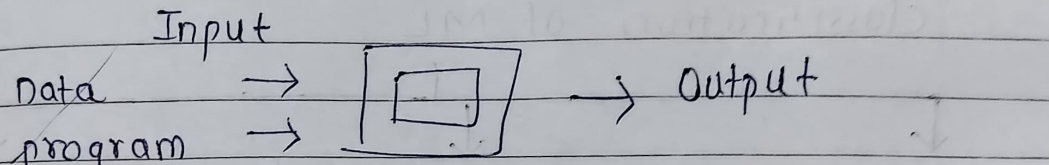
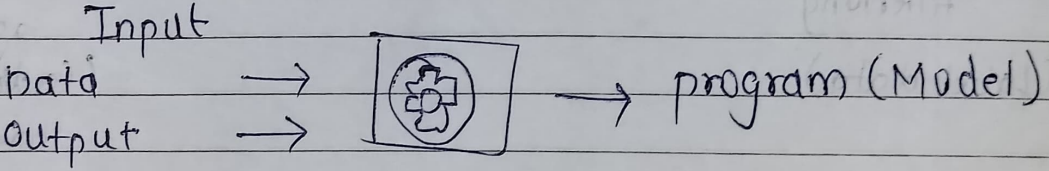
Machine Learning

What is Machine Learning?
Machine learning is the science of getting computers to learn and act like humans do, and improve their learning over time in autonomous fashion, by feeding them data and information in the form of observations & real-world interactions.

How ML is Different from Traditional Programming?
Traditional



ML



Characteristics of ML

- The potential to perform automated data visualization
- Precise Data Analysis
- Business Intelligence at it's finest

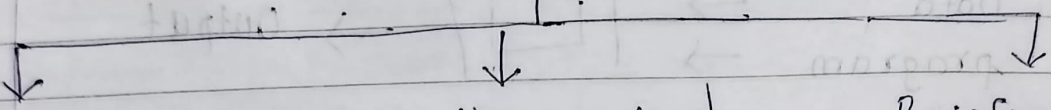
Advantages of ML

- Resolving complex problems
- Automation for everything
- Trends and Pattern Identification
- Wide Range of Appl^{ns}

Disadvantages of ML

- Data Acquisition
- Highly Error-Prone
- Algo selection
- Time consuming

classification of ML



Supervised learning
e.g. spam filtering
(Label data)

Unsupervised learning
(unLabel data)

Reinforcement learning
(learning agent)
(feedback based learning)
e.g. chess playing

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Timeline of ML

1950 — Alan turning proposed turning test
Issac Asimov Proposed The Three Laws of Robotics

1952 - Arthur Samuel - Pioneer, IBM computer to play checkers game

1959 - Term 'ML' was coined by Arthur Samuel
1961 - The first Robot was introduced
1974 - The first Autonomous vehicle was created At - Stanford AI Lab
1997 - IBM Deep Blue Inteilligent Computer Beats Expert At chess
2009 - Self - driving car
2012 - Deep Neural Network
2014 - Deepface
2017 -

Real World Applications

- voice assistant
- Netflix movie recomendation
- Ads recomendation

(1) Recommendation Engines
Ex. Netflix
Appl^n - Media, Entairment, Shopping

(2) Self-driving Cars
Ex. Tesla
Appl^n - Automotive + Transportation

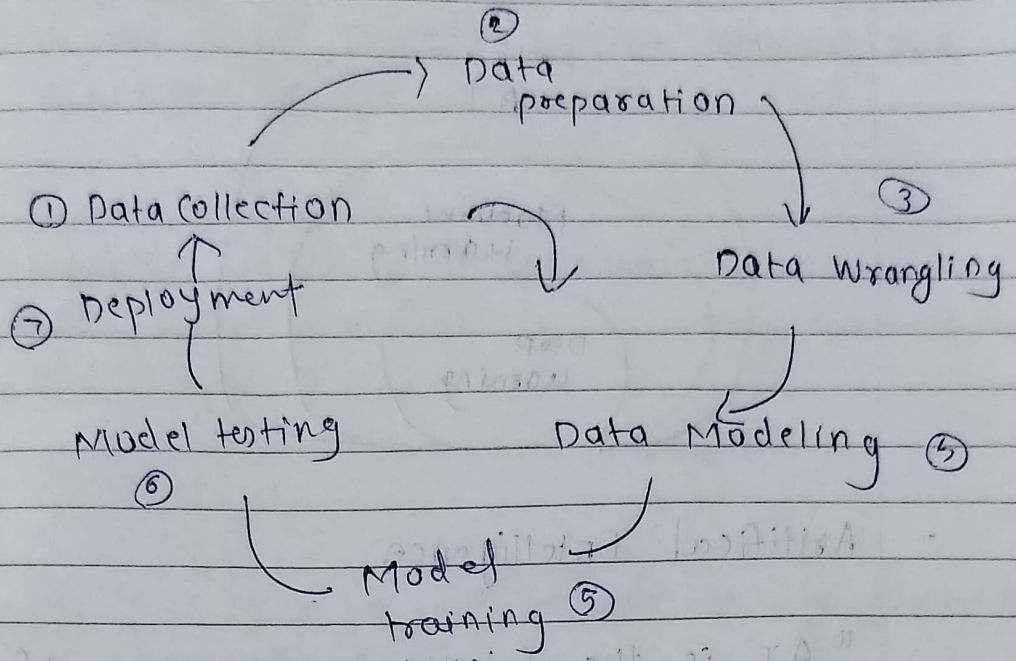
(3) Gamified Learning and Education
Ex. Duolingo's

(4) E-Commerce Websites

(5) Medical Diagnosis
e.x. orderly health

(6) Getting Your Right Answers
e.g. Quora's super specific Answer Ranki

ML Life Cycle



(1) Data Collection :
- Gather data
- use open-src datasets
- relevant data

(2) Data Preparation (Exploration)
- quality of data
- understand data

(3) Data Wrangling :
cleaning, converting raw data to useable format
- Filtering / cleaning
- Filtering noise
- Recognizing & removing outliers
- filling missing values

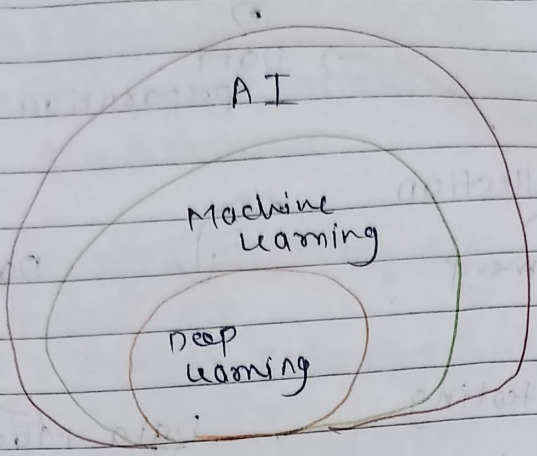
(4) Data Modeling :
Select Algo to build
- Select Algo
- Build model
- validate results

(5) Mode training :
Algo + data fed to learn

(6) Model testing :
check accuracy, validate

(7) Model Deployment :
ready for production

AI Vs ML Vs DL



- Artifical Intelligence.

"AI is the science & engineering of making computers capable of performing tasks that typically require human intelligence."

Based on the capabilities, AI classified as:
(1) Applied AI (Weak AI) — e.g. Alexa
(2) Generalized AI (strong AI) — robots

- Machine learning (Weak AI)
"Subset of AI which enables machines to learn from past data or experience without being explicitly programmed"

classification
(1) Supervised
(2) Unsupervised
(3) Reinforcement

- Deep Learning

"Deep learning is a subset of ML concerned with the algo inspired by the structure and function of human brains"

Uses

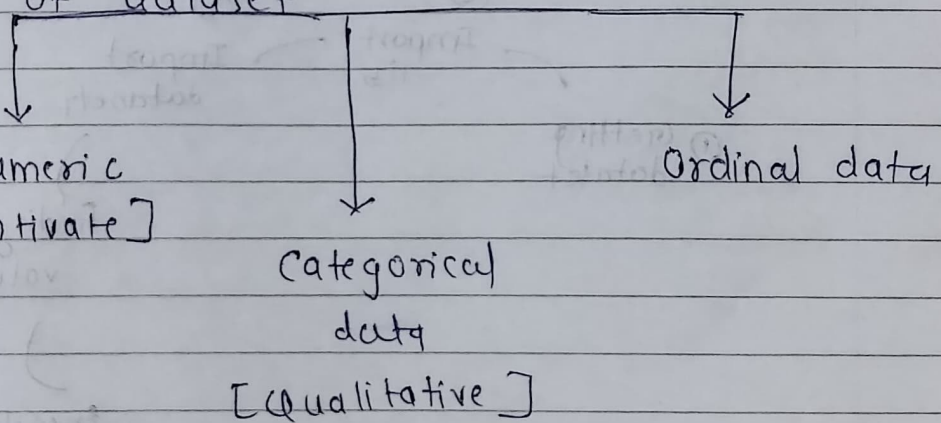
- Automatic Machine Translation
- Fraud News detection
- Colorization of B/W

How to get dataset?

"Dataset is a collection of records usually presented in tabular form"

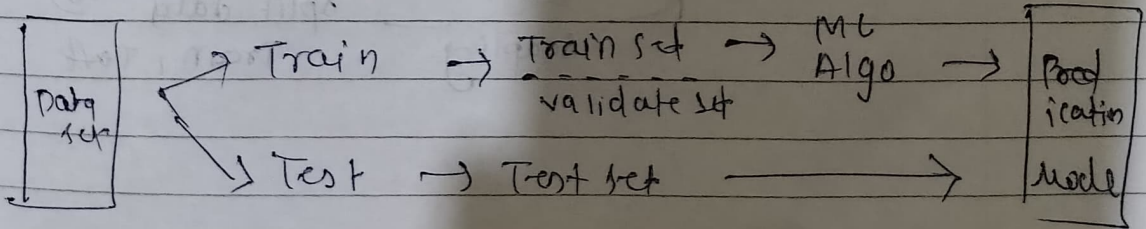
CSV, JSON .... etc

Types of dataset



Need

Training data, Testing data



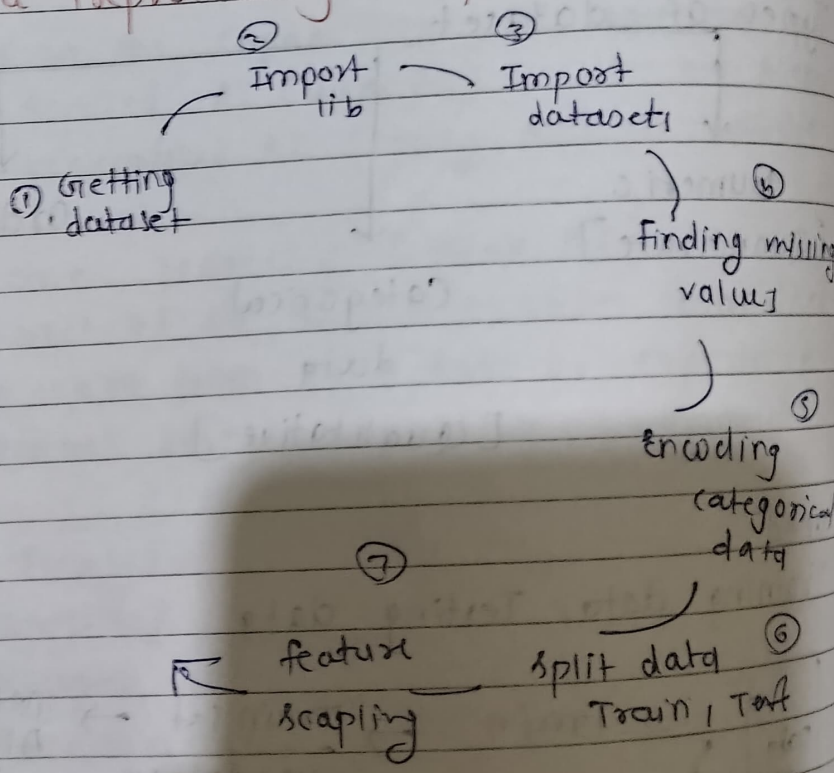
Resources

- Kaggel datasets
- Amazon datasets
- UCI ML Repository
- Google's Data search Engine
- Microsoft datasets
- Awesome Public
- Scikit-learn Datasets
- Indian Govt. datasets

What is Data Preprocessing?

"Process of converting raw data into suitable format"

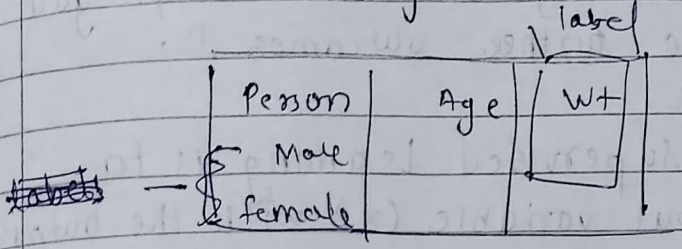
Data Preprocessing Steps Involves



Feature & Label in Machine Learning

Feature : In ML feature means property of our training data

Label : In ML label means the output you get from your model after training.



- Depending on outcome label & feature varies

What is Supervised Learning?

"In Supervised learning, we train the machine using data which is well "labeled" i.e. some input data is already tagged with correct answer and this algorithm learns from labeled training data that helps you to predict the further outcomes."

The goal of Supervised Learning is to map the input variable (x) with the output variable (y)

Types of Supervised ML Algo

Regression	classification
- Linear Regression	- Random forest
- Polynomial Regression	- Decision Trees
- Regression Trees	- Logistic Regression
	- Support Vector Machines

Advantages

- You have full control over what the machine is learning
- You can easily test and debug your model
- You can determine the number of classes

Disadvantages

- Have limited scope
- Collecting labelled dataset is expensive & time-consuming
- wrong prediction

What is Unsupervised Learning?

"In unsupervised learning, we train the machine using data which is "unlabeled" and models itself find the hidden patterns & insights from the given data."

The goal of Unsupervised Learning is to group unlabelled data according to the similarities patterns and differences without any prior training of data.

Types of Unsupervised Learning

- clustering (clusters)
- Associations (discover relationship)

Unsupervised Learning Algo

- K-Means clustering
- KNN
- Hierarchical clustering
- Neural Networks
- Single Value decomposition

Advantages

- Used for more complex tasks
- helful for finding patterns in data
- saves lot of manual work and expense

Disadvantages

- Less accuracy
- Time consuming
- More the features, More the complexity