TECH CONCEPT HUB
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MACHINE LEARNING & AI TRAINING SYLLABUS

Introduction to Python Programming

- Starting with Python Programming
- Basic Python Syntax and Variables
- Control Structures and Functions

Data Structure

- Lists, tuples, and dictionaries
- Iterating through lists, tuples, and dictionaries
- Sets and Frozen sets
- Basic Set O1575perations (union, intersection, difference)

Advance Python Programing

- File handling (CSV and JSON files)
- Exception handling
- Regular expressions and their applications in Python

Python Library

- Pandas
- NumPy

Statistical Concepts & Application

- Descriptive Statistics
- Data Visualization
- Probability Basics
- Probability Distributions
- Probability Distributions Sampling
- Inferential Statistics
- Sampling techniques and the Central Limit Theorem
- Hypothesis testing: t-tests, chi-square tests, ANOVA

SQL Basics & Advance SQL

- SQL Overview
- SQL DDL Commands
- Constraints
- SQL DML Commands

- Querying and Data Manipulation

Data Visualization

- Data Visualization with Matplotlib
- Data Visualization with Seaborn
- Data Visualization with Power BI
    - Clean, transform, and load Data in Power BI
    - Design a data Model in Power BI
    - Introduction to Creating Measures using DAX in Power BI
    - Optimize a Model for Performance in Power BI
    - Work with Power BI visuals
    - Create a data-driven story with Power BI Reports
    - Create Dashboards in Power BI Introduction to dashboards
    - Create Paginated Reports

Scikit-learn

- The Predictive Modeling Pipeline
- The Predictive Modeling Pipeline
- Hyperparameters tuning
- Linear Models
- Decision Tree Models
- Ensemble of Models
- Evaluating Model Performance

Capstone Project

Machine Learning

Fundamentals of Machine Learning

- Supervised Learning, Unsupervised Learning , Reinforcement Learning

Machine Learning Concepts & Terminologies

- PAC (Probably Approximately Correct)
- Noise and Model Complexity
- Triple Trade-Off, Association rules & measures, Algorithms

Linear Regression

- Correlation, Regression, Model Assumptions, Estimation Process

- Least Squares Method, The Coefficient of Determination

Multiple Regression Analysis

- Multiple Regression Analysis
- F-test for the overall fit of the model
- Multiple regression model Building
- Multicollinearity and its Diagnostics
- Interpretation of Regression Coefficients
- Regression Diagnostics and Residual Analysis
- Multiple Linear Regression using Python
- Multiple Regression Assignments

Logistic Regression Analysis

- When and why use Logistic Regression?
- Binary & Multinomial
- Interpreting Logistic Regression
- The logistic function & Interpretation
- Methods for including variables
- Logistic Regression Model using Python
- Logistic Regression Assignments

Maximum Likelihood Estimation

- Bernoulli distribution, Multinomial distribution, Gaussian distribution
- Assessing the Model, Assessing Changes in Models, Assessing Predictors
- Methods of Regression, Complete Separation, Over dispersion
- MLE Assignments

Decision Trees

- Understanding the Concept
- Tree induction: Construction of the tree
- Classification Trees, Entropy, Selecting Attribute, Information gain
- Overfitting Causes & Prevention
- Reduced Error Pruning
- Decision trees - Advantages & Drawbacks
- Ensemble Models
- Decision Trees Assignments

Bayesian Theory

- Axioms of Probability Theory, Conditional Probability , Independence
- Joint Distribution,
- Baye's Rule, Bayesian Categorization, Generative Probabilistic Models
- Naïve Bayes Generative Model, Naïve Bayesian Categorization
- Naïve Bayes Classifier Assignments

Random Forests

- Ensemble Methods - Bagging, Boosting & Random Forests
- Ensemble Classifiers & Models
- Random forest operation & Algorithm
- Features, Advantages and Disadvantages
- Limitations of random forests
- Random Forest Assignments

Support Vector Machine

- Separating Hyperplanes
- Finding the optimal hyperplane
- The Legrangin Dual Problem
- Support Vectors, VC dimension / Non-linear SVM
- The Kernel Trick / Important Kernel Issues
- The primal optimization problem
- The Dual Formulation
- The "C" Problem: Overfitting and Underfitting
- Model selection procedure
- SVM For Multi-class classification
- Applications of SVM, Advantages & Drawbacks

K-Nearest Neighbor (K-NN)

- Non-parametric methods, k-Nearest Neighbor Estimator
- How to Choose k or h, Strengths and Weaknesses
- K-Nearest Neighbor Assignments

K-Means Clustering

- Clustering / Direct Clustering Method
- Mixture densities, Classes v/s Clusters, Non-Hierarchical Clustering
- K-Means / Distance Metrics, K-Means Algorithm
- Color Quantization, Vector Quantization
- Encoding/Decoding

- Expectation Maximization (EM)
- EM Algorithm, Feature Selection vs Extraction
- Seed Choice, Uses of Clustering, Clustering as Pre-processing

Time Series / ARIMA

- Qualitative Forecasting Methods, Quantitative Forecasting Methods
- Trend, Cyclical, Seasonal, Irregular
- Smoothing Methods: Moving Average Method, Exponential Smoothing Method
- Forecast Effect of Smoothing Coefficient
- Linear Time-Series Forecasting Model, Trend Models
- Time Series Plot, Seasonality Plot
- Quadratic Time-Series Forecasting Model
- Quadratic Time-Series Model Relationships
- Quadratic Trend Model
- Exponential Time-Series Forecasting Model
- Exponential Weight, Trend Model
- Autoregressive Modeling (ARIMA)
- Time Series Data Plot
- Auto-correlation Plot
- Evaluating Forecasts
- Quantitative Forecasting Steps
- Forecasting Guidelines, Pattern of Forecast Error, Residual Analysis

Machine learning in cloud

- Cloud Services & Features
- Scripting in Cloud
  Hands on labs
- Accessing Machine Learning Services
- Getting Data
- Preparation of Data
- Applying Machine Learning Algorithm
- Publishing Models

Big Data and Hadoop Fundamentals

- Traditional Data Vs Big Data
- Introduction to Hadoop, Hadoop Ecosystem
- Deploying ML models on Google cloud

ARTIFICIAL INTELLIGENCE

Understanding AI

- Machine learning techniques

Industry application of AI

- Natural Language Processing
- Face Detection
- Sentiment Analyzer
- Reinforcement Learning
- Object Detection
- TensorFlow and Neural Network
- Motion Analysis and Object Tracking

Capstone Project 1
Capstone Project 2

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