**ML with Python(5 Days) Priyansu Panda**

**Day 1**

1. Pre-Class Test
   1. Data structures: Data types, Array, List, Set, Map, trees
   2. Coding: Loops, functions, conditionals
   3. Probability Theory: Events, Event Space, Conditional Probability
   4. Linear Algebra: Matrix and Vectors
   5. Basic Statistics: Mean, Median, Mode, Variance, Standard Deviation, Histogram, Bar plots

#### Python and Data structure

#### Python data types

#### Data Structures

#### Numpy Arrays

#### Functions

#### Data Wrangling in Pandas

#### Introduction in pandas and dataframes

#### Loading and saving dataframes

#### Indexing, slicing and selecting dataframes

#### Handling null values, joining and dropping data

#### Aggregating and merging dataframes

#### Row wise and column wise operations

#### Time series data

#### Practical: Iris Dataset

#### Visualization Techniques:

#### Introduction in Matplotlib and seaborn

#### 2D plots, Contour Plot, Hue, grid, axes, label

#### Univariate and Multivariate exploratory Analysis

#### Statistics Refresher:

#### Probability theory refresher

#### Bayes theorem

#### Law of total probability

#### Probability distribution

#### Discrete distribution: Binomial, Multinomial, Poisson

#### Continuous distributions: Gaussian, Exponential

#### Statistical tests

#### Introduction to Linear Algebra

#### Matrix and vector algebra: Norm, inverse

#### Matrix addition, multiplication

#### Lab using numpy

**Day 2**

#### Supervised Techniques:

#### Linear Regression

#### Understand Maths of Linear regression

#### Cost function and gradient descent

#### Assumptions in linear regression

#### Generalized Linear regression

#### Cross Validation Technique

#### Overfitting and Underfitting

#### Error Metrics: R-squared, MSE, RMSE

#### Project: Predict Insurance Charges

#### Logistic Regression

#### Mathematical foundation

#### Project: Classify using Credit Risk dataset

#### Classification metrics: Accuracy, Specificity, Sensitivity, Confusion Matrix

#### Probability Calibration

**Day 3**

#### Decision Trees

#### Entropy

#### Relative Entropy, KL Divergence and Information Gain

#### Decision Tree classifier

#### Strength and weakness

#### Unsupervised Techniques:

#### K-Means Algorithm

#### Introduction in Clustering

#### Distance metric

#### Finding K

#### K-means++

#### Application: customer segmentation

#### NLP:

#### Text Mining introduction

#### NLP concepts - POS (Tokenization),

#### Word tokenization, Lemmatization, Stemming

#### Morphological Processing, Syntax Analysis,

#### Semantic &amp; Pragmatic Analysis, NER

#### NLP libraries NLTK/Spacy/Gensim

#### Text Classification

#### Term document matrix

#### Bernoulli/Multinomial Naïve Bayes Algorithm

#### Laplace Smoothing

#### Project: Spam Classifier

**Day 4**

#### Topic Modelling

#### LSA Algorithm

#### LDA Algorithm

#### Application of topic modelling: Author Identification

#### Text Embedding

#### Word2Vec Algorithm

#### Embedding in NLP

#### Pretrained Word2Vec Application

#### Find similar and related patterns

#### Open CV

#### GUI features in Open CV

#### Basic operations like pixel editing, geometric transformation

#### Image processing: change colour, smoothing images, image gradients, edge detection, histogram

#### Feature detection using Open CV

#### OCR using KNN in OpenCV

#### Object detection using OpenCV

#### Deep Learning

#### Neural Networks

#### Introduction and Biological similarity

#### Activation functions

#### Perceptron Algorithm

#### Build Perceptron Classifier

**Day 5**

#### Backpropagation algorithm

#### Application of backpropagation in classification: Keras/Tensorflow

#### Project: Fashion Image Dataset Classification

#### Overfitting Issue

#### Regularization

#### Layers of network

#### Dropout

#### Dense

#### Pooling

#### Convolution Neural networks

#### Introduction

#### CNN Architectures

#### CNN Computation

#### Strides, padding and size

#### Pooling Layer

#### Application in image classification using Tensorflow

#### RNN and LSTMs

#### Introduction in RNN

#### Application of RNN- Language Modelling, Sequence Modelling

#### RNN in Language Modelling

#### LSTMs Networks

#### Overview on GRU Networks

* + - 1. **Project:** RNN Based sentiment analyser

#### Post Class Test

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