AI Bangladesh

WELCOME

MACHINE LEARNING WORKSHOP-I

With
AI Bangladesh

Presented By
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SESSION CONTENT

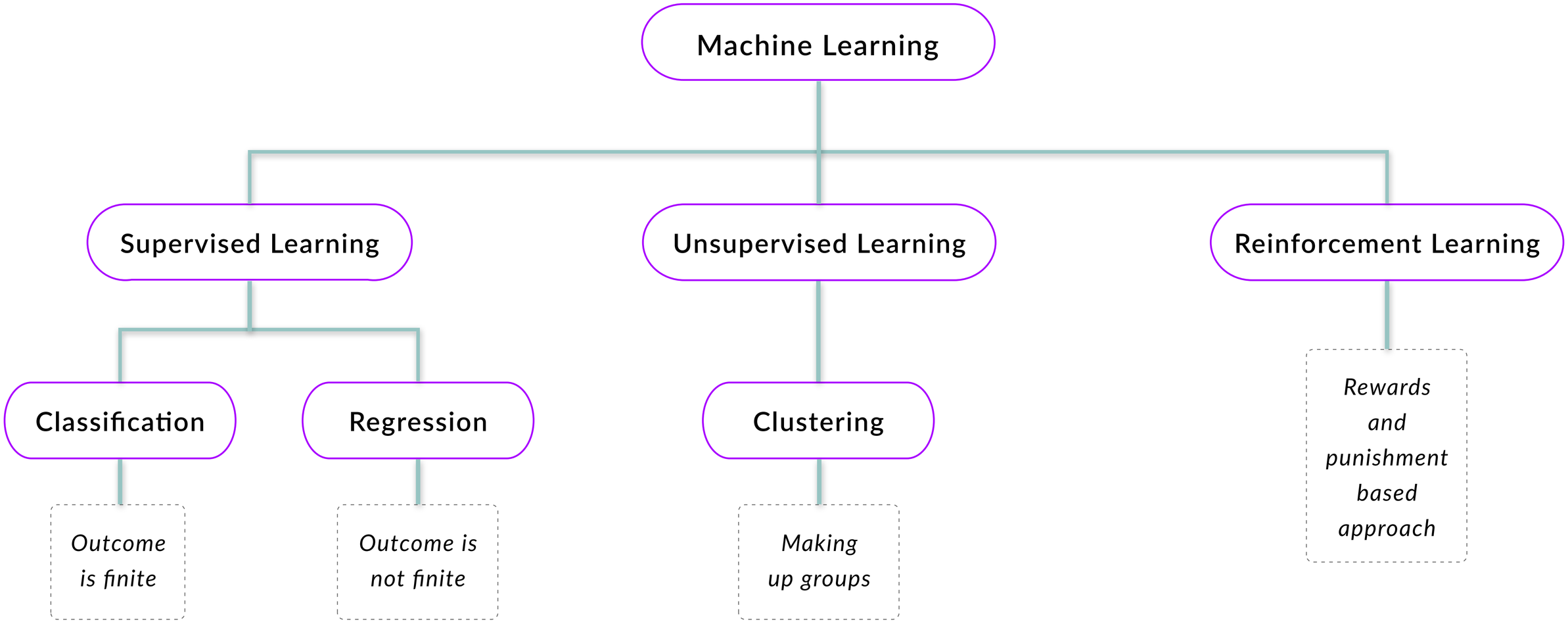
Hands on Coding!

Learning Model Evaluation Methods

Neural Network

- Classification project with naive bayes classifier
- All evaluation matrixes
- Deep Learning, Perceptron Algorithm, MLP

Classification of ML



Supervised Learning Algorithm

Linear Models

- Linear Regression
- Logistic Regression
- Ridge Regression
- Lasso Regression

Tree-Based Models

- Decision Trees
- Random Forests
- Gradient Boosting Machines (GBM)

Probabilistic Models

- Naive Bayes Classifier
- Bayesian Networks

Others

- k Nearest Neighbors
- Support Vector Machines (SVM)
- Neural Networks

Unsupervised Learning Algorithm

Clustering

- K-Means Clustering
- DBSCAN
- Gaussian Mixture Models (GMM)
- Hierarchical Cluster Analysis (HCA)

Dimensionality Reduction

- Principal Component Analysis (PCA)
- t-Distributed Stochastic Neighbor Embedding (t-SNE)
- Uniform Manifold Approximation and Projection (UMAP)

Association Rule Minning

- Apriori
- FP Growth
- Eclat

Neural Network

Supervised Model

Text, Tabular & Time series data

- Multi-Layer Perceptrons (MLP)
- Convolutional Neural Networks (CNN)
- Recurrent Neural Networks (RNN)
- Long Short-Term Memory Networks (LSTM)
- Transformer Models

Other Methods

Algorithms & Techniques

- Generative Adversarial Network (GANs)
- Attention Mechanisms
- Autoencoders
- Ensemble Methods (Bagging, Boosting)
- Knowledge Graph

	Outlook	Temperature	Humidity	Windy	Play Golf
0	Rainy	Hot	High	False	No
1	Rainy	Hot	High	True	No
2	Overcast	Hot	High	False	Yes
3	Sunny	Mild	High	False	Yes
4	Sunny	Cool	Normal	False	Yes
5	Sunny	Cool	Normal	True	No
6	Overcast	Cool	Normal	True	Yes
7	Rainy	Mild	High	False	No
8	Rainy	Cool	Normal	False	Yes
9	Sunny	Mild	Normal	False	Yes
10	Rainy	Mild	Normal	True	Yes

Introduction

Classification Problem

Detect possibility of playing golf in a day:

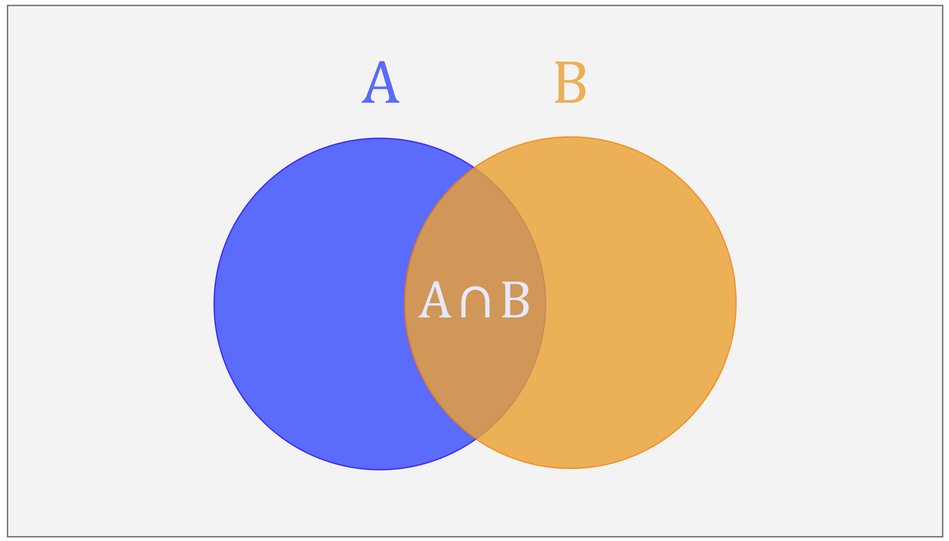
- Outlook = Sunny,
- Temperature = Hot,
- Humidity = Normal,
- Windy = False

Naive Bayes Classifiers

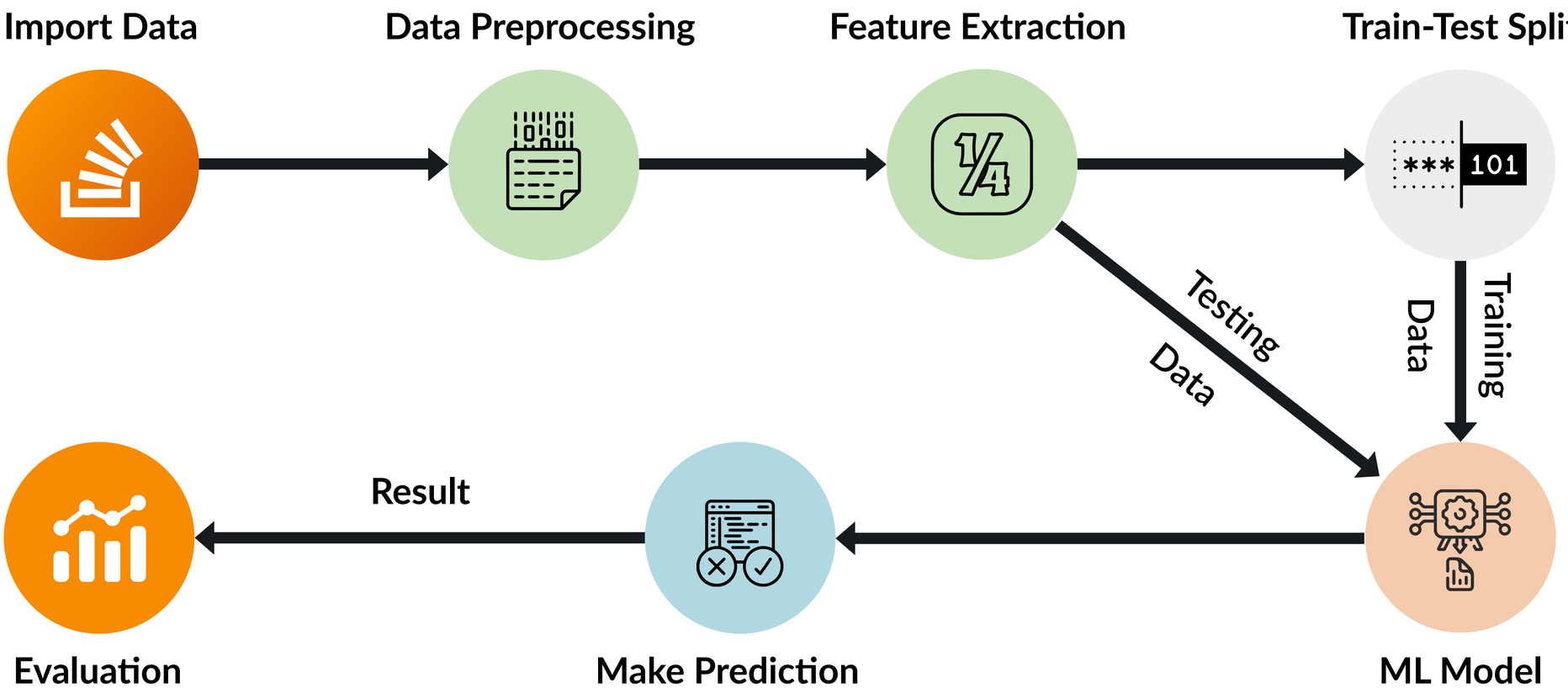
$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$$

$$P(y|X) = \frac{P(X|y) \cdot P(y)}{P(X)}$$

$X = (x_1, x_2, x_3, \ldots)$ feature vector



Steps of ML Projects



Evaluation

Confusion Matrix		Predicted	
		Negative **(N)** **-**	Positive **(P)** **+**
Actual	Negative **-**	True Negative **(TN)**	**False Positive (FP)** **Type I Error**
	Positive **+**	**False Negative (FN)** **Type II Error**	True Positive **(TP)**

Accuracy

For the entire model

- The ratio of correctly predicted observations to the total observations
- Provide an overall effectiveness of system

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN}$$

Confusion Matrix		**Predicted**	
		Negative **(N)** **-**	Positive **(P)** **+**
Actual	Negative **-**	True Negative **(TN)**	**False Positive (FP) Type I Error**
	Positive **+**	**False Negative (FN) Type II Error**	True Positive **(TP)**

Precision

For each class

- Positive Predictive Value
- All the instances the model predicted to be positive (or in a specific class), how many were actually positive

$$\text{Precision} = \frac{TP}{TP+FP}$$

Confusion Matrix		Predicted	
		Negative **(N)** -	Positive **(P)** +
Actual	Negative -	True Negative **(TN)**	**False Positive (FP) Type I Error**
	Positive +	**False Negative (FN) Type II Error**	True Positive **(TP)**

Recall

For each class

- Sensitivity, True Positive Rate
- How many are predicted as true in between all actually true

$$\text{Recall} = \frac{TP}{TP+FN}$$

→

Confusion Matrix		Predicted	
		Negative **(N)** -	Positive **(P)** +
Actual	Negative -	True Negative **(TN)**	**False Positive (FP) Type I Error**
	Positive +	**False Negative (FN) Type II Error**	True Positive **(TP)**

F1-Score

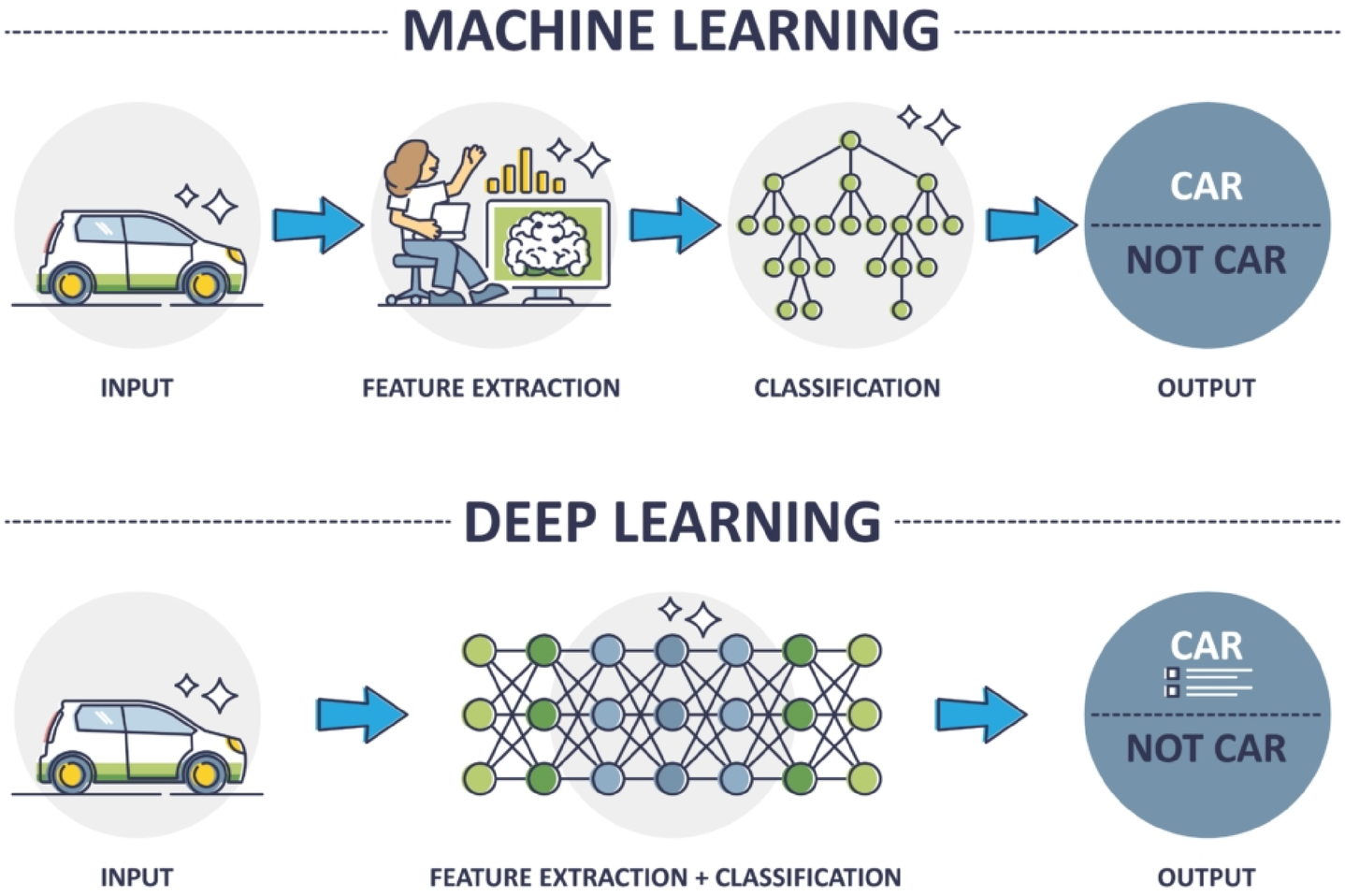
For each class

- The harmonic mean of precision and recall
- Gives a combined idea about these two metrics

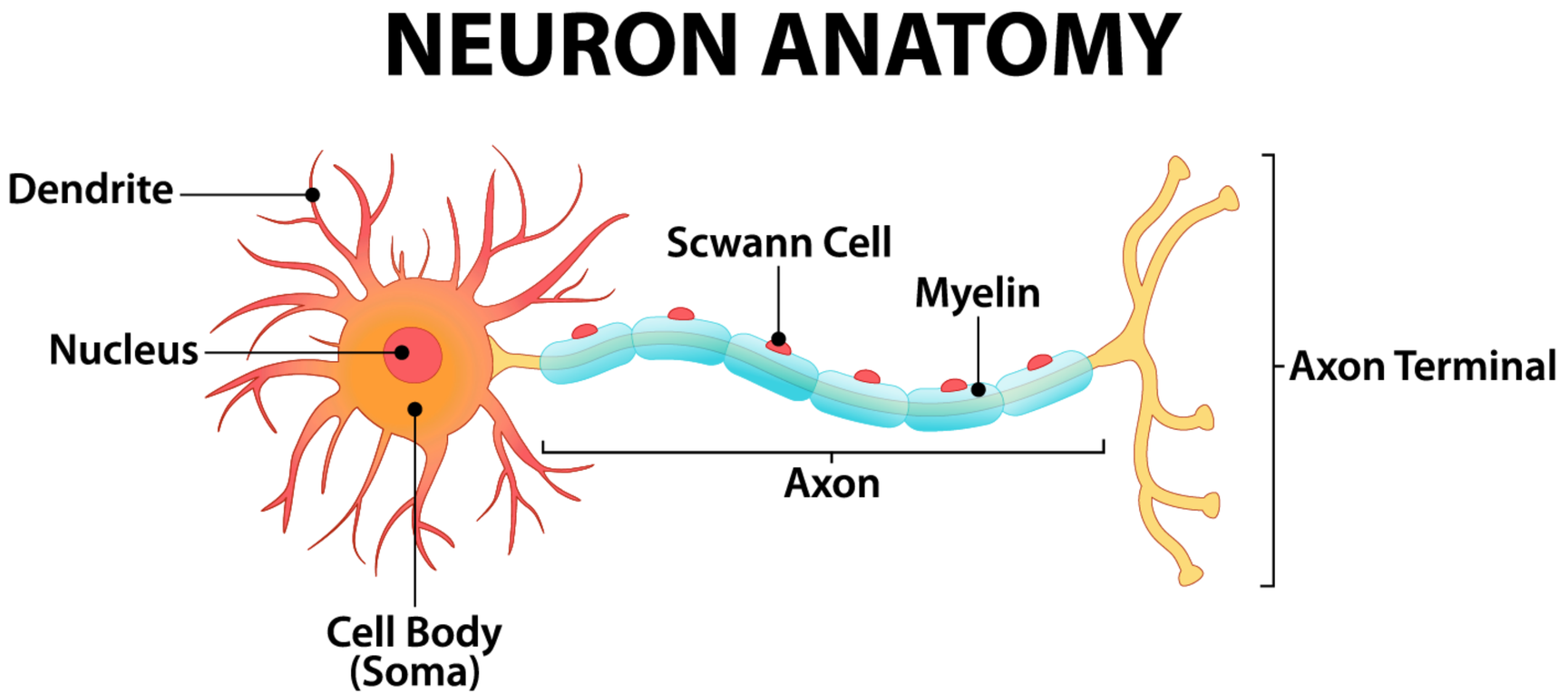
$$\text{F1-Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

Confusion Matrix		**Predicted**	
		Negative **(N)** -	Positive **(P)** +
Actual	Negative -	True Negative **(TN)**	**False Positive (FP) Type I Error**
	Positive +	**False Negative (FN) Type II Error**	True Positive **(TP)**

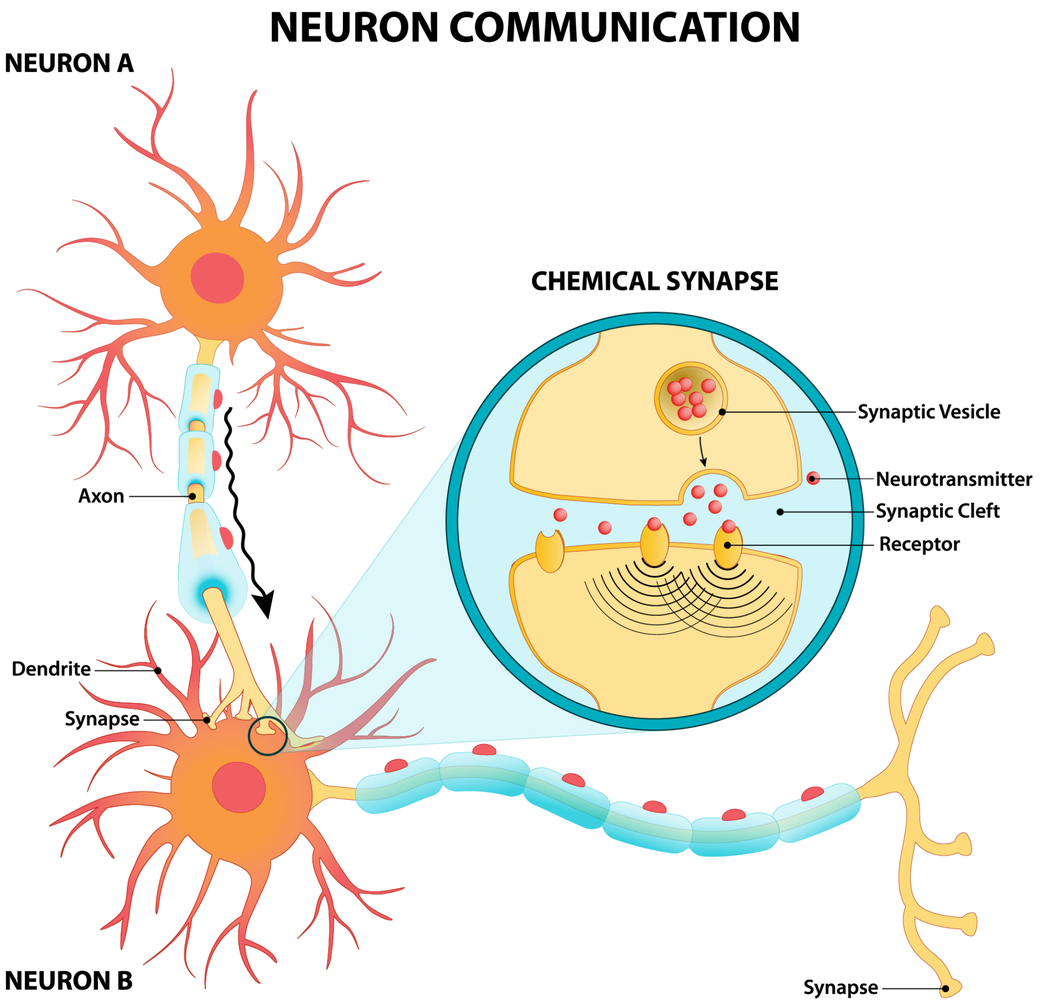
Deep Learning



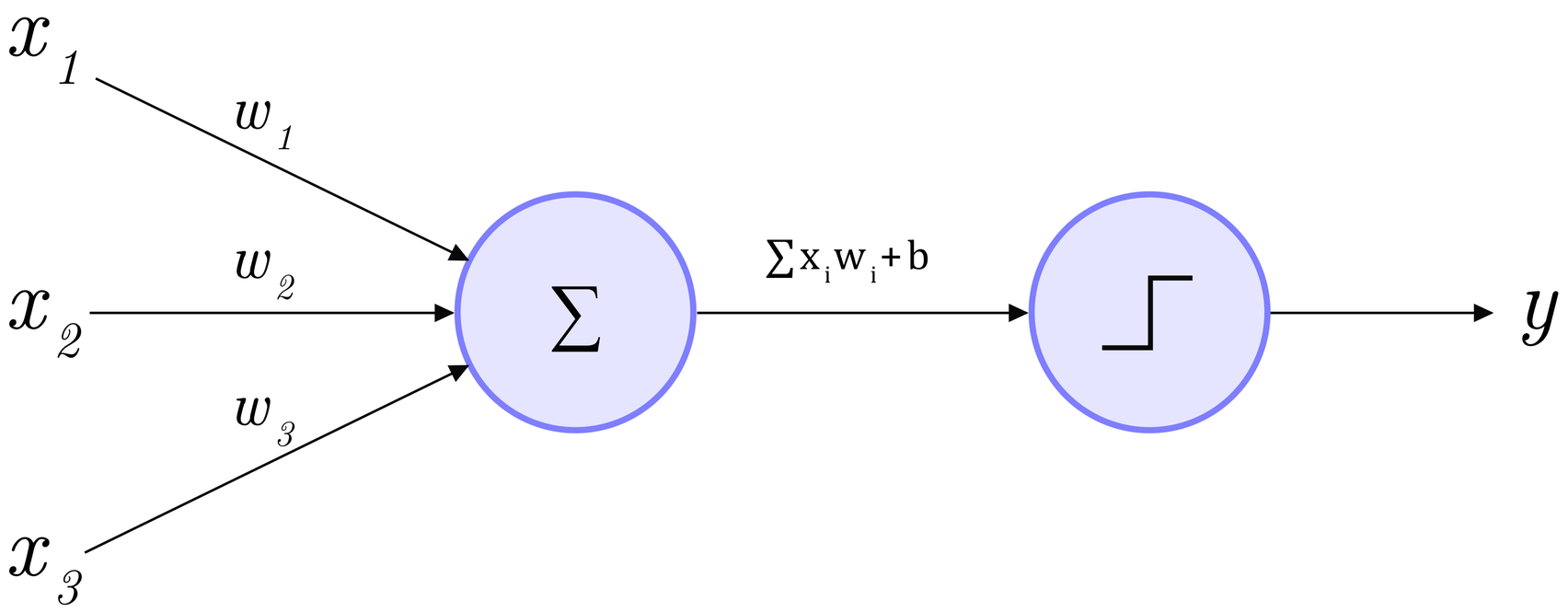
Neuron


NEURON ANATOMY
Dendrite
Nucleus
Cell Body
(Soma)
Scwann Cell
Myelin
Axon
Axon Terminal

Neuron

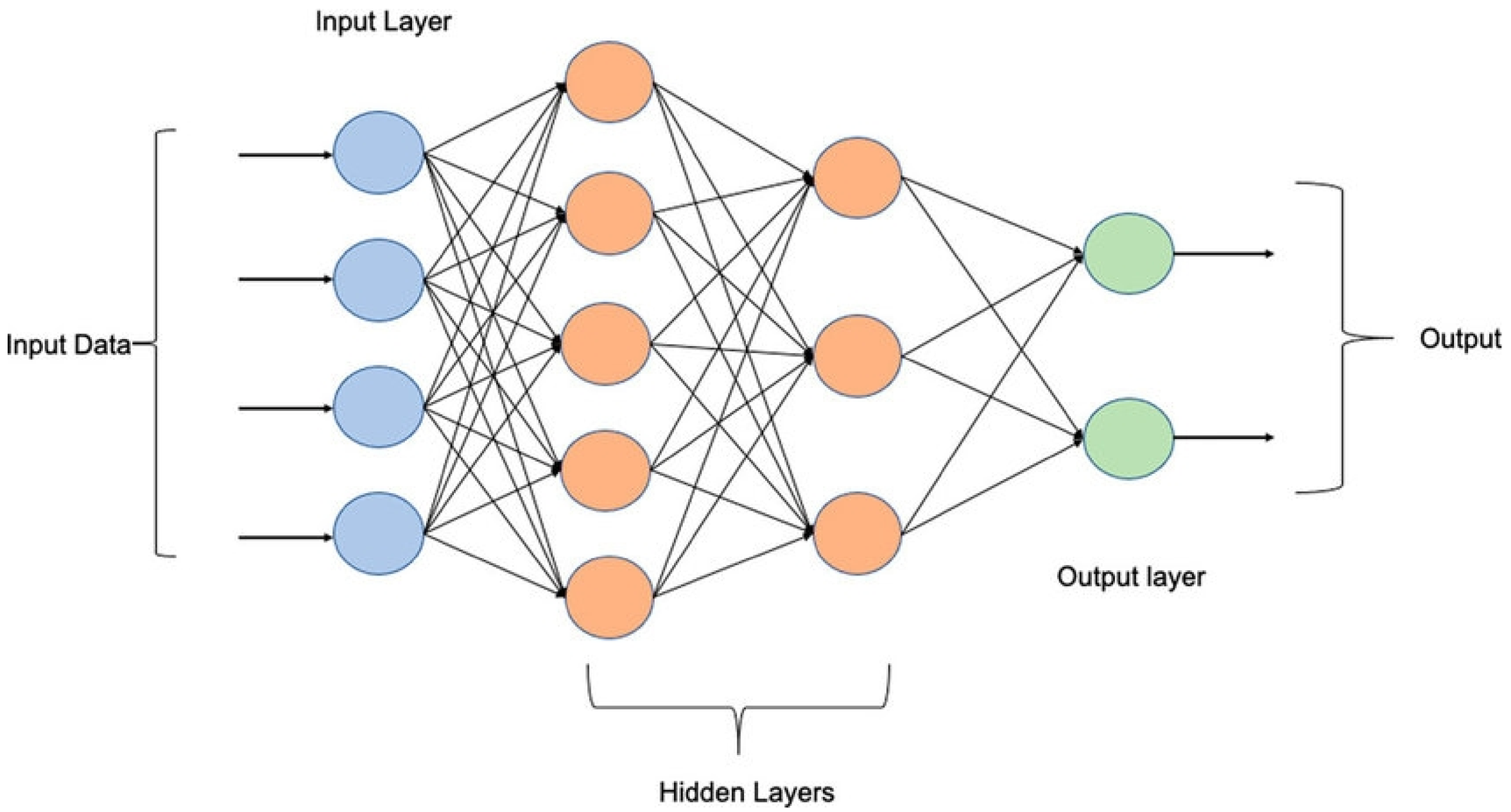

NEURON COMMUNICATION
NEURON A
CHEMICAL SYNAPSE
Synaptic Vesicle
Neurotransmitter
Synaptic Cleft
Receptor
Axon
Dendrite
Synapse
NEURON B
Synapse

Perceptron Algorithm



Neural Network

Multi Layer Perceptron



Types of Neural Networks

Artificial Neural Network (ANN)

For All Kind of Data

Convolutional Neural Network (CNN)

For Image of Data

Generative Adversarial Networks (GANs)

For Produce New Data

Recurrent Neural Network (RNN)

For Time series of Data

Long Short-Term Memory (LSTM)

For Time series of Data

Attention Neural Mechanism

For Time series of Data

Transformer Neural Network

For Time series of Data

THE END

THANK YOU

FOR CONSIDERATE AUDIENCE

AI Bangladesh