ARTIFICIAL INTELLIGENCE SYLLABUS

- **Introduction to Deep Learning & AI**
- **Deep Learning: A revolution in Artificial Intelligence**
- Limitations of Machine Learning

- **What is Deep Learning?**
- Need for Data Scientists
- Foundation of Data Science
- What is Business Intelligence
- What is Data Analysis
- What is Data Mining

- **What is Machine Learning?**
- **Analytics vs Data Science**
- Value Chain
- Types of Analytics
- Lifecycle Probability
- Analytics Project Lifecycle
- Advantage of Deep Learning over Machine learning
- Reasons for Deep Learning
- Real-Life use cases of Deep Learning
- Review of Machine Learning

- **Data**
- Basis of Data Categorization
- Types of Data
- Data Collection Types
- Forms of Data & Sources
- Data Quality & Changes
- Data Quality Issues
- Data Quality Story
- What is Data Architecture
- Components of Data Architecture
- OLTP vs OLAP
- How is Data Stored?

- **Big Data**
- What is Big Data?

- 5 Vs of Big Data
- Big Data Architecture
- Big Data Technologies
- Big Data Challenge
- Big Data Requirements
- Big Data Distributed Computing & Complexity
- Hadoop
- Map Reduce Framework
- Hadoop Ecosystem

- **Data Science Deep Dive**
- What Data Science is
- Why Data Scientists are in demand
- What is a Data Product
- The growing need for Data Science
- Large Scale Analysis Cost vs Storage
- Data Science Skills
- Data Science Use Cases
- Data Science Project Life Cycle & Stages
- Data Acuqisition
- Where to source data
- Techniques
- Evaluating input data
- Data formats
- Data Quantity
- Data Quality
- Resolution Techniques
- Data Transformation
- File format Conversions
- Annonymization

- **Python**
- Python Overview
- About Interpreted Languages
- Advantages/Disadvantages of Python pydoc.
- Starting Python
- Interpreter PATH
- Using the Interpreter
- Running a Python Script

- Using Variables
- Keywords
- Built-in Functions
- StringsDifferent Literals
- Math Operators and Expressions
- Writing to the Screen
- String Formatting
- Command Line Parameters and Flow Control.
- Lists
- Tuples
- Indexing and Slicing
- Iterating through a Sequence
- Functions for all Sequences

- **Operators and Keywords for Sequences**
- The xrange() function
- List Comprehensions
- Generator Expressions
- Dictionaries and Sets.

- **Numpy & Pandas**
- Learning NumPy
- Introduction to Pandas
- Creating Data Frames
- GroupingSorting
- Plotting Data
- Creating Functions
- Slicing/Dicing Operations

- **Deep Dive – Functions & Classes & Oops**
- Functions
- Function Parameters
- Global Variables
- Variable Scope and Returning Values. Sorting
- Alternate Keys
- Lambda Functions
- Sorting Collections of Collections
- Classes & OOPs

- **Statistics**
- What is Statistics
- Descriptive Statistics
- Central Tendency Measures
- The Story of Average
- Dispersion Measures
- Data Distributions
- Central Limit Theorem
- What is Sampling
- Why Sampling
- Sampling Methods
- Inferential Statistics
- What is Hypothesis testing
- Confidence Level
- Degrees of freedom
- what is pValue
- Chi-Square test
- What is ANOVA
- Correlation vs Regression
- Uses of Correlation & Regression

- **Machine Learning, Deep Learning & AI using Python**
- Introduction
- ML Fundamentals
- ML Common Use Cases
- Understanding Supervised and Unsupervised Learning Techniques

- **Clustering**
- Similarity Metrics
- Distance Measure Types: Euclidean, Cosine Measures
- Creating predictive models
- Understanding K-Means Clustering
- Understanding TF-IDF, Cosine Similarity and their application to Vector Space Model
- Case study

- **Implementing Association rule mining**
- What is Association Rules & its use cases?
- What is Recommendation Engine & it’s working?
- Recommendation Use-case

- Case study

- **Understanding Process flow of Supervised Learning Techniques**
- Decision Tree Classifier
- How to build Decision trees
- What is Classification and its use cases?
- What is Decision Tree?
- Algorithm for Decision Tree Induction
- Creating a Decision Tree
- Confusion Matrix
- Case study

- **Random Forest Classifier**
- What is Random Forests
- Features of Random Forest
- Out of Box Error Estimate and Variable Importance
- Case study

- **Naive Bayes Classifier**
- Case study

- **Project Discussion**
- **Problem Statement and Analysis**
- Various approaches to solve a Data Science Problem
- Pros and Cons of different approaches and algorithms.

- **Linear Regression**
- Case study
- Introduction to Predictive Modeling
- Linear Regression Overview
- Simple Linear Regression
- Multiple Linear Regression

- **Logistic Regression**
- Case study
- Logistic Regression Overview
- Data Partitioning
- Univariate Analysis
- Bivariate Analysis

- Multicollinearity Analysis
- Model Building
- Model Validation
- Model Performance Assessment AUC & ROC curves
- Scorecard

- **Support Vector Machines**
- Case Study
- Introduction to SVMs
- SVM History
- Vectors Overview
- Decision Surfaces
- Linear SVMs
- The Kernel Trick
- Non-Linear SVMs
- The Kernel SVM

- **Time Series Analysis**
- Describe Time Series data
- Format your Time Series data
- List the different components of Time Series data
- Discuss different kind of Time Series scenarios
- Choose the model according to the Time series scenario
- Implement the model for forecasting
- Explain working and implementation of ARIMA model
- Illustrate the working and implementation of different ETS models
- Forecast the data using the respective model
- What is Time Series data?
- Time Series variables
- Different components of Time Series data
- Visualize the data to identify Time Series Components
- Implement ARIMA model for forecasting
- Exponential smoothing models
- Identifying different time series scenario based on which different Exponential Smoothing model can be applied
- Implement respective model for forecasting
- Visualizing and formatting Time Series data
- Plotting decomposed Time Series data plot
- Applying ARIMA and ETS model for Time Series forecasting

- Forecasting for given Time period
- Case Study

- **Machine Learning Project**
- **Machine learning algorithms Python**
- Various machine learning algorithms in Python
- Apply machine learning algorithms in Python

- **Feature Selection and Pre-processing**
- How to select the right data
- Which are the best features to use
- Additional feature selection techniques
- A feature selection case study
- Preprocessing
- Preprocessing Scaling Techniques
- How to preprocess your data
- How to scale your data
- Feature Scaling Final Project

- **Which Algorithms perform best**
- Highly efficient machine learning algorithms
- Bagging Decision Trees
- The power of ensembles
- Random Forest Ensemble technique
- Boosting – Adaboost
- Boosting ensemble stochastic gradient boosting
- A final ensemble technique

- **Model selection cross validation score**
- Introduction Model Tuning
- Parameter Tuning GridSearchCV
- A second method to tune your algorithm
- How to automate machine learning
- Which ML algo should you choose
- How to compare machine learning algorithms in practice

- **Text Mining& NLP**
- Sentimental Analysis
- Case study

- **PySpark and MLLib**
- Introduction to Spark Core
- Spark Architecture
- Working with RDDs
- Introduction to PySpark
- Machine learning with PySpark – Mllib

- **Deep Learning & AI using Python**
- **Deep Learning & AI**
- Case Study
- Deep Learning Overview
- The Brain vs Neuron
- Introduction to Deep Learning

- **Introduction to Artificial Neural Networks**
- The Detailed ANN
- The Activation Functions
- How do ANNs work & learn
- Gradient Descent
- Stochastic Gradient Descent
- Backpropogation
- Understand limitations of a Single Perceptron
- Understand Neural Networks in Detail
- Illustrate Multi-Layer Perceptron
- Backpropagation – Learning Algorithm
- Understand Backpropagation – Using Neural Network Example
- MLP Digit-Classifier using TensorFlow
- Building a multi-layered perceptron for classification
- Why Deep Networks
- Why Deep Networks give better accuracy?
- Use-Case Implementation
- Understand How Deep Network Works?
- How Backpropagation Works?
- Illustrate Forward pass, Backward pass
- Different variants of Gradient Descent

- **Convolutional Neural Networks**
- Convolutional Operation

- Relu Layers
- What is Pooling vs Flattening
- Full Connection
- Softmax vs Cross Entropy
- ” Building a real world convolutional neural network for image classification”

- **What are RNNs – Introduction to RNNs**
- Recurrent neural networks rnn
- LSTMs understanding LSTMs
- long short term memory neural networks lstm in python

- **Restricted Boltzmann Machine (RBM) and Autoencoders**
- Restricted Boltzmann Machine
- Applications of RBM
- Introduction to Autoencoders
- Autoencoders applications
- Understanding Autoencoders
- Building a Autoencoder model

- **Tensorflow with Python**
- Introducing Tensorflow
- Introducing Tensorflow
- Why Tensorflow?
- What is tensorflow?
- Tensorflow as an Interface
- Tensorflow as an environment
- Tensors
- Computation Graph
- Installing Tensorflow
- Tensorflow training
- Prepare Data
- Tensor types
- Loss and Optimization
- Running tensorflow programs

- **Building Neural Networks using**
- **Tensorflow**
- Tensors
- Tensorflow data types

- CPU vs GPU vs TPU
- Tensorflow methods
- Introduction to Neural Networks
- Neural Network Architecture
- Linear Regression example revisited
- The Neuron
- Neural Network Layers
- The MNIST Dataset
- Coding MNIST NN
- **Deep Learning using**
- **Tensorflow**
- Deepening the network
- Images and Pixels
- How humans recognise images
- Convolutional Neural Networks
- ConvNet Architecture
- Overfitting and Regularization
- Max Pooling and ReLU activations
- Dropout
- Strides and Zero Padding
- Coding Deep ConvNets demo
- Debugging Neural Networks
- Visualising NN using Tensorflow
- Tensorboard

- **Transfer Learning using**
- **Keras and TFLearn**
- Transfer Learning Introduction
- Google Inception Model
- Retraining Google Inception with our own data demo
- Predicting new images
- Transfer Learning Summary
- Extending Tensorflow
- Keras
- TFLearn
- Keras vs TFLearn Comparison

- **Resume Preparation & Mock Interview**

THANK YOU..