

# Artificial Intelligence & Machine Learning

## Session 1: Introduction to AI-ML-DL

- A discussion on Artificial Intelligence
- Difference in machine learning & Deep learning
- Comparison between human neural systems to Artificial Neural Networks

### Package required installing to create environment for implementation:

- Numpy-Numeric computing-handling Nd-array.
- Scipy-Scientific Computing
- Pandas-Data Exploration
- Sklearn-Machine Learning Algorithm
- Matplotlib-Data Visualization
- Seaborn-Data Visualization
- Jupyter Notebook – Interactive Interface by ipython mode to write code for model building

## Session 2: Python Introduction

- Significance to python programming
- Why python needed for machine learning
- Features of python

## Session 3: Python Data Structures & its operations

- Numbers
- string
- List
- Tuple
- Dictionary
- Sets

## Session 4: Python Function

- Python function definition & calling
- Function arguments types
- How to write code in python for a task

## Session 5: Statistical Learning

- Population, sample, methods of sampling – basics of statistics
- Measures of distribution – Mean, median, mode, S.D& variance Empirical rule – Normal distribution
- Probability & its basics – Mutually exclusive events, independent events Laws of probability
- Conditional probability
- Types of distribution – Binomial, Poisson & Normal distribution Hypothesis
- ANOVA

## Session 6: Numpy

- Array Creation
- Basic Operations
- Universal Functions
- Indexing, Slicing and Iterating
- Shape Manipulation¶¶
- Changing the shape of an array
- Stacking together different arrays
- Splitting one array into several smaller one

## Session 7: Pandas

- Series-1d
- Data frame-2d
- Panel-3D
- Exploratory Data Analysis
- Data Visualization using pandas
- Data preprocessing-Nan & Nat handling
- Interpolation method to fill nan value

## Session 8: Supervised Learning Algorithm

### Regression problems:

#### 1. Linear Regression Algorithms

- Univariate LR Analysis
- Bivariate LR Analysis
- Multivariate LR Analysis

## 2. Optimization methods

- Polynomial feature based LR
- Random Forest LR

### Session 9: Performance Metrics

- Mean absolute error
- Squared error
- Mean squared error
- Root mean squared error
- $R^2$  error
- Accuracy score
- Confusion Matrix
- Precision
- Recall
- F score

### Session 10: Optimization principles

- Back Propagation
- Forward Propagation
- Gradient descent techniques
- Upsampling & Down Sampling
- Overfitting & underfitting

### Session 11: Supervised - Classification problems

- Logistic Regression Algorithm
- KNN(K-Nearest neighbor) Algorithm
- Navie Bayes Algorithm(Gaussian,Multinomial,Bernoulli)
- Decision tree Algorithm
- Support Vector Machine
  - ❖ Support Vector Classifier (SVC)
  - ❖ Support Vector Repressor (SVR)

### Session 12:Un-Supervised Algorithms

- K-Means Clustering Algorithm
- Principal Component Analysis

### **Session 13: Ensemble Techniques**

- Boosting Techniques
- Bagging Techniques
- Voting Techniques

### **Session 14: Deep Learning Algorithm**

- Introduction to neural networks
- Deep neural Networks
- Single layer perceptron
- Multi Layer perceptron
- Feed forward Neural Networks

### **Session 15: Deep Learning Frame work**

- Tensorflow
- Keras
- Deep discussion on tensorflow with keras

### **Session 16: Opencv-image handling**

- Opencv installation
- Image read ,Write & show
- Basic function in opencv

### **Session 17: Image preprocessing**

- Image Augmentation
- Image normalization
- Image standardization

### **Session 18: Convolution Neural Networks**

- Convolution layer
- Filter used in convolution layer
- Strides
- Padding
- Pooling Layer(sum,avg,max)
- Dense layer
- Flattening
- Output layer
- Case Study –Image classification –cat or dog

- Activation Functions
  - ❖ Relu
  - ❖ Leaky Relu
  - ❖ Sigmoid
  - ❖ Softmax
  - ❖ Tanh

### **Session 19: Recurrent Neural Networks**

- Introduction to RNNs
- RNN implementation
- RNN implementation with TensorFlow
- Computational graph
- Introduction to long short term memory networks
- Life cycle of LSTM
- LSTM implementation