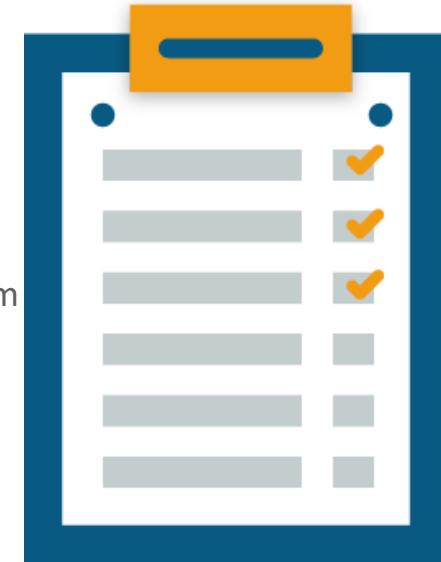
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Introduction to Machine Learning

Topics

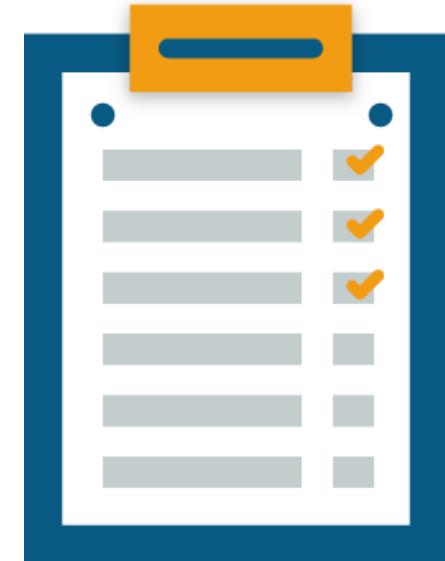
- What is Machine Learning?
- Myths of Machine Learning
- Applications of Machine Learning
- Types of Machine Learning
 - Supervised Learning
 - Unsupervised Learning
 - Reinforcement Learning
- Regression Algorithm
- Classification Algorithm
- Clustering Algorithm
- Anomaly Detection Algorithm
- Experiment with Google

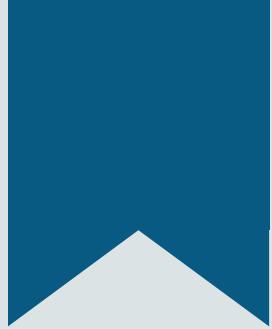


Objectives

At the end of this module you will be able to:

- Understand the problem scenarios faced in the industry
- Learn what is Machine Learning
- Learn about various applications Of Machine Learning around you
- Bust out myths related to Machine Learning
- Learn how Machine Learning works
- Understand different types of Machine Learning
- Get an overview of Machine Learning algorithm
- Learn how to write a basic Machine Learning code in python
- DIY - Teachable Machine





Scenario 1: Edgeways - A Software Company

Scenario Of Edgeways



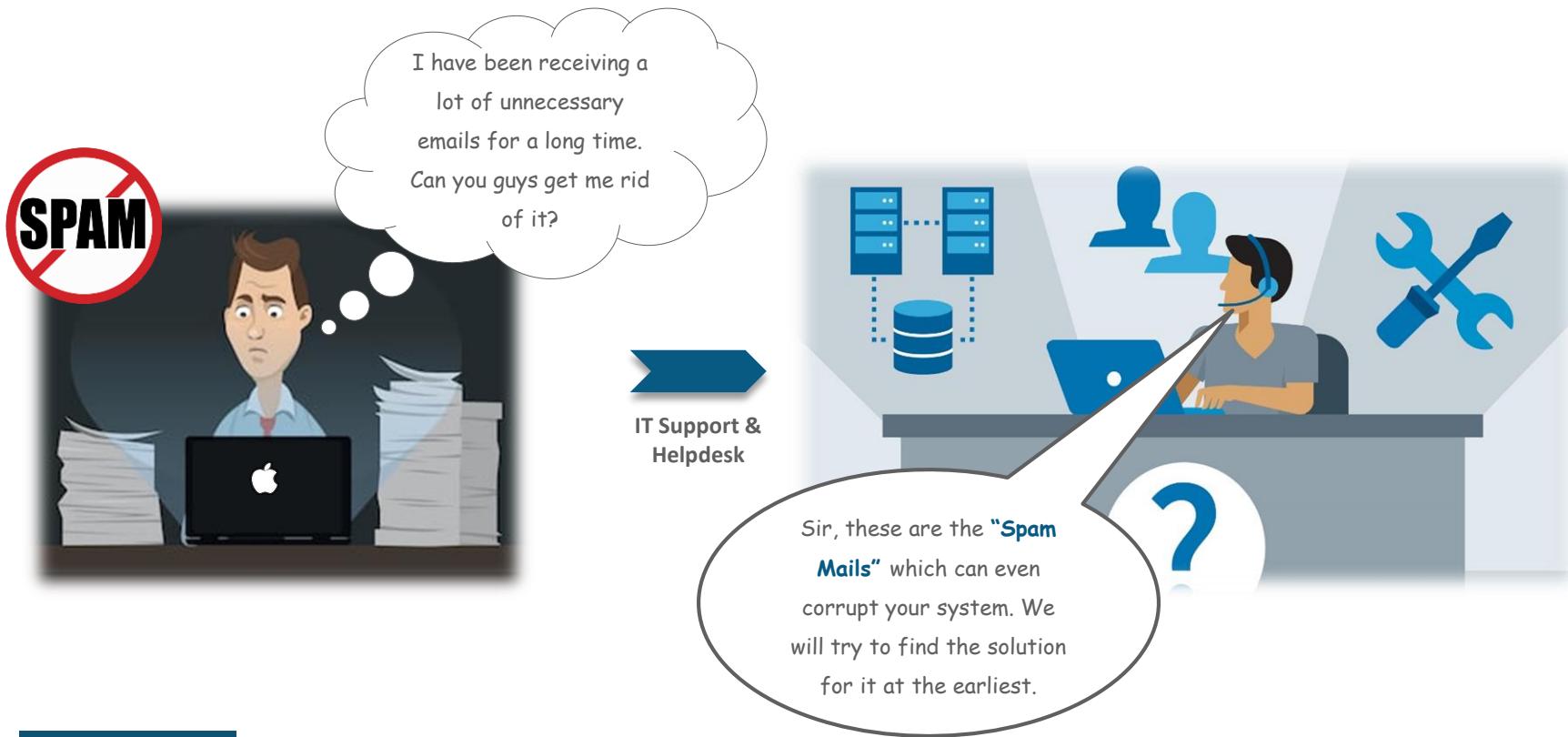
A professional from **Edgeways** checks his inbox for new mails or updates. While checking, he comes across a lot of unnecessary emails that frustrate him.

Hey Dear,
Congratulations!!!!
I am pleased to inform you that
you have won an amount of
100K in a lottery ticket. You can
send your “account details” by
replying to same mail.
Best Regards
Friend

Hey Dear,
Surprises are waiting at
your door!!!!
Reply to the same mail
and see the magic.
Best Regards
Anonymous

.....
many more

Edgeways: Challenge Faced





Edgeway's Challenge: Probable Solution

Probable Solution

Spam mails can be detected by manually setting a filter on some words

For Example,

If words like lottery are found, then mark the mail as a spam mail



Be careful with this message. Similar messages were used to steal people's personal information. Unless you trust the sender, don't click links or reply with personal information. [Learn more](#)



Greetings To You And Your Family,

Our names are John and Lisa Robinson of Munford, Tennessee winner of power-ball lottery some 2016 of the sum of \$528.8 million share of the prize in one lump-sum payment of \$327.8 million. We just commenced our charity donation scheme and we willing to give out cash grant of US\$500,000.00 each to (7) Lucky international recipients worldwide. You received this message because your E-mail ID have been listed as one of our (7) lucky winner in our charity donation.

Our aim is to raise the living standards of people across the world. This may be a surprise to you or a joke or hoax to you due to the scams in the internet this days, please have no doubt as this is very real. To confirm the legitimacy, visit my web page: <http://money.cnn.com/2016/05/01/news/largest-lottery-jackpots/>

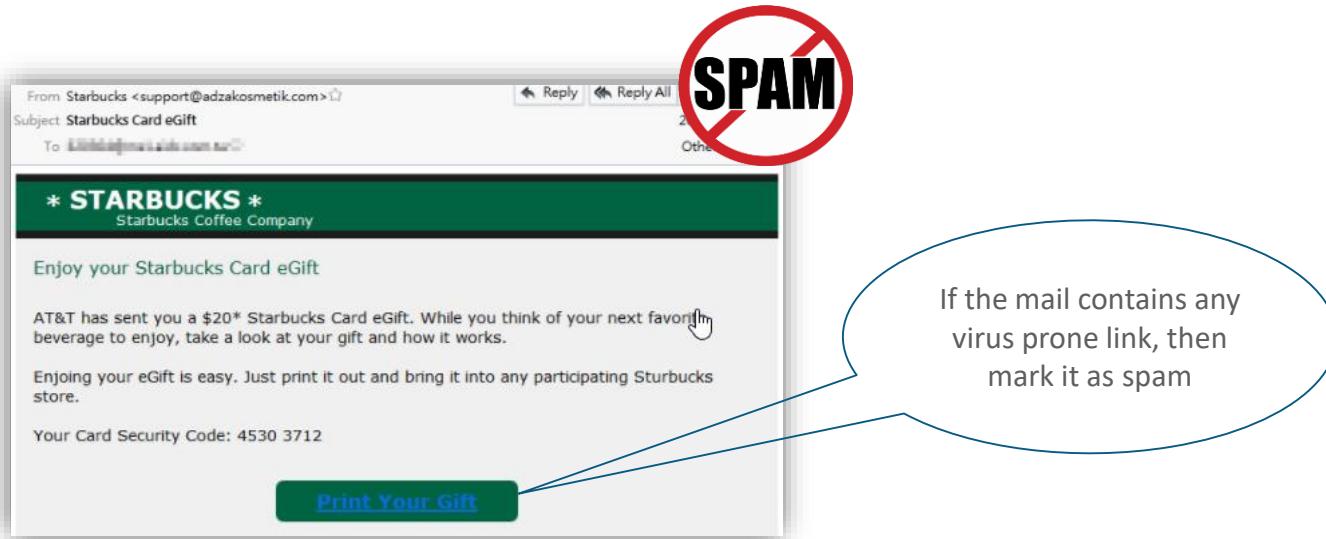
After your confirmation, Kindly respond to this message with your Full Names and your contact address for more details on how to receive your cash grant.

Kindly accept my warmest Congratulations.

Warm Regards,
John & Lisa Robinson

Such as 'lottery' keyword

Probable Solution





Scenario 2: E-Cart An E-Commerce Company

Scenario Of E-cart



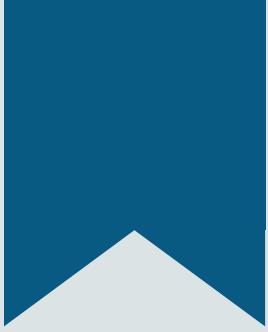
There is a downfall in the sales of “**E-Cart**” an e-commerce company

E-Cart: Challenge Faced



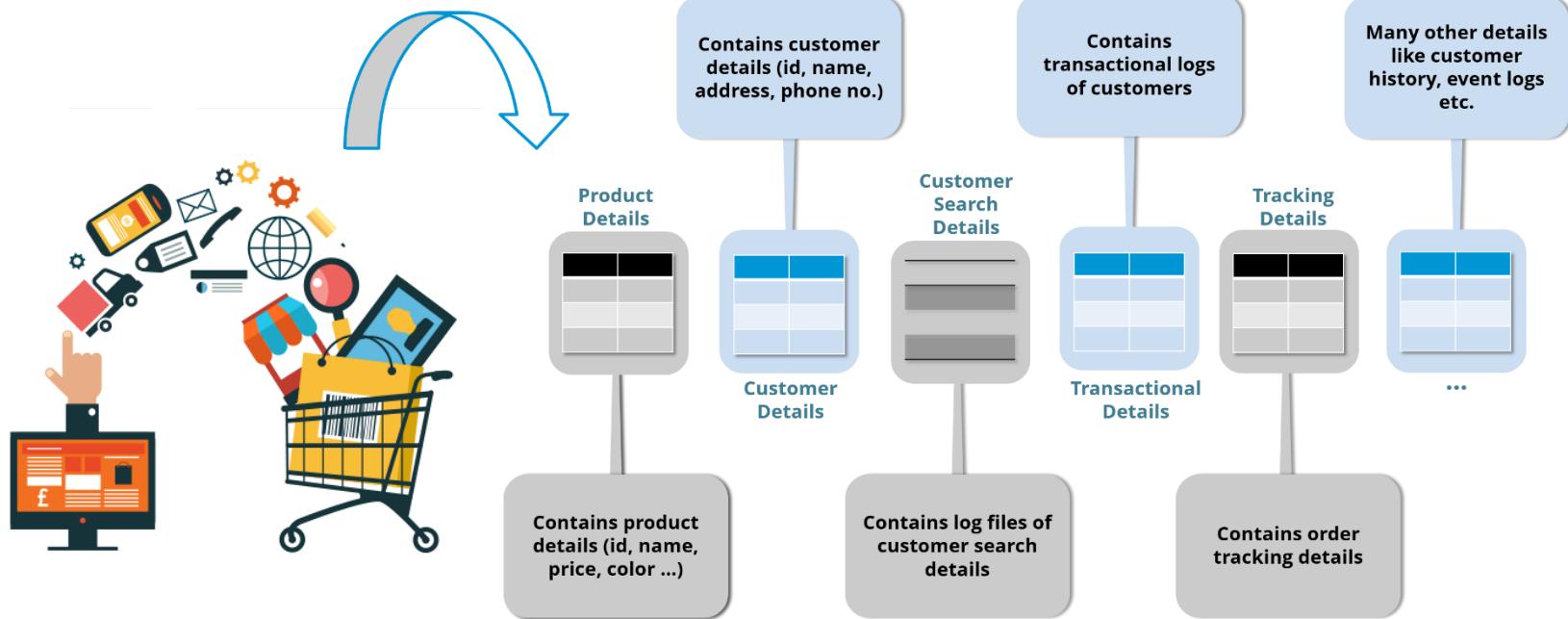
pixedrive

In a leadership meeting it was noticed that *a lot of unused data* can be used to boost company sales



E-Cart: Customer Data Sources

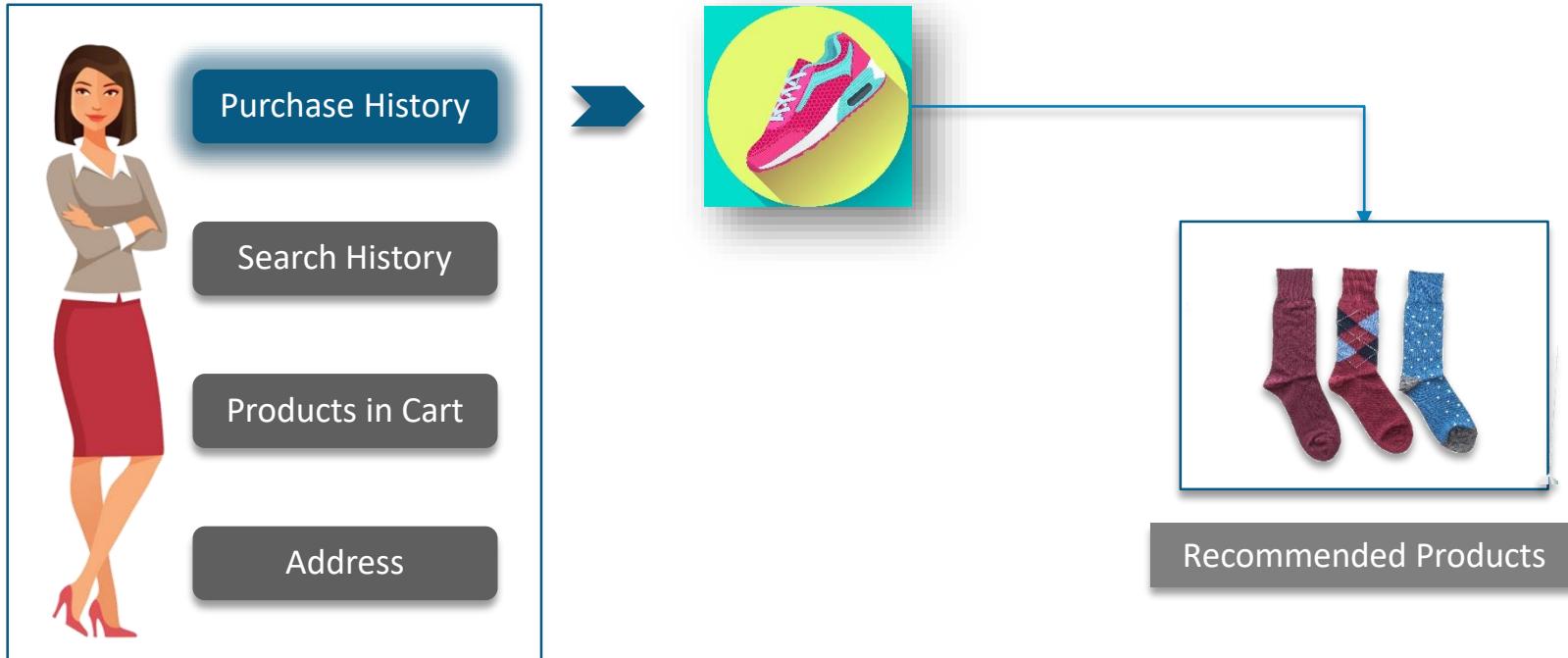
E-Cart: Customer Data Sources



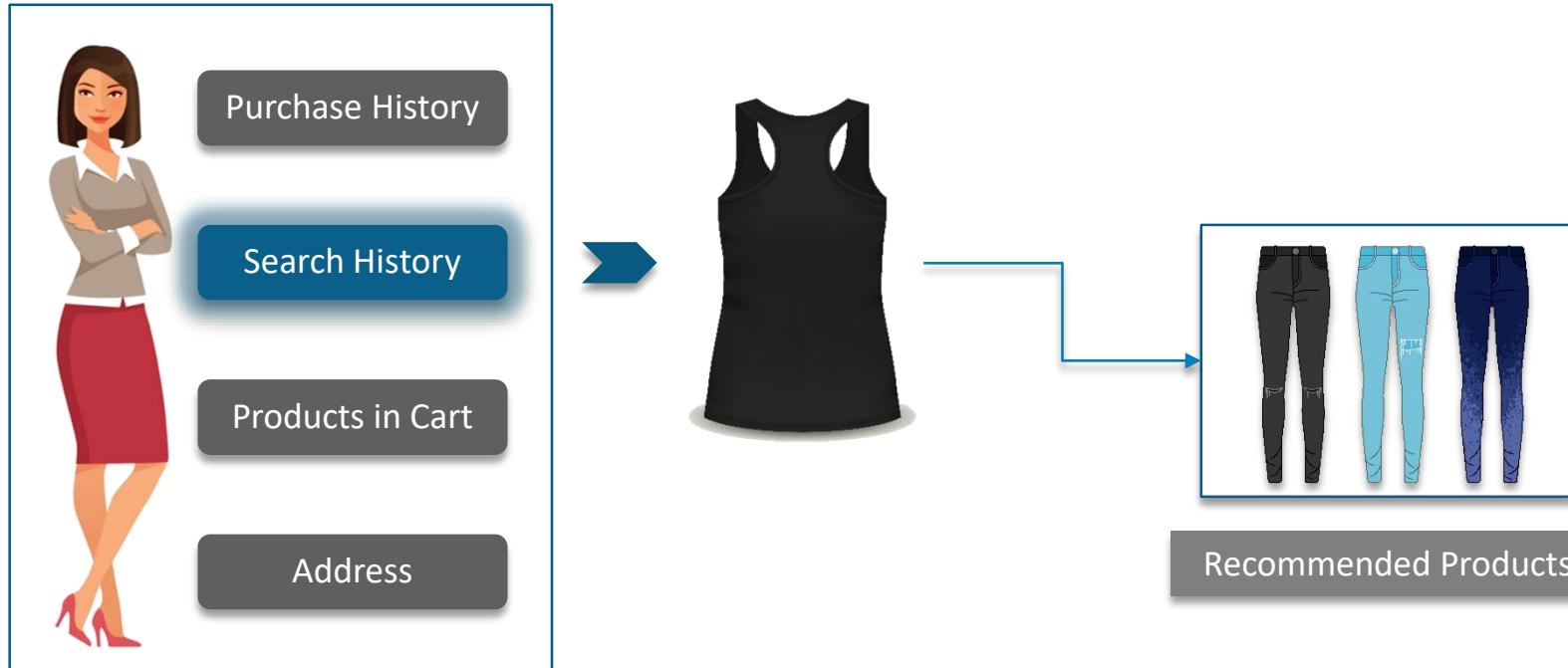


Marketing Correct Product to the Correct Audience Using Unused Data

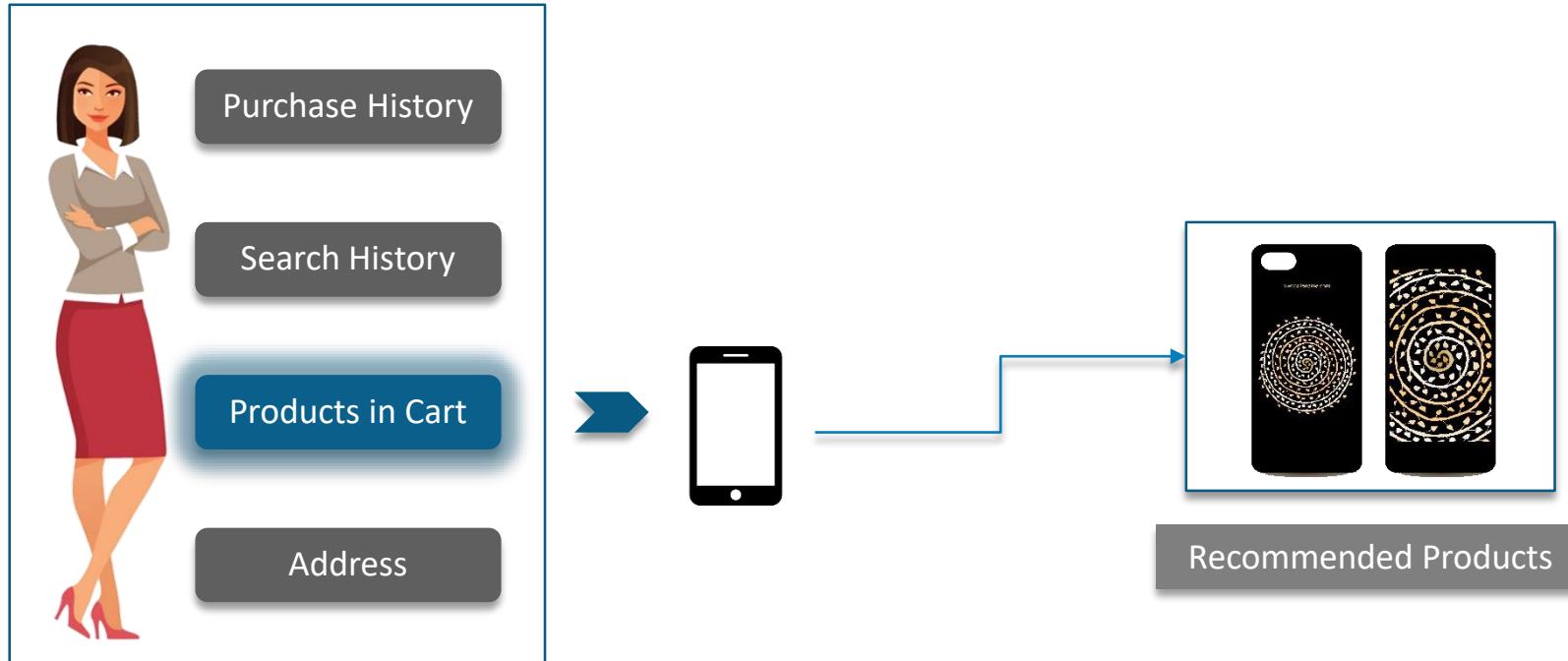
Probable Solution



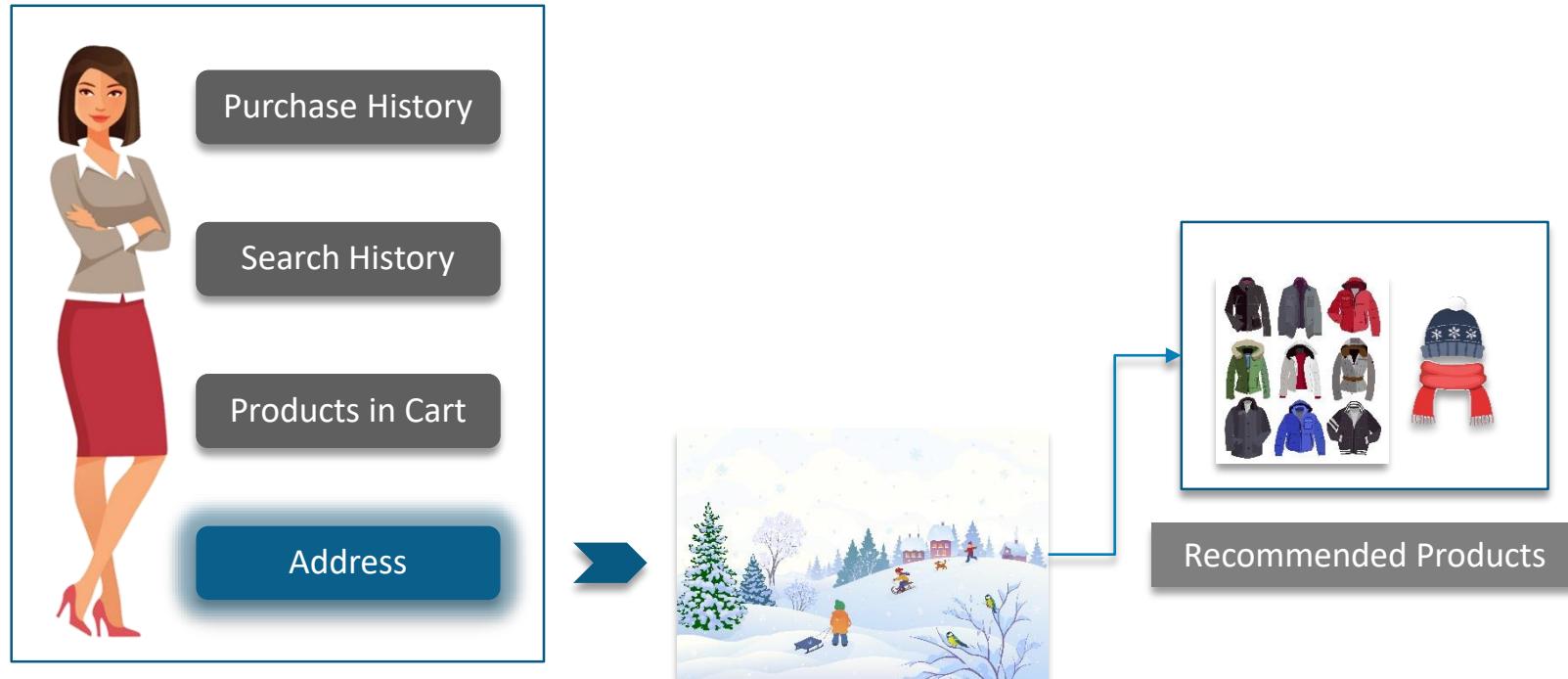
Probable Solution



Probable Solution



Probable Solution



Who Can Solve The Problem?



How many times do I need to set
the filter manually?



How can I enhance the
customer's shopping experience?

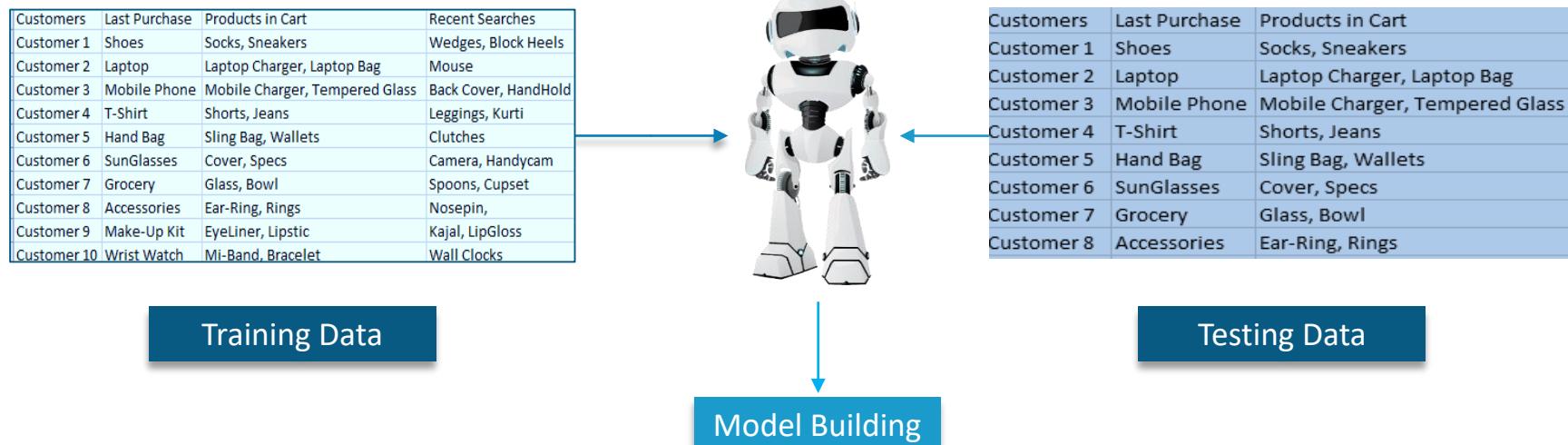




What Is Machine Learning?

What Is Machine Learning?

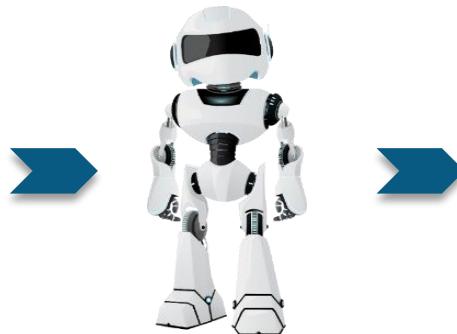
- Machine learning is a sub-set of artificial intelligence (AI)
- Allows the system to automatically learn and improve from experience without being explicitly programmed



What Is Machine Learning?

- Machine learning is a sub-set of artificial intelligence (AI)
- Allows the system to automatically learn and improve from experience without being explicitly programmed

Customers	Last Purchase	Products in Cart	Recent Searches
Customer 1	Shoes	Socks, Sneakers	Wedges, Block Heels
Customer 2	Laptop	Laptop Charger, Laptop Bag	Mouse
Customer 3	Mobile Phone	Mobile Charger, Tempered Glass	Back Cover, HandHold
Customer 4	T-Shirt	Shorts, Jeans	Leggings, Kurti
Customer 5	Hand Bag	Sling Bag, Wallets	Clutches
Customer 6	SunGlasses	Cover, Specs	Camera, Handycam
Customer 7	Grocery	Glass, Bowl	Spoons, Cupset
Customer 8	Accessories	Ear-Ring, Rings	Nosepin,
Customer 9	Make-Up Kit	EyeLiner, Lipstic	Kajal, LipGloss
Customer 10	Wrist Watch	Mi-Band, Bracelet	Wall Clocks

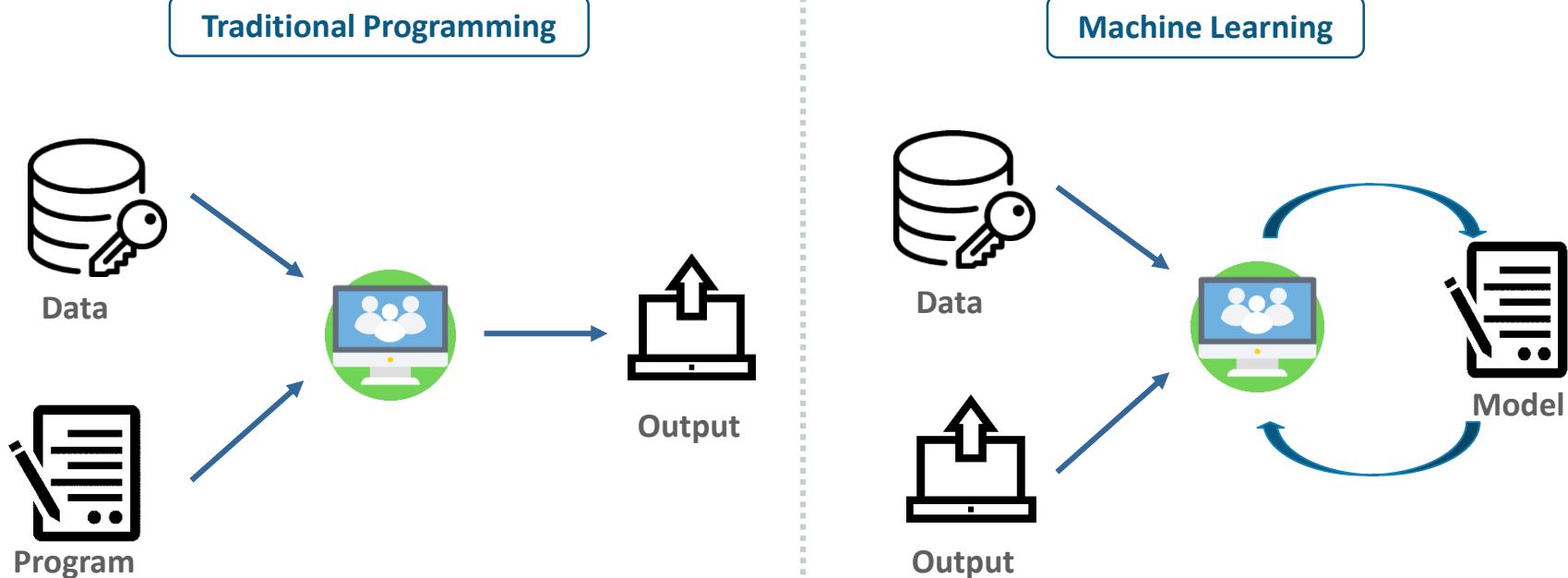


New Input

Trained Model

Predicted Output

Traditional Programming Vs Machine Learning



Machine Learning Helps To...



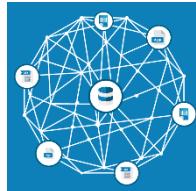
01

Detect patterns in the dataset

Focus on machine, learning on its own when *exposed* to *new data*



02



03

Find hidden insights using iterative algorithms

Automate analytical model building

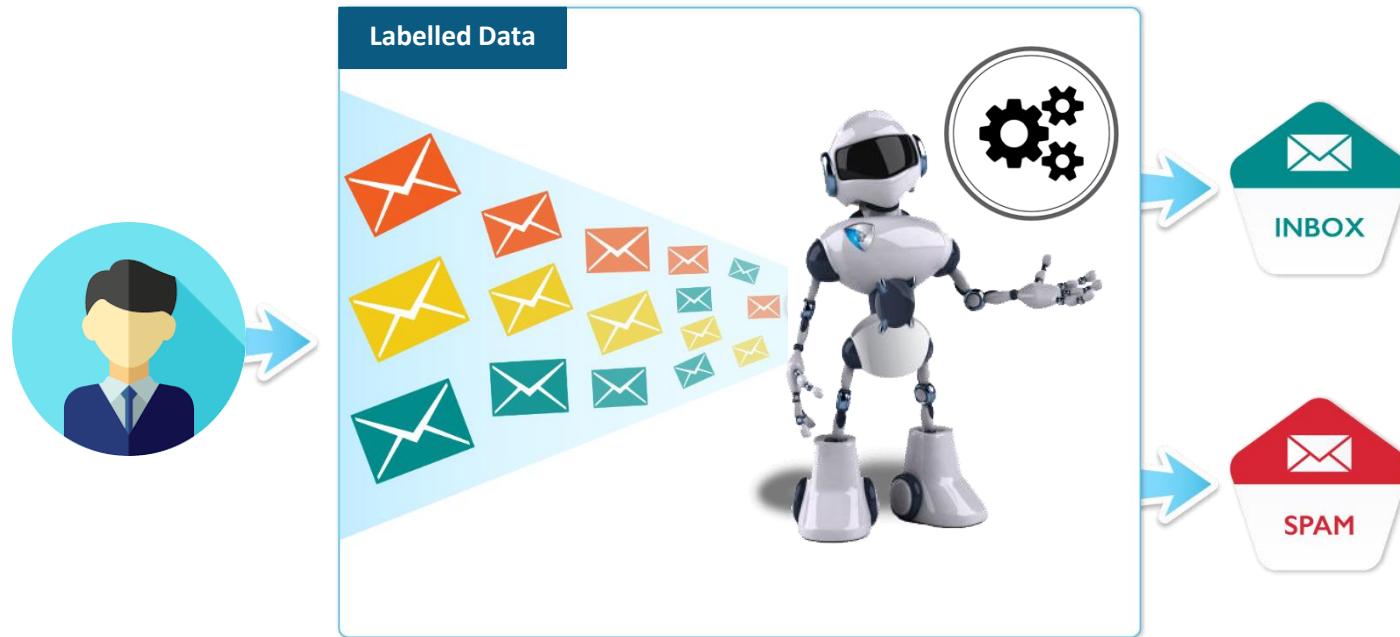


04



Scenario 1: Edgeways Challenge Resolved

Solution Using Machine Learning



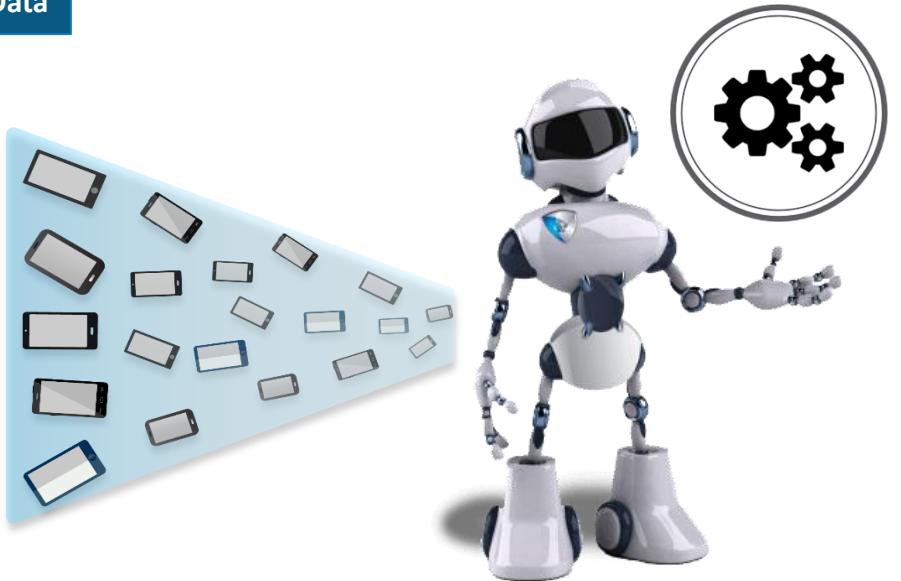
Machine is programmed to learn from labelled data to create rules to classify the mails



Scenario 2: E-Cart Challenge Resolved

Solution Using Machine Learning

Customer Data



Machine learns from the customers' data and clusters similar data together to recommend products to the customers



Best Recommendation



Iphone 6



Iphone 7

Other Recommendations



Mobile Cover



Tempered Glass



Iphone Charger

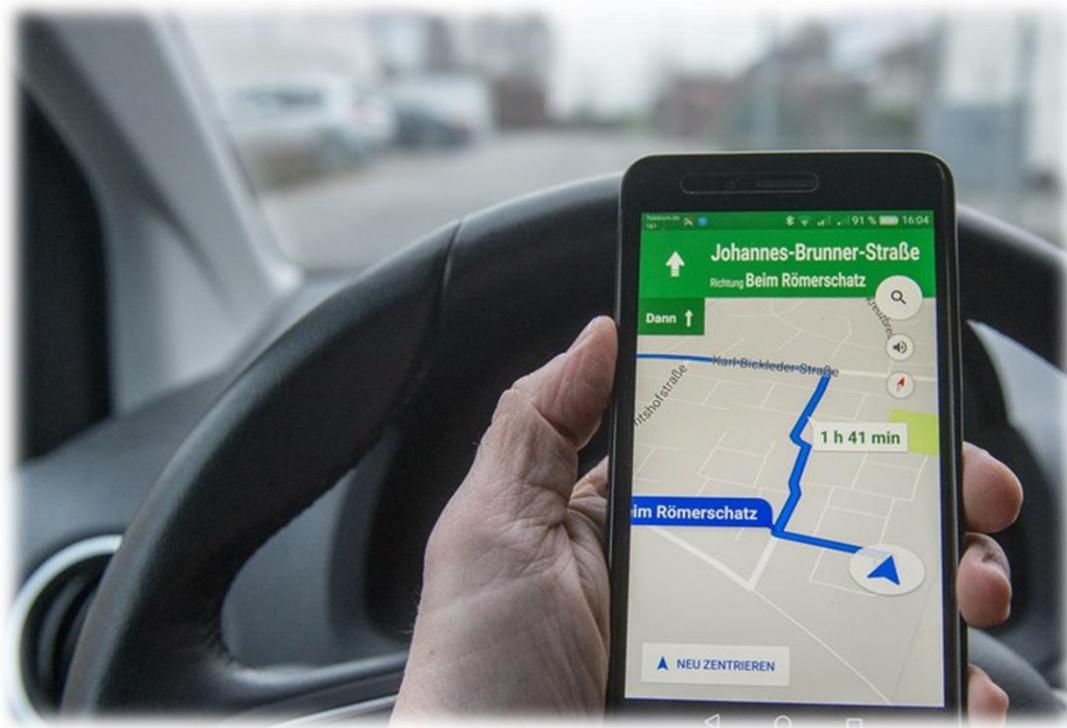


Applications Of Machine Learning

Machine Learning Applications

Google

How do you think Google
Predicts the traffic so accurately?



Machine Learning Applications



How do you think Amazon
Recommends you the products?



Machine Learning Applications



How do you think Amazon Alexa
responds to your commands?

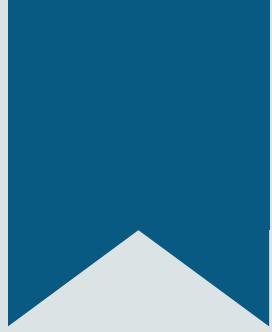


Machine Learning Applications



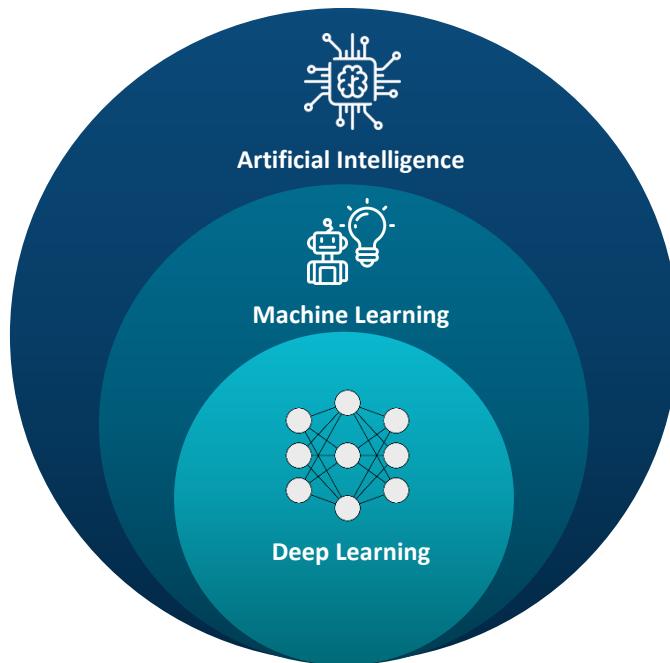
How do you think Google Translate
converts the text for you?



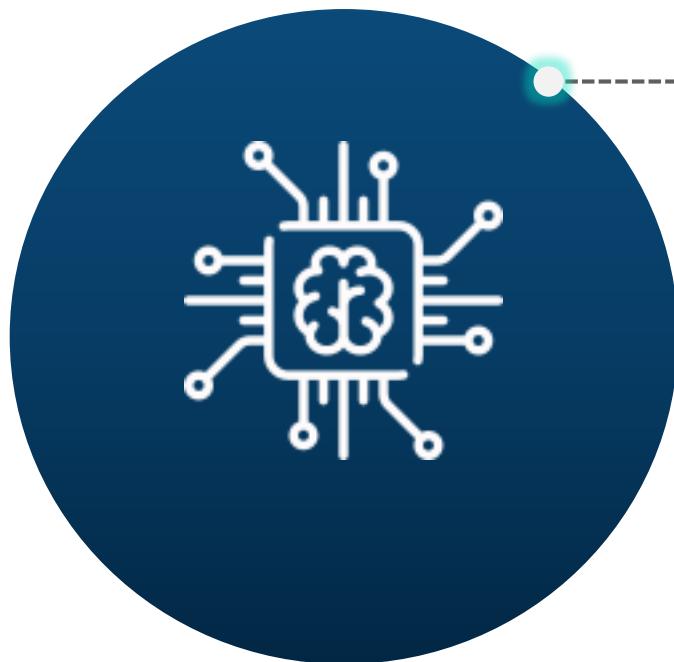


Myths Of Machine Learning

Myth 1: AI vs Machine Learning vs Deep Learning



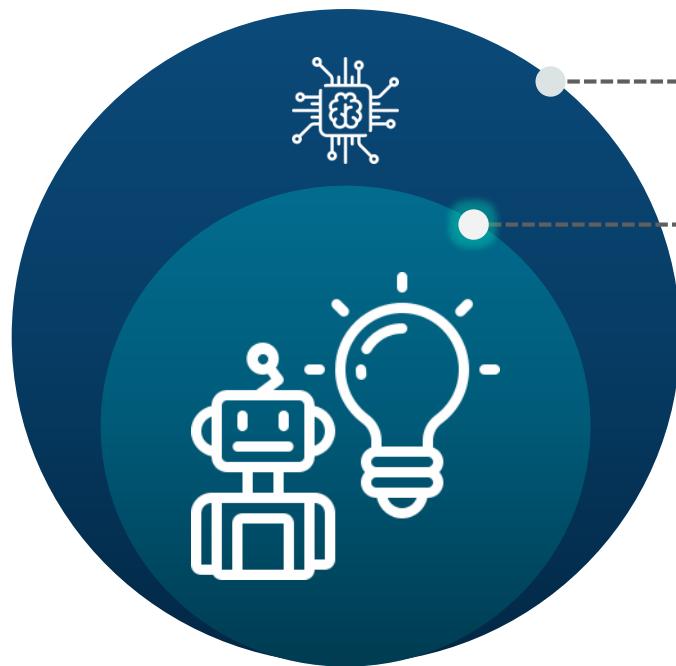
Myth 1: AI vs Machine Learning vs Deep Learning



Artificial Intelligence

Area of computer science that emphasizes on the creation of intelligent machines that work and react like humans.

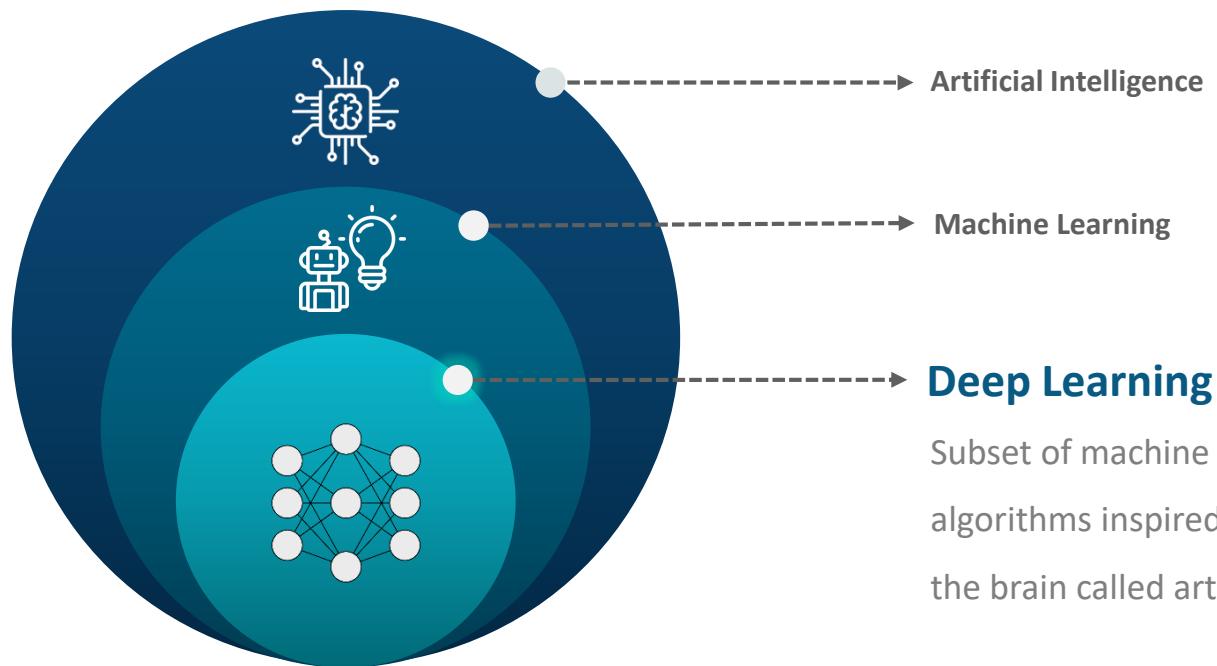
Myth 1: AI vs Machine Learning vs Deep Learning



Machine Learning

A subset of AI which gives a machine the ability to learn without being explicitly programmed.

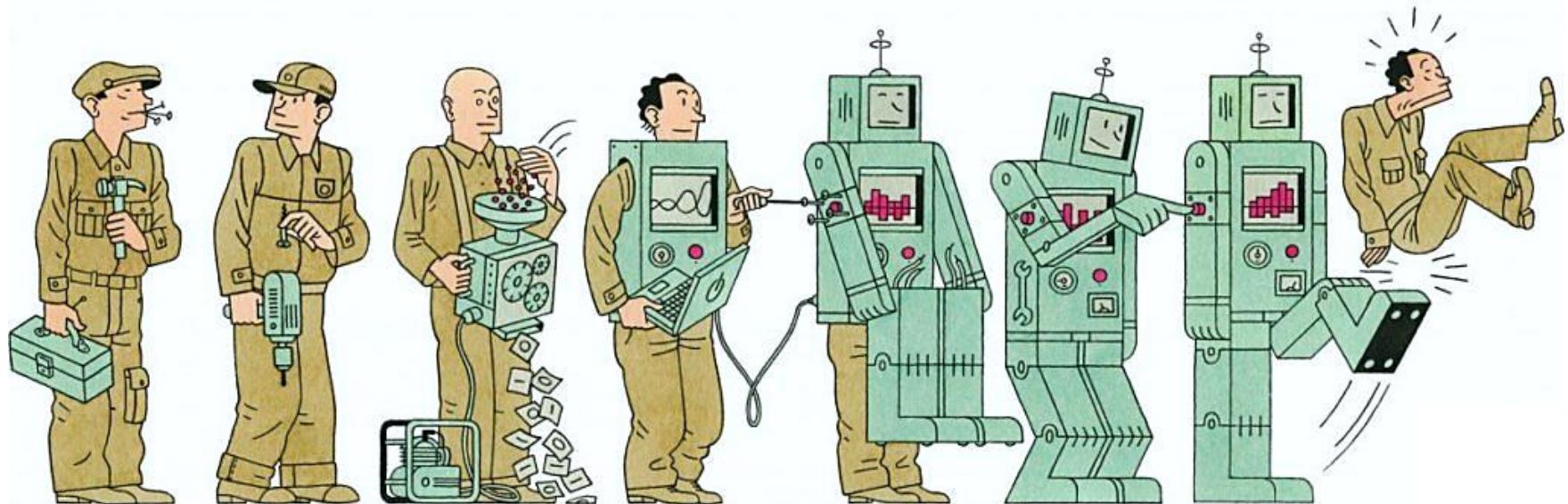
Myth 1: AI vs Machine Learning vs Deep Learning



Deep Learning

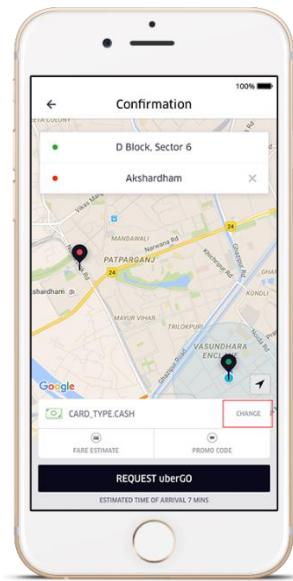
Subset of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks.

Myth 2: Will Robots Take Over Your Job?



Will Robots take over your JOB?

Myth 2: Will Robots Take Over Your Job?



Uber is using
Machine Learning

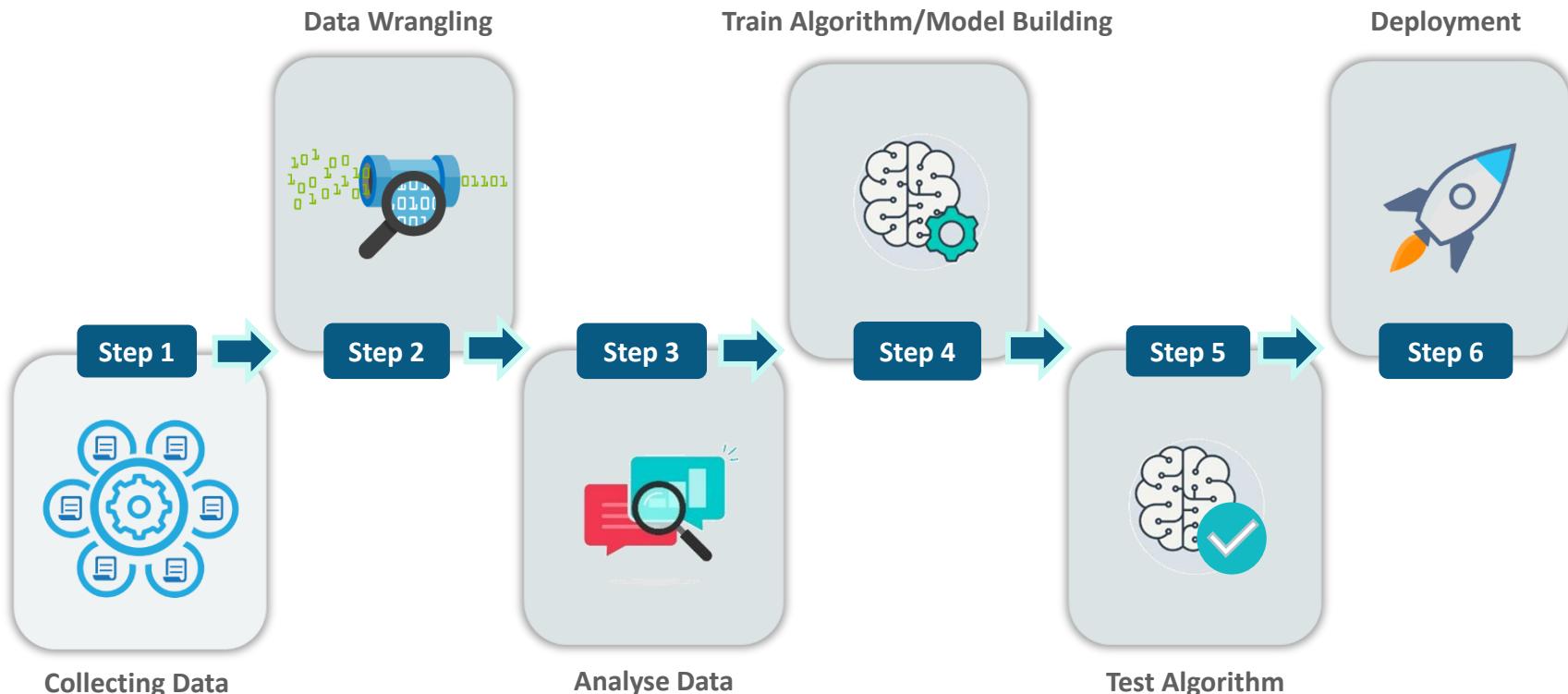


Do you still think Robots will take up your JOB?



But How Machine Learning Works?

Steps Of Machine Learning



Collecting Data

1 Collecting Data

2 Data Wrangling

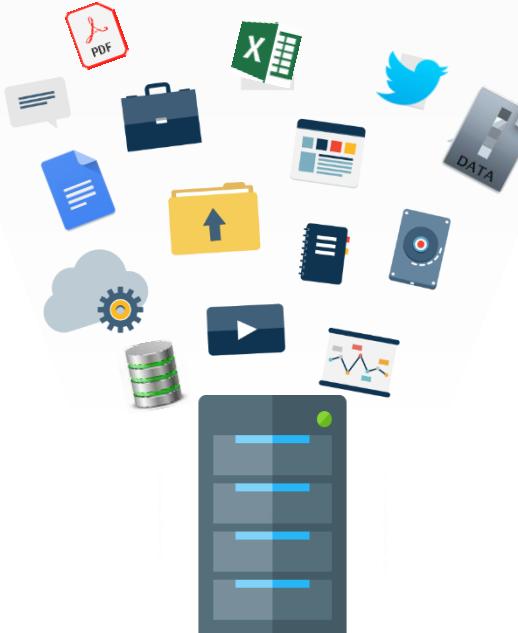
3 Analyze Data

4 Train Algorithm

5 Test Algorithm

6 Deployment

Collecting relevant data from various sources



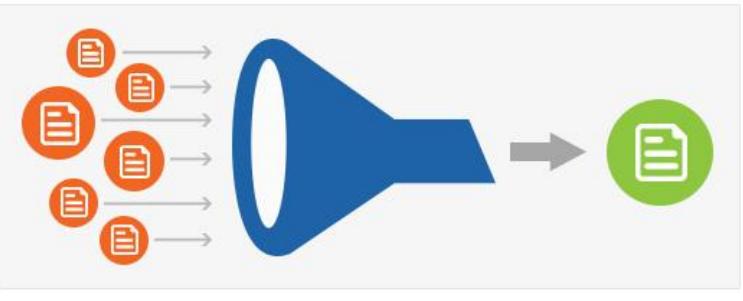
Data collected from various
sources in a server

Data Wrangling

- 1 Collecting Data
- 2 Data Wrangling
- 3 Analyze Data
- 4 Train Algorithm
- 5 Test Algorithm
- 6 Deployment

Cleaning and converting “Raw Data” into a convenient consumption format

Data acquired from sources



Analyze Data

1 Collecting Data

2 Data Wrangling

3 Analyze Data

4 Train Algorithm

5 Test Algorithm

6 Deployment

Analyse the data to gain more insight out of it. Main purpose is to make the best out of waste.



Analyze Data

1 Collecting Data

2 Data Wrangling

3 Analyze Data

4 Train Algorithm

5 Test Algorithm

6 Deployment

While analysing, you can select and filter out the relevant data required to prepare the model

Full Feature Set



Identify Useful Features



Selected Feature Set

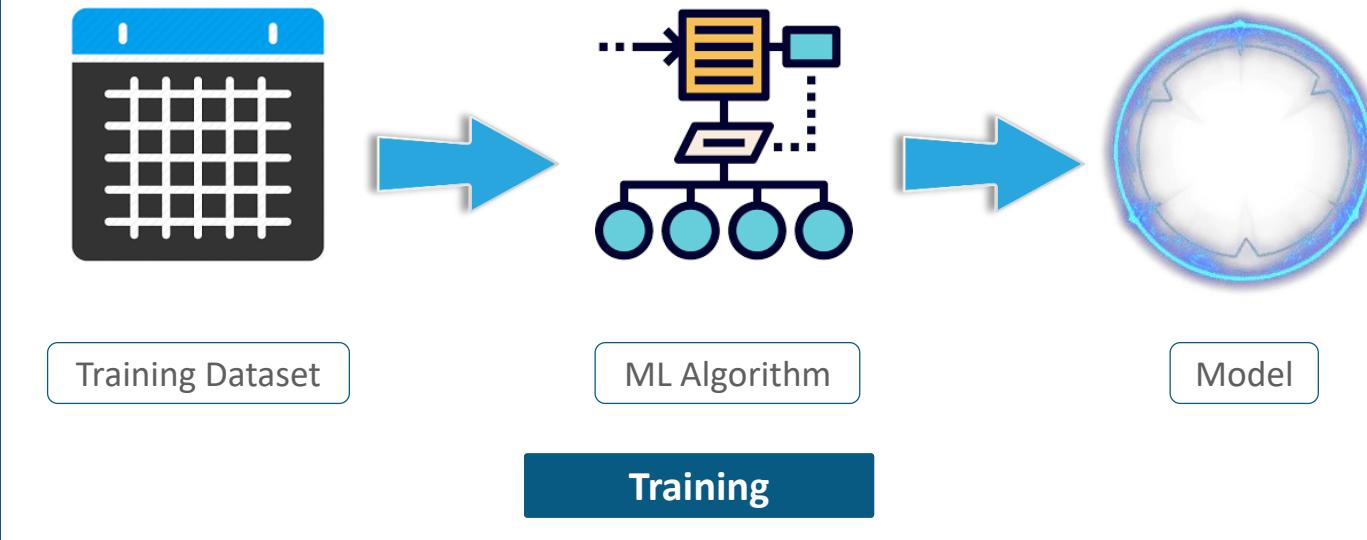


Feature Selection

Train Algorithm

- 1 Collecting Data
- 2 Data Wrangling
- 3 Analyze Data
- 4 Train Algorithm
- 5 Test Algorithm
- 6 Deployment

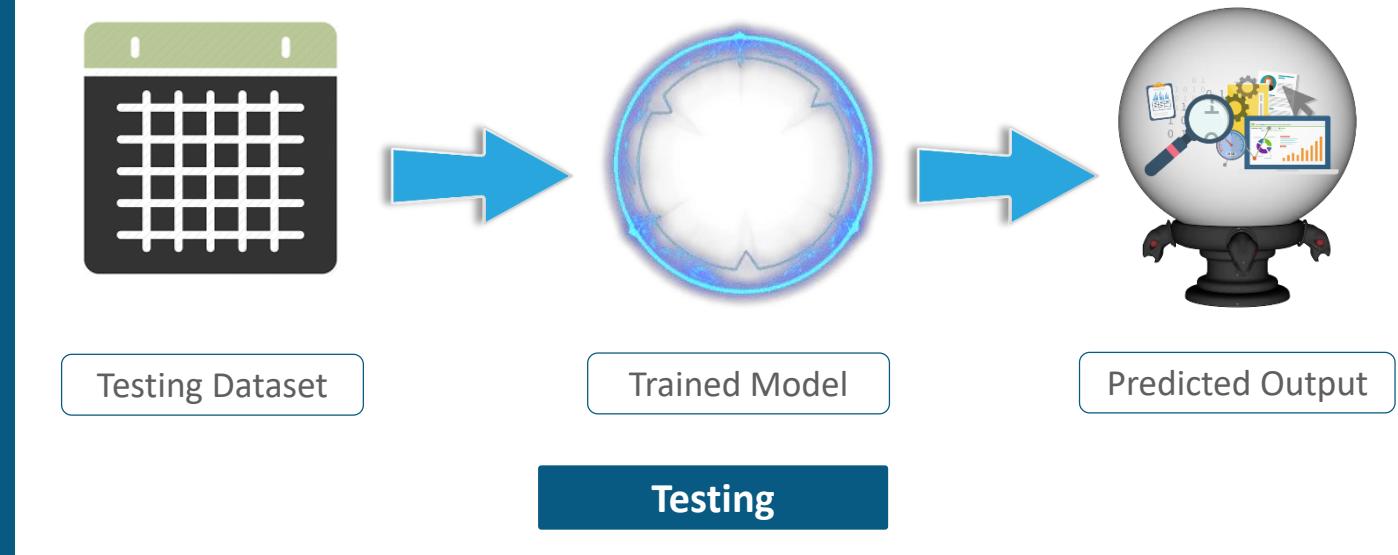
- The algorithm is trained on the training dataset
- It helps the algorithm to understand the pattern and the rules which govern the data



Test Algorithm

- 1 Collecting Data
- 2 Data Wrangling
- 3 Analyze Data
- 4 Train Algorithm
- 5 Test Algorithm
- 6 Deployment

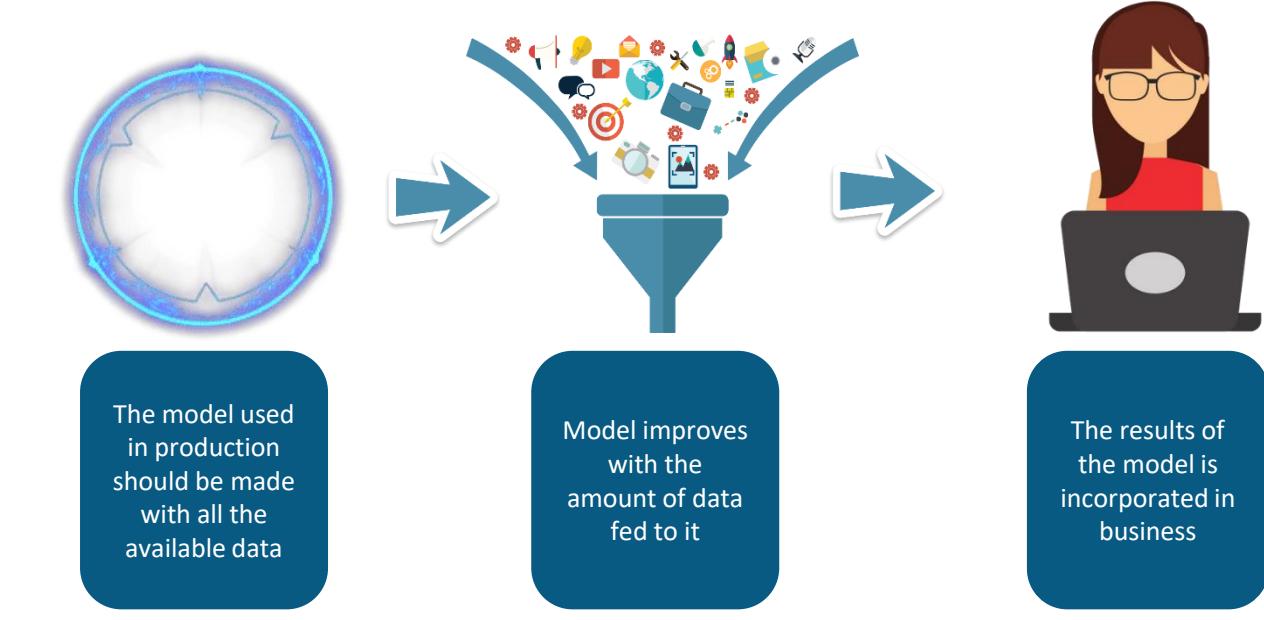
The testing dataset determines the accuracy of our model



Deployment

- 1 Collecting Data
- 2 Data Wrangling
- 3 Analyze Data
- 4 Train Algorithm
- 5 Test Algorithm
- 6 Deployment

If the speed and accuracy of the model is acceptable, then that model can be deployed



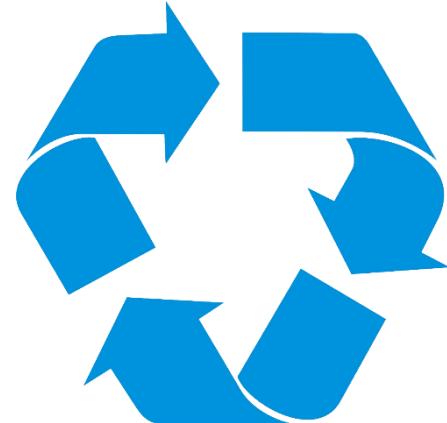
Deployment

- 1 Collecting Data
- 2 Data Wrangling
- 3 Analyze Data
- 4 Train Algorithm
- 5 Test Algorithm
- 6 Deployment

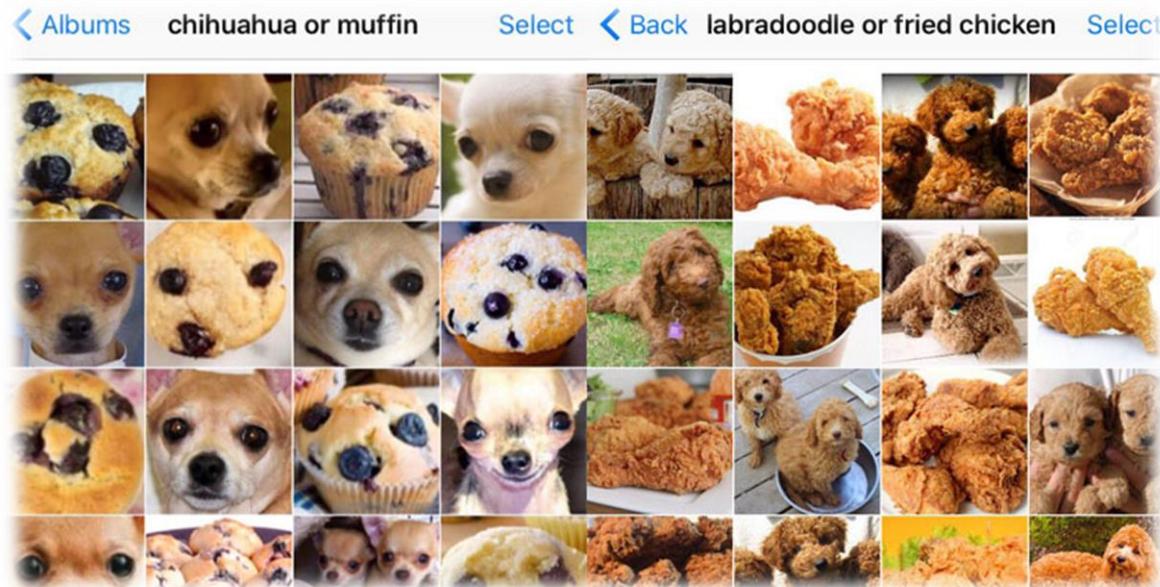


NOTE

Once deployed, the model is updated and improved on the basis of its performance. If there is a dip in performance, the model is re-trained.



Machine Works Better With More Data...

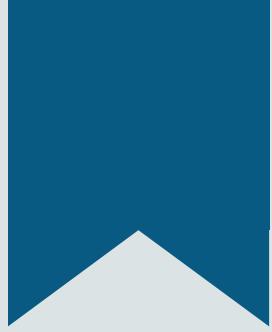


Machine gets trained better with more data

Captcha – Are We Creating An ML Model With It?



What-If we are training a machine
by adding labels to the images?



Types Of Machine Learning

Types Of Machine Learning

Supervised Learning

Unsupervised Learning

Reinforcement Learning

Let's understand each one of them with some use-case





Use Case: Fruit Classification (Labelled)

Use Case: Fruit Classification

Scenario: Basket filled with different kinds of fruits.

Task: Predict the fruits' label

Banana



- Big
- Green or Yellow
- Long curved
- Cylindrical

Apple



Grapes



- Small
- Green
- Round to oval
- Bunch

- Big
- Red
- Round
- Depression at top

Use Case: Fruit Classification

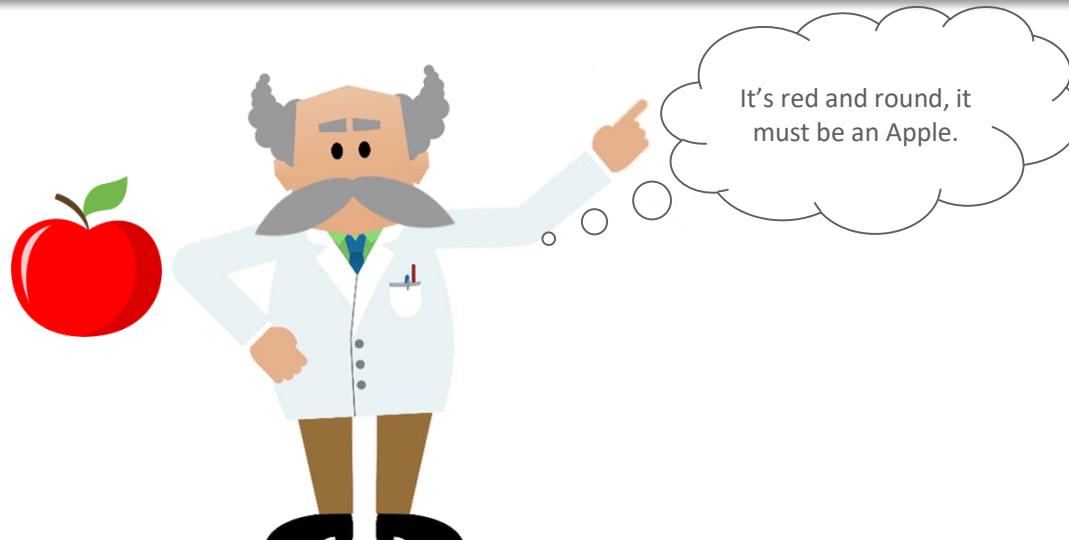
Task: Predict the fruit based on its colour, size and shape

For example: If the fruit is yellow, curved cylindrical in shape then it's a *banana*



What Is Supervised Learning?

- Learning from the labelled data and applying the knowledge to predict the label of the new data(test data), is known as ***Supervised Learning***
- Previous example we saw was an example of *Supervised Learning*



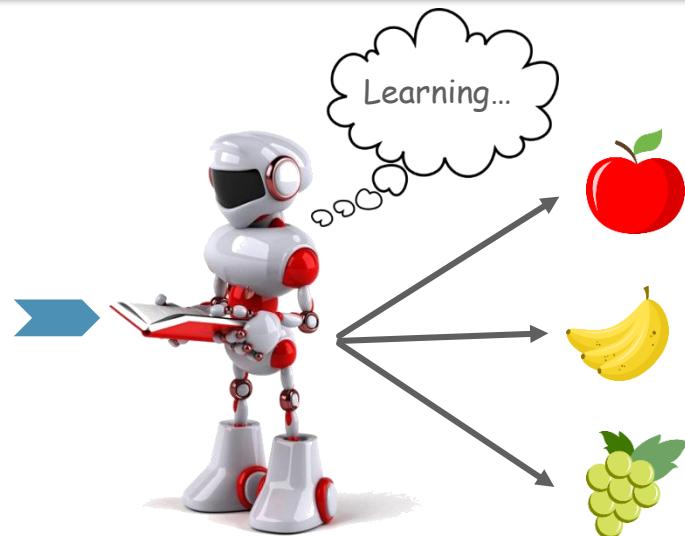


I wonder, if
Machine could
do this task for
me!

Fruit Classification – Train The Machine With Dataset

Machine can do the same task if trained with the same experience/knowledge using the data.

No.	Size	Color	Shape	Fruit Name
1	Big	Red	Rounded shape with depression at the top	Apple
2	Small	Green	Round to oval,Bunch shape Cylindrical	Grapes
3	Big	Yellow	Long curving cylinder	Banana
4	Big	Yellow	Long curving cylinder	Banana
5	Big	Red	Rounded shape with depression at the top	Apple
6	Small	Green	Round to oval,Bunch shape Cylindrical	Grapes



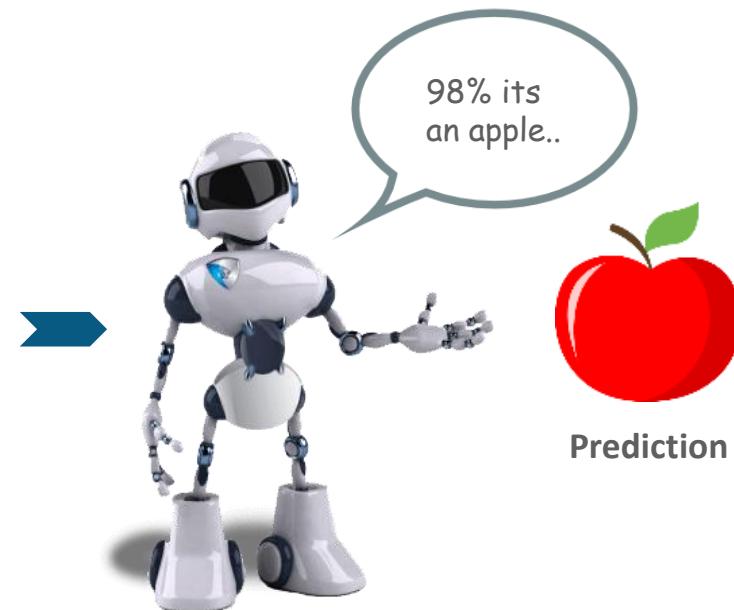
Machine Learning from the data

Fruit Classification – Train The Machine With Dataset

Once trained, machine can use the knowledge, to predict the output of any new input.

No.	Size	Color	Shape
7	Big	Red	Rounded shape with depression at the top

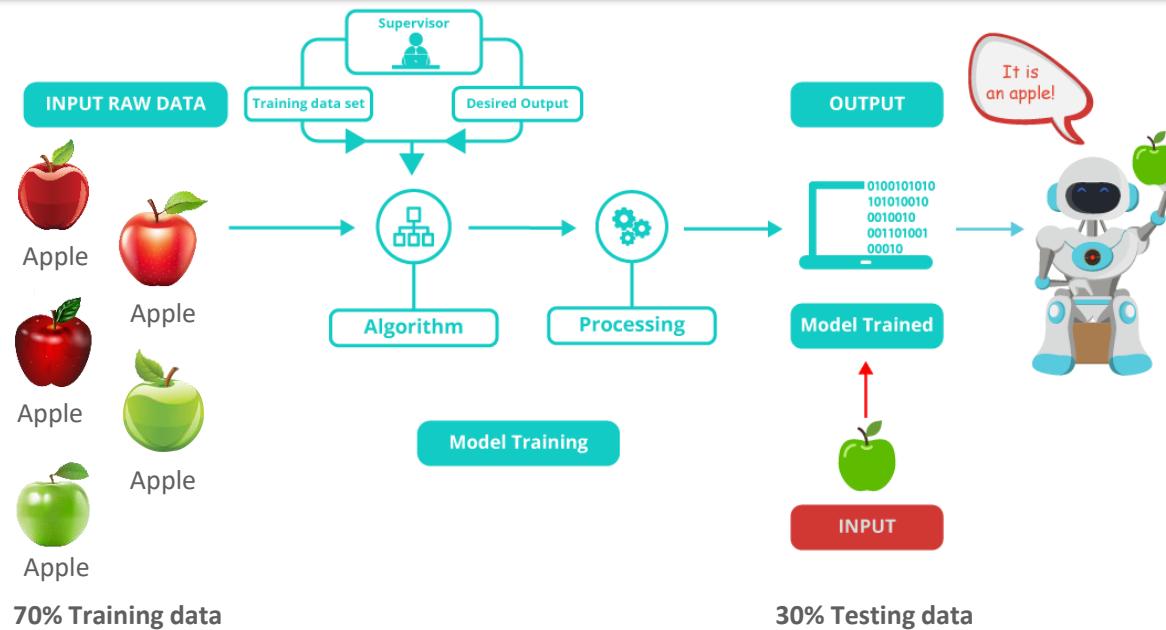
New Input Data



Prediction

So What Exactly Is Supervised Learning?

Learning from the labelled data and applying the knowledge to predict the label of the new data(test data), is known as ***Supervised Learning***.



Supervised Learning Application



Text/Email Classification is an example of supervised machine learning task since a labelled dataset containing text documents and their labels is used to train a classifier.





Use Case: Fruit Classification (Unlabelled)

Use Case: Fruit Classification (Unlabelled)

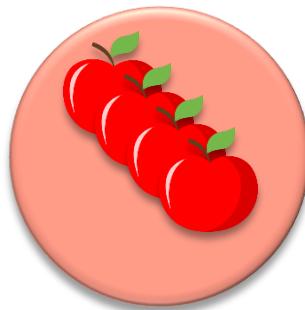


So, how will I group them?

Use Case: Fruit Classification (Unlabelled) - Solution

What will you do: Arrange the fruit w.r.t to its physical characteristics

For example, Physical characteristic - **colour**: Arrange them on the basis of their **colour**

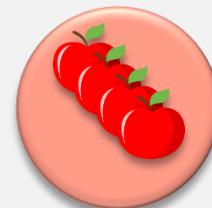


Fruits grouped on the basis of their colour

Use Case: Fruit Classification (Unlabelled) - Solution

Physical characteristic: **colour** and **size**

- RED COLOR AND BIG SIZE: **apple**
- YELLOW COLOR AND BIG SIZE: **bananas**
- GREEN COLOR AND SMALL SIZE: **grapes**



Fruits are grouped together, without using any labels to train the machine. The collection is segregated and grouped/clustered together on the basis of similar physical characteristics.

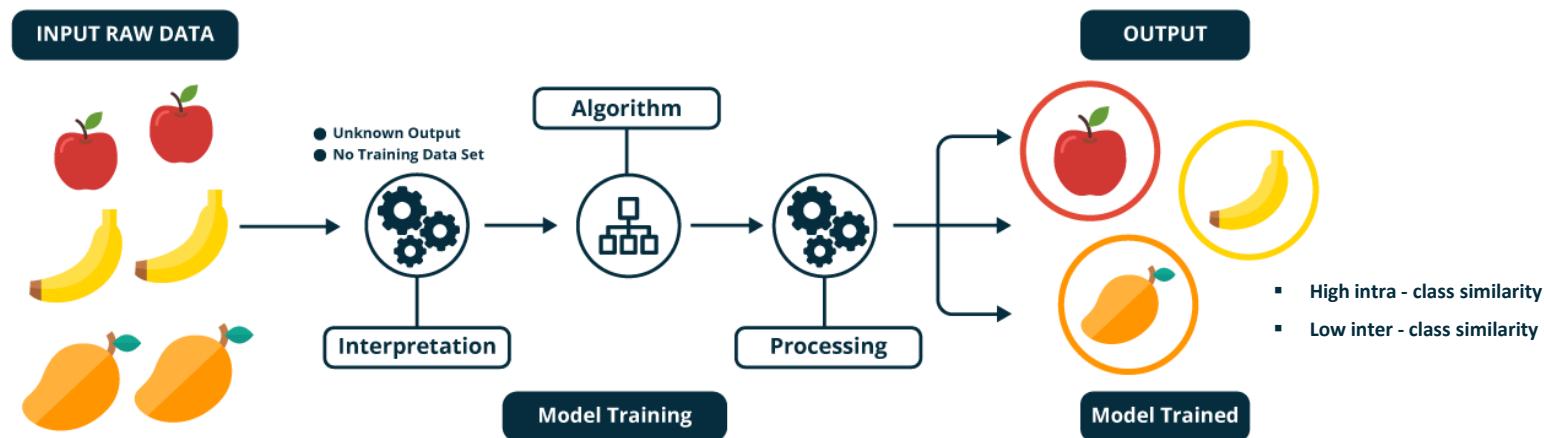
NOTE

The output is dynamic to the input values. That is, output might change with new input value.

The process of machine/model getting trained in the above discussed way is aka **Unsupervised Learning**.

So What Exactly Is Unsupervised Learning?

The learning method which uses the technique of grouping/clustering the unlabelled data together on the basis of its physical characteristics, and predicting the cluster of the new data(test data), is known as **Unsupervised Learning**

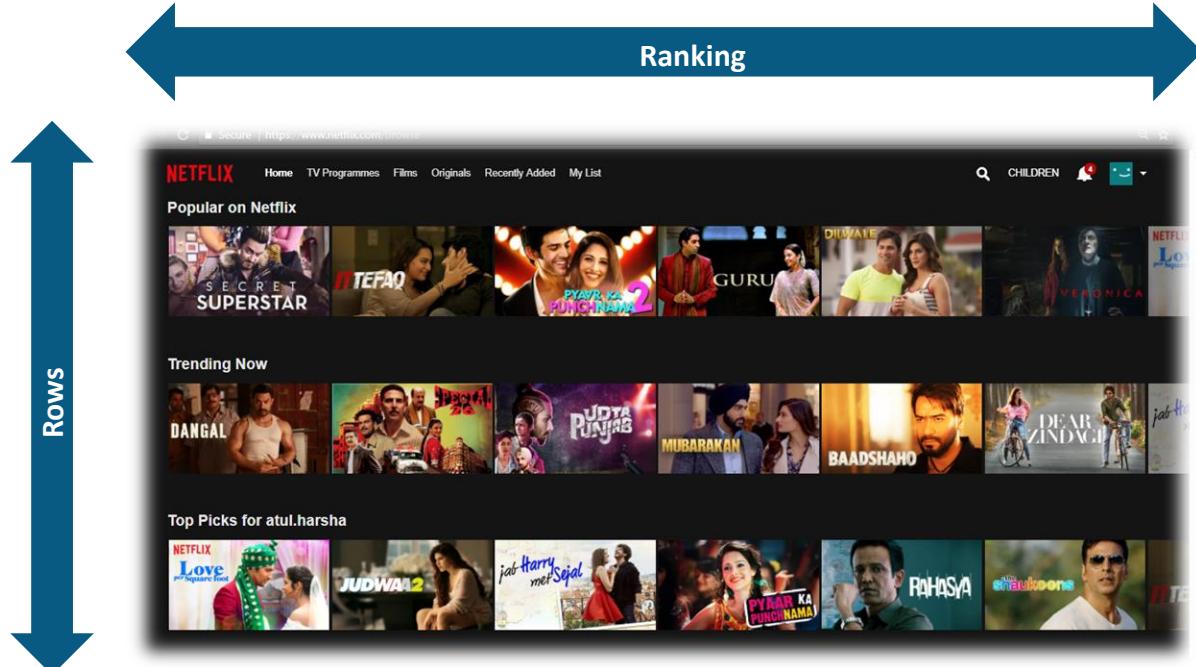


Unsupervised Learning Application



Over 75% of what you watch
is recommended by Netflix

Recommendations are
made by machine learning

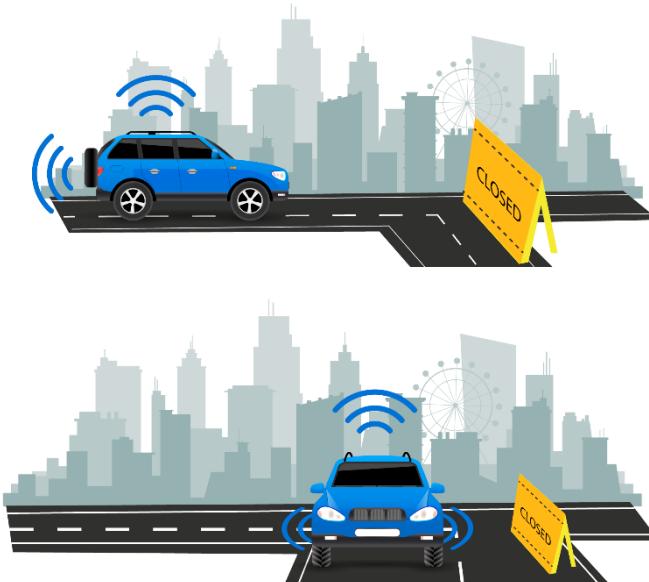




Use-Case : Training A Self-Drive Car

Use-Case : Training A Self-Drive Car

- **Task:** Train a self-drive car to follow the instructions on the road
- No train or test data, machine learns from the event and result of their actions



- 1 Observe
- 2 Select Action using policy
- 3 Action!
- 4 Reward or Penalty
- 5 Update Policy
- 6 Iterate the process

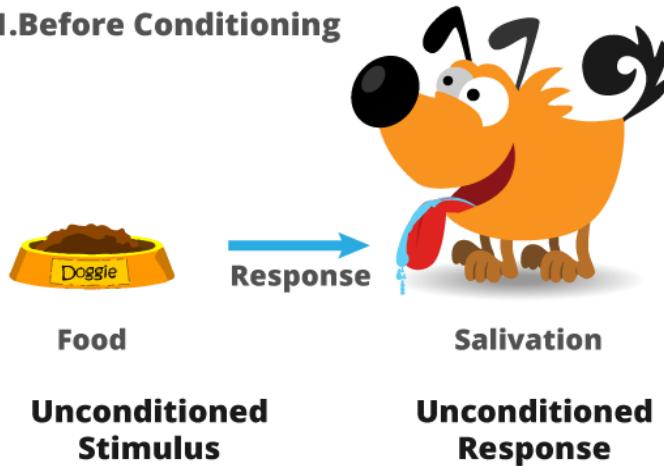


Reinforcement Learning: Pavlov's Dog Training

Pavlov used reinforcement learning to train his dog:

Stage 1: Master gave the food and seeing the food, dog started salivating.

1. Before Conditioning



Reinforcement Learning: Pavlov's Dog Training

Pavlov used reinforcement learning to train his dog:

Stage 2: Master rang the bell, but this time the dog did not respond to it.

2. Before Conditioning



Response



Bell

Neutral stimulus

No Salivation

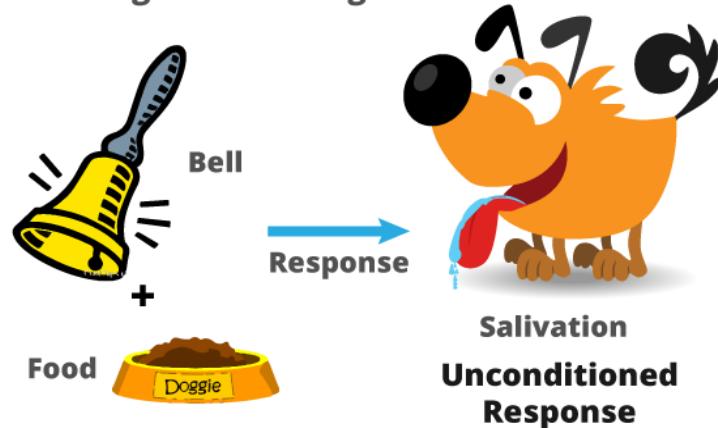
No Conditioned Response

Reinforcement Learning: Pavlov's Dog Training

Pavlov used reinforcement learning to train his dog:

Stage 3: Master rang the bell and then gave the food (This step was repeated again and again).

3. During Conditioning



Reinforcement Learning: Pavlov's Dog Training

Pavlov used reinforcement learning to train his dog:

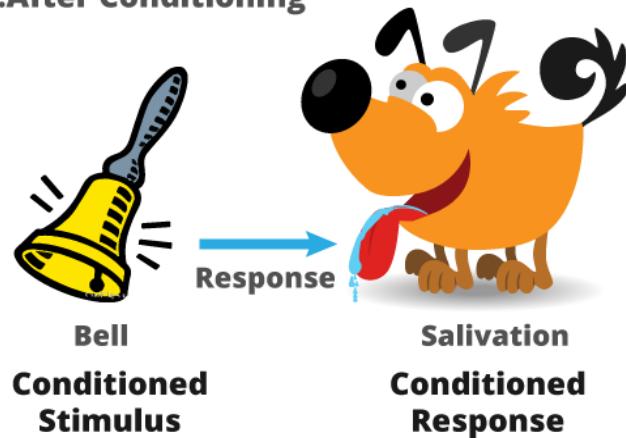
Stage 4: Dog started salivating just after hearing the bell.



NOTE

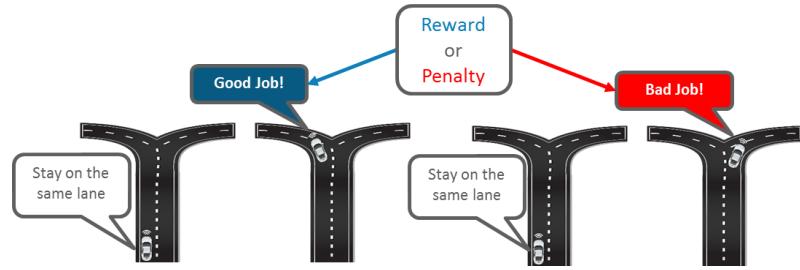
Dog is reinforced to learn that whenever his master will ring the bell, he will get the food

4. After Conditioning



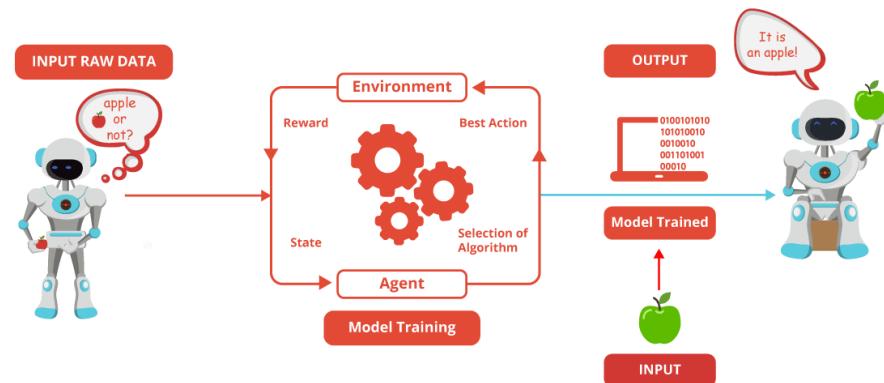
So What Exactly Is Reinforcement Learning?

- Reinforcement learning is a hit and trial method of learning
- The machine gets a Reward or Penalty point for each action it performs
- If the option is correct, the machine gains the reward point
- If the option is incorrect, the machine gets a penalty point



So What Exactly Is Reinforcement Learning?

- Reinforcement Learning (RL) is learning by interacting with a space or an environment
- It selects its actions on basis of its experiences (exploitation & exploration)
- RL agent learns from the consequences of its actions, rather than taught explicitly



Reinforcement Learning Application



TESLA

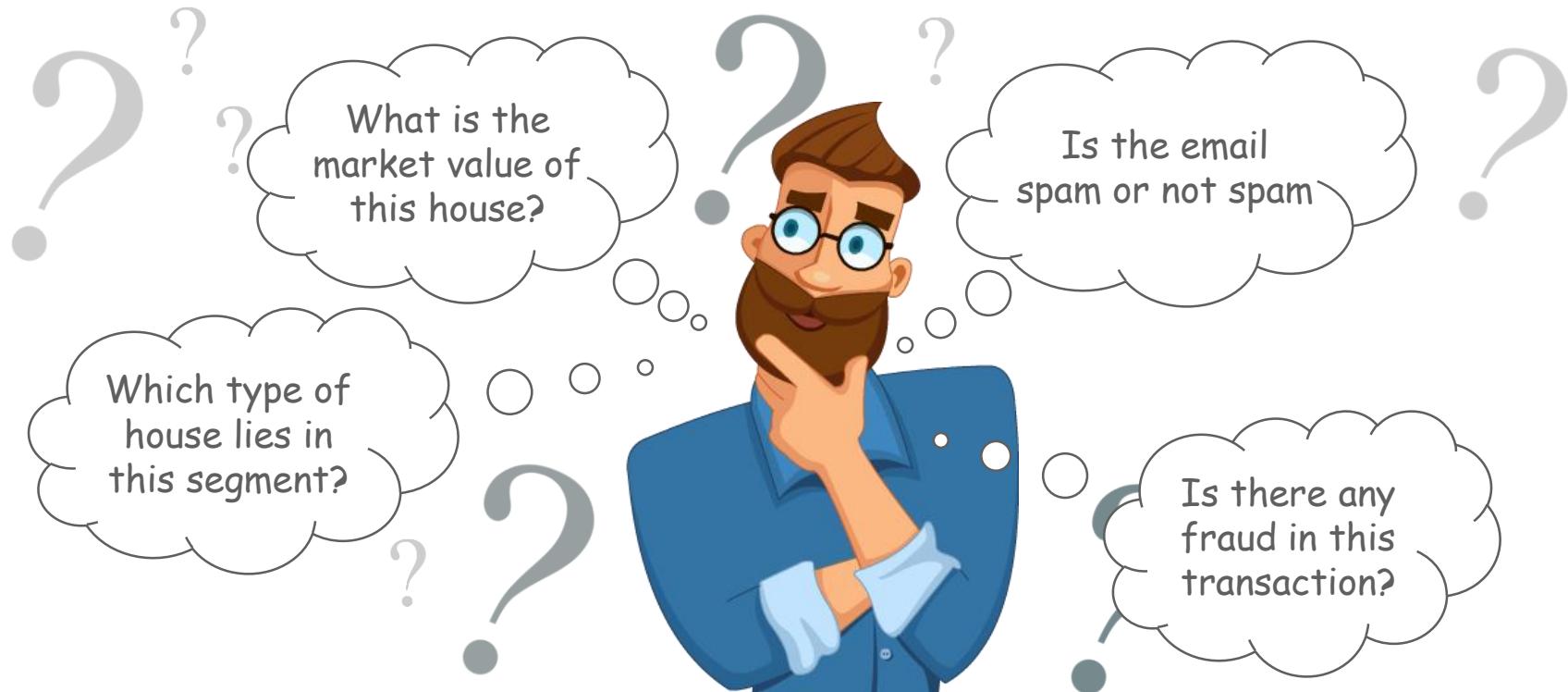
How do you think Tesla's self
driving cars work?





What Can You Do With Machine Learning?

Ask Your Machine



Regression Algorithm

Data itself is predicted

- What is the market value of this house?
- Is it going to rain tomorrow?

For example:

- Linear Regression
- Logistic Regression
- Polynomial Regression



Classification Algorithm

Category is predicted using the data

- Is the person a male or a female?
- Is the mail spam or non-spam?

For example:

- Decision Tree
- Logistic regression
- Naïve Bayes
- Random Forest



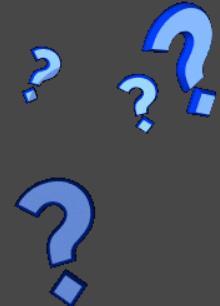
Clustering Algorithm

Groups data based on some condition

- Which type of house lies in this segment?
- What type of customer buys this product?

For example:

- K – Means Clustering
- C- Means Clustering
- Hierarchical Clustering



Anomaly Detection Algorithm

Identify unusual data points

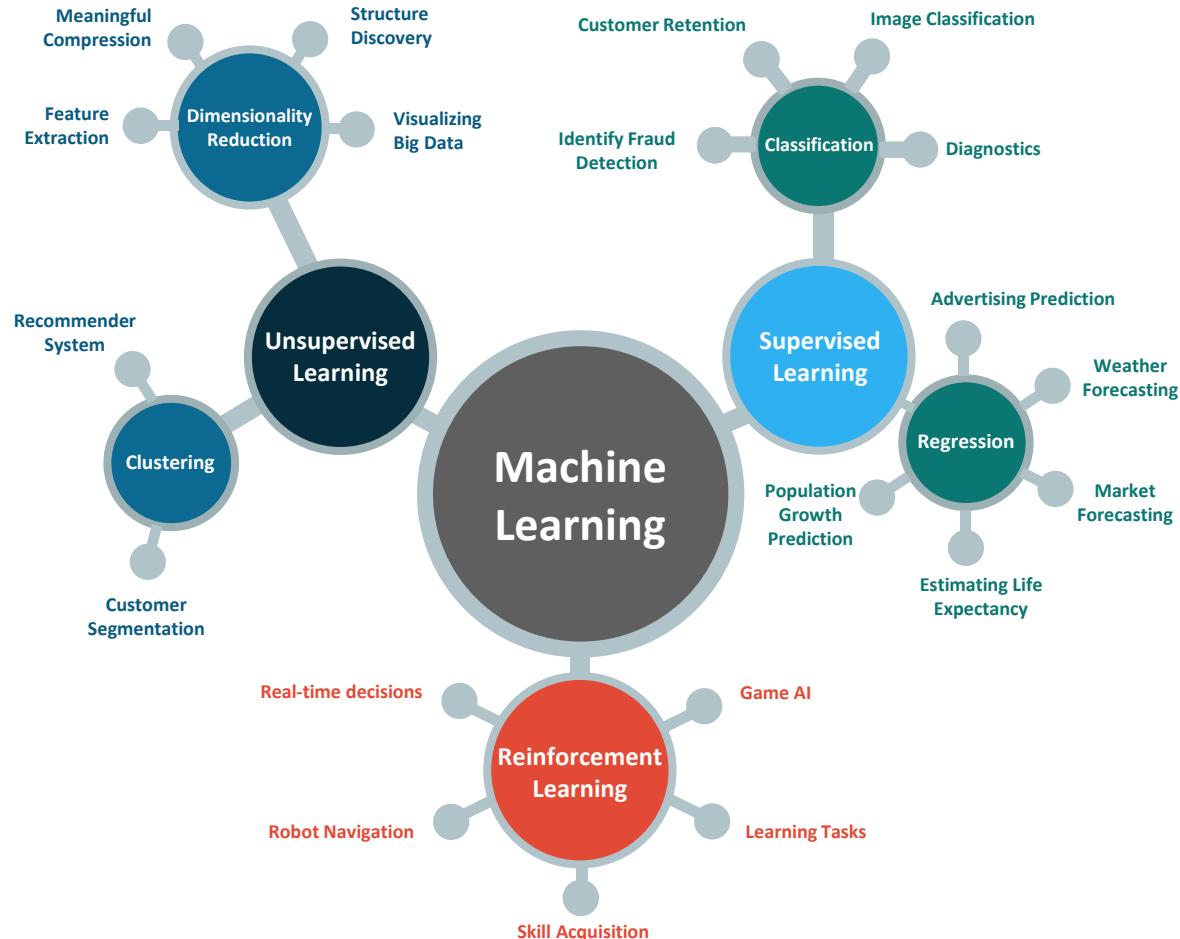
- Is there any fraud in this transaction?
- Is someone trying to hack our network?

For example:

- Time Series
- Support Vector Machine (SVM)
- K-Nearest Neighbor (KNN)
- K – Means
- C- Means



Machine Learning Usage





Machine Learning Using Python: Demo

Some Libraries Used In Python

Seaborn

Focused on the visual of statistical models which include heat maps and depict the overall distributions

Matplotlib

Enables you to make-
Bar charts, Scatter plots, Line Charts, Histograms, Pie charts, Contour plots, Quiver plots

Scikit-Learn

Open source, simple and efficient for data mining and data analysis. Built on NumPy and matplotlib.

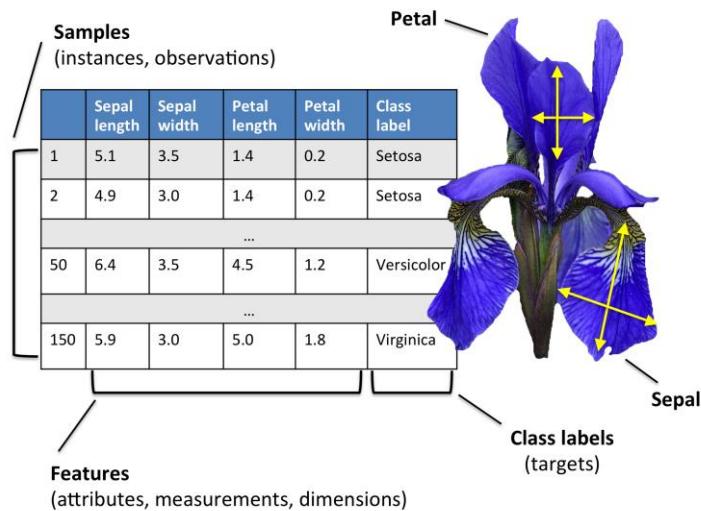
Pandas

Perfect tool for data wrangling, designed for quick and easy data manipulation, aggregation, and visualization

Numpy

Stands for Numerical Python, provides an abundance of useful features for operations on n-arrays and matrices in Python

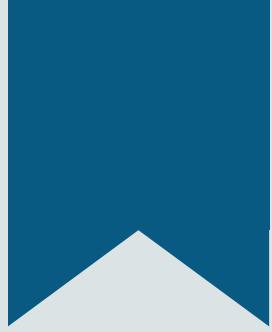
Hello World Of Machine Learning: Flower Classification



Iris Dataset

Why IRIS Dataset is best for beginners?

- Numeric Attribute: figure out how to load and handle data
- Classification Problem: Helps in understanding supervised learning algorithm
- Multi-class classification: Require specialized handling.
- Dataset has 4 attributes and 150 rows: small and easily fits into memory
- All of the numeric attributes are in the same units and the same scale: special scaling or transforms is not required to get started



Experiments with Google



Teach a machine using your camera,
live in the browser. No coding required.

► Let's Go!

or [skip the tutorial](#)

This is an
A.I.
Experiment

Made with
some friends from
Google

Activate Windows
Go to Settings to activate Windows.

[Privacy & Terms](#)

edureka!

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Summary

What Is Machine Learning?

Machine learning is a sub-set of artificial intelligence (AI).
Allows the system to automatically learn and improve from experience without being explicitly programmed.

New Input → Trained Model → Predicted Output

Source: Edureka! Machine Learning

Machine Learning Applications

Google
How do you think Google predicts the traffic or accessibility?

Source: Edureka! Machine Learning

Types Of Machine Learning

Let's understand each one of them with some use-case.

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

Source: Edureka! Machine Learning

Use-Case : Training A Self-Drive Car

Task: Train a self-drive car to follow the instructions in the road.
No trials or test data, machine learns from the event and result of their actions.

- Observe
- Select Action using policy
- Act
- Reward or Penalty
- Update Policy
- Repeat the process

Source: Edureka! Machine Learning

Ask Your Machine

What is the market value of this house?
Is the email spam or not spam?
Which type of house lies in this segment?
Is there any fraud in this transaction?

Source: Edureka! Machine Learning

Hello World Of Machine Learning: Flower Classification

Why IRIS Dataset is best for beginners?

- Human friendly figure out how to load and handle data
- Classification problem helps in understanding supervised learning algorithm
- Well-known dataset for testing classification models
- Dataset has 150 entries and 100 entries small and easily understandable
- All of the numeric attributes are in the same units and the same scale; standardizing or transforming is not required to get started

IRIS Dataset:

Slno	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	Class
1	5.1	3.5	1.4	0.2	Iris-setosa
2	4.9	3.0	1.4	0.2	Iris-setosa
3	4.7	3.2	1.3	0.2	Iris-setosa
4	4.6	3.1	1.5	0.2	Iris-setosa
5	5.0	3.6	1.4	0.2	Iris-setosa
6	5.4	3.9	1.7	0.4	Iris-versicolor
7	7.0	3.2	4.7	1.4	Iris-versicolor
8	6.4	3.2	4.5	1.5	Iris-versicolor
9	6.9	3.1	4.9	1.5	Iris-versicolor
10	5.5	2.3	4.0	1.3	Iris-versicolor

Source: Edureka! Machine Learning



Thank You

For more information please visit our website
www.edureka.co