**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

#### Recommended Additions:

1.      Post-development model deployment strategies

2.      Python-Django or Python-Flask frameworks for model consumption

3.      Building pipelines for handling data feeds to the model and providing predictions from the models in a production scenario

4.      Re-training techniques of already trained models

5.      Usage of cloud based ML services like Amazon Sagemaker, Azure ML Studio and IBM Watson ML Studio

Usage of some cloud based AI services using Rest APIs

#### 