

AI and ML Course Contents (5 days)

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Machine Learning Intro and Python Environment Setup
Introduction to Artificial Intelligence and related Industry Use Cases
Basics of Data Science , Machine Learning and Deep Learning.
Setting up Anaconda & Python Notebooks.
Working on notebooks for Machine Learning

Python Basics

Python Basic Data Types

Data Structures (List, Tuple, Dictionary)

Creating, accessing, and slicing tuples, lists and Dictionaries

Functions, Control Flow

Module and Packages

Errors and Exceptions

Python Mathematical Computation Libraries (Numpy) and Scientific (SciPY)

Numpy Overview

Properties and types of Ndim Arrays

Accessing Array elements : Indexing, Slicing, Iteration, Indexing with Boolean Arrays

Basic operation on NDim Arrays

Shape Manipulation

Numpy Mathematical operations examples

Scipy Overview

Scipy Statistical sub package (T-Test, p-value, Anova etc)

Scipy Linear algebra computation

Data Manipulation and Exploratory Analysis (Pandas)

Introduction to Pandas

Pandas Series

Pandas Data Frame

Pandas File Read and Write Support

Data Operation, Summarization, Slicing & Dicing
Data Cleaning Missing Values, Outliers
Data Filtering

Data Visualization in Python (Matplotlib)
Introduction to Data Visualization
Matplotlib Features
Bar Plot , Line Chart, Box Plot, Scatter Plot
Set Axis, Labels, and Legend Properties
Controlling axis labels and colors

Supervised Machine Learning-1 (Scikit Learn) - (Industry Use case Implementation with Model Tuning)
Introduction Machine Learning Life Cycle
Decision Tree Algorithms
Classification Tree
Regression Tree
Tree based Ensemble Learning
Random Forest
Gradient Boosting Trees

Model Evaluation, Improvements & Performance Metrics (Machine Learning lifecycle for Model Tuning)
Data Split Practices
Cross Validation
K-Fold Validation
Confusion Matrix
ROC Curves
Mean Absolute/Square Errors & R-Square
Ensemble Learning
Model Selection and Finalization
Grid Search

Supervised Machine Learning-2
Support Vector Machine (SVM Model)
SVM Kernel Training
SVM Model hyper parameter Tuning
K Nearest Neighbor (KNN Model)
KNN Model Training

Unsupervised Learning - Clustering
Hierarchical Clustering
K-Mean Clustering
Model Evaluation

Dimensionality Reduction
Principal Component Analysis (PCA)

Deep Learning Neural Network Modeling and Tuning (Industry Use case Implementation with Model Tuning)
Multi Layer Perceptron Model
Cost Function Formation
Back propagation and Gradient Descent Algorithm
ANN Model Training
Neural Network Hyper parameter Tuning
Tensorflow
Keras
Industry Use Case using ANN Model

Convolutional Neural Networks (Industry Use case Image recognition Implementation with Modeling)

- o CNN Architecture
- o Convolution Function
- o Pooling and Flattening
- o Computer Vision
- o Image Acquisition and manipulation
- o Edge Detection, Corner Detection
- o Image Scaling
- o Dropout layer and Regularization

- o Rectifier Linear Unit (Relu)

Artificial Intelligence for Text, NLP and Forecasting Training

Course Introduction

Compare AI vs ML vs DL

Introduction to neural networks

The math behind neural networks

Activation functions

Vanishing gradient problem and ReLU

Loss functions

Gradient descent

Back propagation

Understanding the intuition behind neural networks

Introducing Perceptrons

Single Layer linear classifier

Step Function

Updating the weights

Linear separability and XOR problem

Hidden Layers: Intro to Deep Neural Networks and Deep Learning

Hidden Layers as a solution to XOR problem

The architecture of deep learning

Introducing Keras/TensorFlow

What is Keras?

Using Keras with a TensorFlow Backend

Lab: Using Keras to implement a neural network

Introducing TensorFlow

TensorFlow intro

TensorFlow Features

TensorFlow Versions

GPU and TPU scalability

Lab: Setting up and Running TensorFlow

The Tensor: The Basic Unit of TensorFlow

Introducing Tensors

TensorFlow Execution Model

Lab: Learning about Tensors
Recurrent Neural Networks in Keras/TensorFlow
Introducing RNNs
RNNs in TensorFlow
Lab: RNN
Long Short-Term Memory (LSTM) in TensorFlow

Text processing elements
TF-IDF
Word2vec
Tokenizers, n-grams
Stopword removal
Sentiment analysis
Text processing pipelines
Natural Language Processing
What is NLP?
Sensory Acuity
Behavioral Flexibility

NLP Techniques
NLP and Deep Learning
Word2vec
Learning word embedding
The Skip-gram Model
Building the graph
Training the model
Visualizing the embeddings
Optimizing the implementation
Text classification with TensorFlow
Automatic translation (seq2seq)
Text generation with RNN
Named entity extraction with RNNs (sequence modeling)
Bidirectional LSTM with attention
Natural Language Processing pipelines

Conversational AI
Introduction to the Rasa framework
Generating natural language
Understanding natural language
Chatbots
Time series processing and forecasting elements

Traditional Time Series forecasting with ARIMA models
Defining Autocorrelation
Understanding the Dickey-Fuller Test

Forecasting with TensorFlow and Keras
Using RNN and LSTM in time series prediction.
Validation and metrics of Time Series Prediction models
References and Next steps
Structured Activity/Exercises/Case Studies:
Using TensorFlow to create an RNN
Sentiment analysis project
Natural Language Processing project