COMPREHENSIVE PYTHON PROGRAMMING FOR DATA SCIENCE

Module 1: Python Basics

Lesson 1 : Introduction to Python

- Installation and Running Python (Jupyter Notebook, .py files from terminal, Google Colab).

Lesson 2 : Basic Data Types and Type Conversion

- Overview of data types: integers, floats, strings, booleans.
- Type conversion techniques.

Lesson 3 : Variables and Operators

- Variable declaration and scope.
- Arithmetic, relational, and logical operators.

Lesson 4 : Flow Control

- Conditional statements: if, elif, else.
- Looping constructs: for and while loops.

Lesson 5 : Python Identifiers and Functions

- Naming conventions and best practices for identifiers.
- Building and using functions: print, type, id, sys, len.

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Module 2: Data Structures and Utilities

Lesson 1 : Lists

- Creation, indexing, and slicing.
- List methods: append, pop, insert, remove, sort, reverse.
- List comprehension.

Lesson 2 : Sets

- Set creation and operations: add, remove, union, intersection, difference.

Lesson 3 : Tuples

- Tuple creation and immutability.
- Accessing tuple elements: indexing and slicing.

Lesson 4 : Dictionaries

- Dictionary creation and key-value pairs.
- Common dictionary methods: keys(), values(), items(), get(), pop(), update.

Lesson 5 : Understanding the Range Function

- Using range() in loops.
- Different arguments for range().

Module 3: Functions

Lesson 1 : Types of Functions

- Inbuilt vs User-defined functions.
- Function arguments and return values.

Lesson 2 : Variable Scope

- Global vs Local variables.
- Anonymous functions with lambda.

Module 4: Object-Oriented Programming (OOP)

Lesson 1 : Classes and Objects

- Introduction to built-in classes vs user-defined classes.
- Creating classes and objects, using the __init__method.

Lesson 2 : Class Attributes and Methods

- Instance vs Class variables.
- Instance, class, and static methods.

Lesson 3 : Inheritance and Polymorphism

- Basics of inheritance and its types.
- Duck typing, operator overloading, method overloading, method overriding.

Lesson 4 : Decorators and Abstract Classes

- Using decorators to modify functions.
- Abstract classes and methods.

Lesson 5 : Iterators and Generators

- Understanding iterators in Python.
- Creating generators for efficient memory use.

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Module 5: Error Handling and File Operations

Lesson 1 : Error and Exception Handling

- Try, except, finally blocks.
- Custom exception classes.

Lesson 2 : File Handling

- Reading from and writing to files.
- Understanding file modes and context managers.

Lesson 3 : Documentation

- Writing docstrings and comments for better code readability.

Lesson 4 : Modularization

- Organizing code into modules and packages.
- Introduction to pickling and unpickling.

Module 6: Data Manipulation with Pandas

Lesson 1 : Introduction to Pandas

- Installing Pandas and importing the library.
- Creating and manipulating DataFrames and Series.

Lesson 2 : DataFrame Operations

- Loading different file formats (CSV, Excel).
- Renaming columns, handling missing values.

Lesson 3 : DataFrame Methods

- DataFrame attributes and methods (head(), tail(), groupby(), etc.).
- Sorting and filtering data.

Lesson 4 : Merging and Joining DataFrames

- Concatenating DataFrames and handling duplicate entries.

Lesson 5 : Time Series with Pandas

- Handling date and time data, date indexing, and time series analysis.

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Module 7: Numerical Computing with NumPy

Lesson 1 : Introduction to NumPy

- Installation and basic usage.
- Creating and manipulating NumPy arrays.

Lesson 2 : Array Operations

- Mathematical operations, reshaping, and flattening arrays.
- Important NumPy functions (min(), max(), sum(), etc.).

Lesson 3 : Matrix Operations

- Understanding matrices, diagonal matrices, and operations like addition and multiplication.

Lesson 4 : Statistical Functions

- Using NumPy for statistical analysis (mean(), median(), std(), etc.).

Module 8: Data Visualization

Lesson 1 : Introduction to Matplotlib

- Basic plotting with pyplot.
- Creating different types of plots: line, bar, histogram, scatter, pie, and 3D plots.

Lesson 2 : Customizing Plots

- Setting limits, labels, titles, and legends.

Lesson 3 : Introduction to Seaborn

- Creating statistical plots (catplot, stripplot, boxplot).
- Visualizing relationships and distributions with Seaborn.

Module 9: Scientific Computing with SciPy

Lesson 1 : Overview of SciPy

- Introduction and installation.
- Key modules: signal processing, optimization, statistics.

Lesson 2 : Linear Algebra and Integration

- Performing linear algebra operations.
- Basic integration techniques.

Module 10: Statistical Modeling with Statsmodels

Lesson 1 : Linear Regression

- Fitting models using statsmodels.
- Understanding model summaries.

Lesson 2 : Time Series Analysis

- Time series modeling techniques and diagnostics.

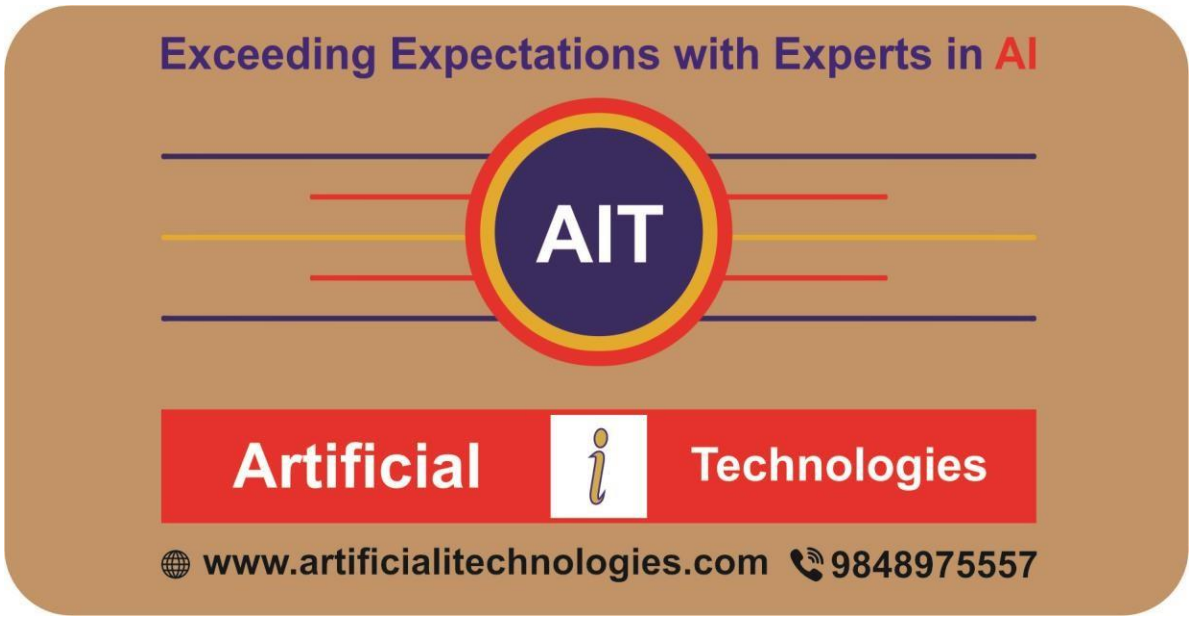
Lesson 3 : Statistical Tests

- Performing ANOVA and hypothesis testing.

CAPSTONE PROJECT

Project : Data Analysis and Visualization

- Select a dataset and perform comprehensive analysis using Python libraries.
- Apply data cleaning, manipulation, visualization, and statistical modeling techniques learned in the course.



MATHEMATICS FOR DATA SCIENCE AND MACHINE LEARNING

Module 1 : Set Theory

Lesson 1 : Introduction to Set Theory

- Definition of sets, elements, and notation.
- Types of sets: finite, infinite, subsets, power sets.

Lesson 2 : Set Operations

- Union, Intersection, Difference, and Complement.
- Venn diagrams for visual representation of sets.

Lesson 3 : Data Representation

- Representation of data in sets.
- Introduction to database operations: SELECT, JOIN, and UNION.

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Module 2: Combinatorics

Lesson 1 : Basics of Combinatorics

- Introduction to counting principles.
- Importance of combinatorics in data science.

Lesson 2 : Permutations and Combinations

- Definitions and formulas.
- Applications in sampling and feature selection.

Lesson 3 : Experiment Design

- Understanding experimental design principles.
- Types of designs: Randomized, Block, Factorial.

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Lesson 4 : Data Partitioning and Cross-Validation

- Techniques for partitioning data.
- Importance of cross-validation in model evaluation.

Module 3: Probability

Lesson 1 : Introduction to Probability

- Definitions and basic concepts.
- Types of probability: theoretical vs. empirical.

Lesson 2 : Probability Rules

- Addition Rule and Multiplication Rule.
- Understanding conditional probability and independence.

Lesson 3 : Advanced Probability Concepts

- Total Probability and Probability Decision Trees.
- Bayes' Theorem and its applications.

Lesson 4 : Sensitivity & Specificity

- Understanding these metrics in the context of classification models.

Lesson 5 : Naive Bayes Classifiers

- Bernoulli, Gaussian, and Multinomial Naive Bayes.
- Applications and implementation.

Module 4: Probability Distributions

Lesson 1 : Overview of Probability Distributions

- Definition and importance in statistics.

Lesson 2 : Common Distributions

- Binomial, Poisson, Normal, and Standard Normal Distribution.
- Understanding Gaussian Distribution and Uniform Distribution.

Lesson 3 : Distribution Characteristics

- Z-Score, Skewness, and Kurtosis.
- Introduction to Geometric and Hypergeometric Distributions.

Lesson 4 : Markov Chains

- Basics and applications of Markov Chains in probability.

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Module 5: Linear Algebra

Lesson 1 : Introduction to Linear Equations

- Definitions and examples of linear equations.

Lesson 2 : Matrices and Matrix Algebra

- Matrix operations: addition, subtraction, multiplication.
- Understanding the concept of vectors and their applications.

Lesson 3 : Determinants and Inverses

- Calculation and properties of determinants.
- Finding and interpreting the inverse of a matrix.

Lesson 4 : Eigenvalues and Eigenvectors

- Definitions and significance in data science.
- Applications in Principal Component Analysis (PCA).

Lesson 5 : Distance Measures

- Euclidean Distance and Manhattan Distance.
- Applications in clustering and classification.

Module 6: Calculus

Lesson 1 : Basics of Differentiation

- Definition and rules of differentiation.
- Applications in optimization problems.

Lesson 2 : Partial Differentiation

- Introduction and significance in multivariable functions.

Lesson 3 : Maxima and Minima

- Finding critical points and applying the First and Second Derivative Tests.

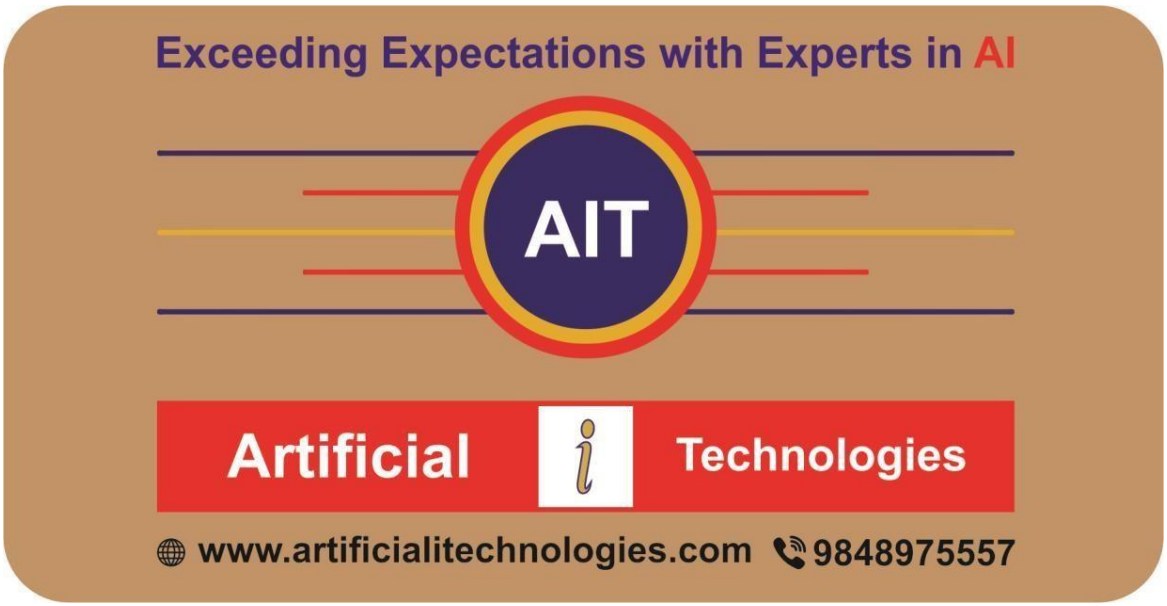
Lesson 4 : Indices and Logarithms

- Rules and applications in simplifying expressions.

CAPSTONE PROJECT

Project : Application of Mathematical Concepts

- Choose a dataset and apply concepts learned in the course (e.g., use of probability distributions, linear algebra in data transformations, optimization techniques in model training).
- Present findings and mathematical justifications for decisions made.



STATISTICS AND PROBABILITY: FUNDAMENTALS TO ADVANCED CONCEPTS

Module 1: Introduction to Statistics

Lesson 1 : What is Statistics?

- Importance and applications of statistics in various fields.

Lesson 2 : Population vs. Sample

- Definitions, differences, and significance in statistical analysis.
- Concepts of reference and sampling techniques.

Module 2: Types of Data

Lesson 1 : Qualitative (Categorical) Data

- Nominal and Ordinal data types.

Lesson 2 : Quantitative (Numerical) Data

- Discrete and Continuous data types.

Lesson 3 : Cross Sectional vs. Time Series Data

- Understanding the differences and applications.

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Module 3: Descriptive Statistics

Lesson 1 : Measures of Central Tendency

- Mean, Mode, and Median: definitions and calculations.

Lesson 2 : Measures of Dispersion

- Range, Variance, Standard Deviation, Interquartile Range (IQR), Mean Absolute Deviation (MAD).

Lesson 3 : Measures of Shape

- Skewness (positive, negative, zero) and Kurtosis (Leptokurtic, Mesokurtic, Platykurtic).

Module 4: Levels of Measurement

Lesson 1 : Measurement Scales

- Nominal, Ordinal, Interval, and Ratio scales.

Lesson 2 : Variables

- Types of variables: categorical (nominal, ordinal) and numerical (discrete, continuous).
- Dependent, Independent, Control, Moderating, and Mediating variables.

Module 5: Frequency Distribution

Lesson 1 : Constructing Frequency Distribution Tables

- Understanding nominal, ordinal, interval, and ratio data.
- Relative frequency and cumulative frequency.

Lesson 2 : Visualizing Data

- Histograms, Scatter Plots, and Box Plots.
- Identifying outliers and constructing plots.

Module 6: Correlation and Regression

Lesson 1 : Correlation Analysis

- Pearson and Spearman correlation methods.
- Understanding correlation coefficients.

Lesson 2 : Simple and Multiple Regression

- Overview of regression analysis and its applications.
- Regression error metrics: RMSE, MAE, R^2.

Module 7: Advanced Statistical Concepts

Lesson 1 : Percentiles, Quartiles, and IQR

- Understanding and calculating percentiles and quartiles.

Lesson 2 : Central Limit Theorem

- Importance and implications of the Central Limit Theorem.

Lesson 3 : Degrees of Freedom

- Understanding the concept and its applications.

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Module 8: Inferential Statistics

Lesson 1 : Hypothesis Testing

- Formulation of Null and Alternate Hypotheses.
- One-tailed vs. two-tailed tests.
- Understanding p-values and statistical significance.

Lesson 2 : Error Types

- Type I error (false positive) and Type II error (false negative).

Lesson 3 : Statistical Tests

- Overview and application of various tests:
  - Sample Test
  - ANOVA (Analysis of Variance)
  - Chi-Square Test
  - Z-Test and T-Test

Module 9: Probability Theory

Lesson 1 : Introduction to Probability

- Basic concepts and definitions in probability.
- Rules of probability: addition and multiplication rules.

Lesson 2 : Conditional Probability

- Understanding and calculating conditional probability.

Lesson 3 : Bayes' Theorem

- Application and significance of Bayes' theorem in statistics.

Module 10: Information Theory in Statistics

Lesson 1 : Entropy in Machine Learning

- Understanding entropy and its role in decision trees.

Lesson 2 : Information Gain

- Calculation and application of information gain.

Lesson 3 : Surprise in ML

- Understanding the concept of surprise and its applications in data analysis.

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Module 11: Loss Functions and Cost Functions

Lesson 1 : Overview of Loss Functions

- Mean Squared Error (MSE), Mean Absolute Error (MAE).

Lesson 2 : Advanced Loss Functions

- Huber Loss Function and Cross Entropy Loss Function.

Module 12: Practical Applications of Statistics

Lesson 1 : Statistical Software and Tools

- Introduction to R, Python, or statistical software for data analysis.

Lesson 2 : Real-world Applications

- Case studies illustrating the application of statistics in different domains.

Lesson 3 : Projects and Hands-on Practice

- Analyze datasets using learned statistical concepts and techniques.

CAPSTONE PROJECT

Project : Comprehensive Data Analysis

Select a dataset, perform EDA, apply inferential statistics, and present findings using visualizations and statistical analysis

MACHINE LEARNING ESSENTIALS: FROM BASICS TO MODEL DEPLOYMENT

Module 1: Introduction to Machine Learning

Lesson 1 : What is Machine Learning?

- Overview of machine learning and its importance in data science.
- Applications of machine learning across industries.

Lesson 2 : Types of Machine Learning

- **Supervised Learning:** classification, regression.
- **Unsupervised Learning:** clustering, dimensionality reduction.
- **Reinforcement Learning:** understanding agent, reward, and environment.

Lesson 3 : Essential Concepts in ML

- Classification and regression problems.
- Important elements: data, features, model, evaluation.
- The curse of dimensionality and its impact on model performance.

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Module 2: Exploratory Data Analysis (EDA)

Lesson 1 : Introduction to EDA

- The role of EDA in data science and machine learning.
- Techniques for understanding the dataset: univariate, bivariate, multivariate analysis.

Lesson 2 : Data Visualization

- Visualizing continuous variables: histograms, box plots.
- Visualizing discrete variables: bar plots, pie charts.
- Visualizing time-series variables: line plots.
- Correlation heatmaps for feature relationships.
- Data distribution plots for identifying skewness.

Module 3: Data Preprocessing and Wrangling

Lesson 1 : Data Cleaning and Preparation

- Handling missing values (mean/mode imputation, KNN, etc.).
- Dealing with outliers: z-score, IQR method.

Lesson 2 : Feature Engineering

- Adding new features based on domain knowledge.
- Feature transformations: log transformation, polynomial features, etc.

Lesson 3 : Feature Scaling and Normalization

- Scaling techniques: min-max scaling, standardization.
- Normalization and its impact on distance-based algorithms.

Lesson 4 : Encoding and Data Wrangling

- Encoding categorical variables: one-hot encoding, label encoding.
- Introduction to dummy variables.

Module 4: Feature Selection and Dimensionality Reduction

Lesson 1 : Feature Selection Techniques

- Filter methods: correlation matrix, chi-square test.
- Wrapper methods: recursive feature elimination (RFE).
- Embedded methods: regularization (Lasso, Ridge).

Lesson 2 : Dimensionality Reduction

- Introduction to Principal Component Analysis (PCA).
- Sparse PCA and Kernel PCA.
- Singular Value Decomposition (SVD).
- Non-negative matrix factorization (NMF).

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Module 5: Regression

Lesson 1 : Introduction to Regression

- Understanding regression as a supervised learning technique.
- Mathematical foundations of regression models.

Lesson 2 : Types of Regression

- Simple Linear Regression.
- Multiple Linear Regression.
- Polynomial Regression.
- Lasso and Ridge Regression.
- Elastic Net Regression.

Lesson 3 : Evaluation Metrics for Regression

- Mean Absolute Error (MAE).
- Mean Squared Error (MSE).
- Root Mean Squared Error (RMSE).
- R^2 and Adjusted R^2.

Module 6: Classification

Lesson 1 : Introduction to Classification Problems

- Overview of binary and multiclass classification.
- Bias-Variance tradeoff in classification models.

Lesson 2 : Common Classification Algorithms

- **K-Nearest Neighbors (KNN):** working with distance-based classification.
- **Logistic Regression:** mathematical background, optimization techniques, and stochastic gradient descent.
- **Support Vector Machines (SVM):** linear SVM, kernel-based SVM (RBF, polynomial, sigmoid).
- **Naive Bayes:** Bayes theorem, types of Naive Bayes (Bernoulli, Multinomial, Gaussian).
- **Decision Trees:** CART algorithm, impurity measures (Gini, cross-entropy), feature importance.
- **Random Forest and Ensemble Learning:** bagging, boosting (AdaBoost, Gradient Boost, XGBoost).

Lesson 3: Model Evaluation Metrics for Classification

- Confusion matrix, accuracy, F1-score, precision, and recall.
- Sensitivity, specificity, true positive rate (TPR), false positive rate (FPR).
- ROC curve and AUC (Area Under Curve).

Lesson 4 : Handling Imbalanced Datasets

- Techniques for dealing with imbalanced classes (oversampling, undersampling, SMOTE).

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Module 7: Clustering and Unsupervised Learning

Lesson 1 : Introduction to Clustering

- Overview of unsupervised learning.
- Applications of clustering in business.

Lesson 2 : K-Means Clustering

- Finding the optimal number of clusters: elbow method.
- Cluster stability and optimizing inertia.

Lesson 3 : Hierarchical Clustering

- Agglomerative clustering and dendrograms.
- DBSCAN clustering for non-spherical clusters.

Lesson 4 : Association Rules and Market Basket Analysis

- Apriori algorithm for association rule learning.
- Implementing recommendation engines using collaborative filtering.

Module 8: Time Series Forecasting

Lesson 1 : Introduction to Time Series Data

- Components of time series: trend, seasonality, noise.
- Understanding stationary vs. non-stationary time series.

Lesson 2 : Time Series Models

- AR (Autoregressive model).
- ARMA, ARIMA (Autoregressive Integrated Moving Average).
- SARIMA, SARIMAX (Seasonal ARIMA).

Lesson 3 : Model Validation and Selection

- ACF and PACF for time series model diagnosis.
- Cross-validation techniques for time series.

Module 9: Model Selection and Hyperparameter Tuning

Lesson 1 : Cross-Validation

- Understanding cross-validation (k-fold, stratified cross-validation).
- Overfitting and underfitting.
- Bias-variance tradeoff in model selection.

Lesson 2 : Hyperparameter Tuning

- GridSearchCV and Randomized Search CV for hyperparameter optimization.
- Practical example using Scikit-learn.

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Module 10: Model Deployment and Pipelines

Lesson 1 : Introduction to ML Pipelines

- Building and automating end-to-end machine learning pipelines.
- Integrating feature engineering, model training, and evaluation.

Lesson 2 : Joblib and Model Serialization

- Saving and loading machine learning models using Joblib.
- Model persistence for production-ready models.

Lesson 3 : Model Deployment in Flask

- Building a web application to deploy ML models using Flask.
- Implementing REST APIs to serve predictions.

CAPSTONE PROJECTS

Project 1 : Classification Problem: Predicting Customer Churn

- Build, train, and evaluate a classification model to predict customer churn.
- Handle imbalanced datasets and perform feature engineering.

Project 2 : Regression Problem: House Price Prediction

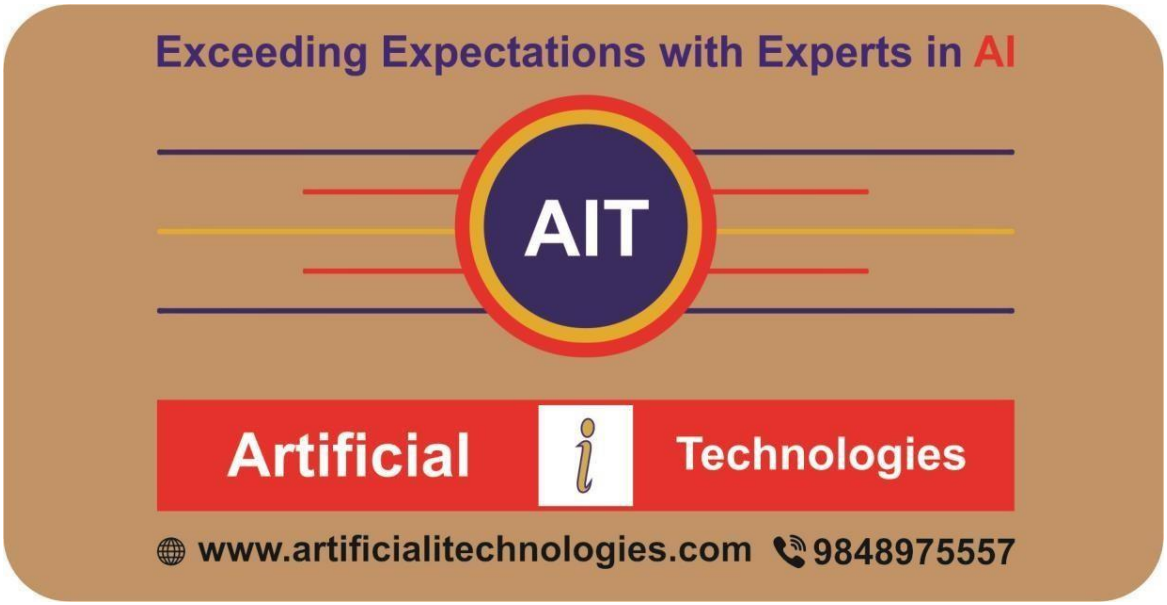
- Apply regression algorithms to predict house prices based on various features.
- Implement feature scaling, normalization, and model evaluation.

Project 3 : Time Series Forecasting: Stock Price Prediction

- Use ARIMA/SARIMA models to forecast future stock prices.
- Evaluate the model's performance on time series data.

Project 4 : Model Deployment: Flask Web App for Predicting Loan Approval

- Create a Flask web application that takes user input and predicts loan approval using an ML model.



DEEP LEARNING MASTERY: FROM BASICS TO ADVANCED TECHNIQUES

Module 1: Introduction to Deep Learning and Neural Networks

Lesson 1 : Introduction to Deep Learning

- Overview of machine learning and deep learning.
- The evolution of deep learning and its importance in AI.
- Applications of deep learning in various industries.

Lesson 2 : Neural Networks: The Foundation

- Biological neurons vs. artificial neurons.
- Introduction to perceptrons: structure and basic learning rule.
- Limitations of the perceptron and introduction to Multilayer Perceptron (MLP).
- MLP architecture: hidden layers, output layers, and loss functions.

Lesson 3 : Activation Functions and Their Importance

- Introduction to activation functions (ReLU, Sigmoid, Tanh).
- Why activation functions are crucial in deep learning.
- Choosing the right activation function for your neural network.

Module 2: Training Neural Networks

Lesson 1 : Backpropagation and Gradient Descent

- Understanding forward and backward propagation.
- Introduction to cost functions and how they are minimized.
- Gradient Descent: the optimization process.
- Vanishing and exploding gradient problems.

Lesson 2 : Regularization Techniques

- Introduction to regularization (L1, L2, dropout) to prevent overfitting.
- Batch normalization: improving model stability.

Lesson 3 : Optimizers and Learning Rate Schedulers

- Overview of optimizers: SGD, Adam, RMSprop, etc.
- Understanding learning rate and its role in convergence.
- Hyperparameter tuning: fine-tuning optimizers and regularization.

Lesson 4 : Introduction to PyTorch

- Why PyTorch? Overview of its features and advantages.
- Setting up PyTorch and creating your first neural network.
- Practical example: building and training a simple model with PyTorch.

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Module 3: Deep Learning with TensorFlow

Lesson 1 : Introduction to TensorFlow

- What is TensorFlow? Advantages of using TensorFlow for deep learning.
- Installation and setup of TensorFlow.
- Basic TensorFlow syntax.

Lesson 2 : TensorFlow Computational Graphs

- Understanding graphs in TensorFlow: how they work.
- Variables and placeholders in TensorFlow.
- Practical: creating a simple computation graph.

Lesson 3 : Building Neural Networks with TensorFlow and Keras

- Introduction to Keras API: a high-level API for TensorFlow.
- Building and training neural networks with Keras.
- Practical example: constructing an MLP using TensorFlow/Keras.

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Module 4: Artificial Neural Networks (ANNs)

Lesson 1 : ANN Architecture

- Overview of ANN architecture and its components.
- Forward propagation and backward propagation.
- Epoch, batch size, and learning rate.

Lesson 2 : Training and Fine-Tuning ANNs

- Dealing with vanishing gradients during training.
- Tuning hyperparameters: number of layers, neurons, learning rate.
- Choosing the right activation function for different layers.
- Practical exercise: building and tuning an ANN for a classification problem.

Module 5: Recurrent Neural Networks (RNNs)

Lesson 1 : Introduction to RNNs

- What is an RNN? Understanding its architecture and applications.
- RNN vs. ANN: when to use which.
- Backpropagation through time (BPTT) and the challenges.

Lesson 2 : Long Short-Term Memory (LSTM) and GRU

- Introduction to LSTMs and their importance in sequence modeling.
- GRUs: a simplified alternative to LSTMs.
- Implementing LSTM and GRU in PyTorch and TensorFlow.
- Practical exercise: time-series prediction using LSTM.

Lesson 3 : Advanced RNN Architectures

- Bidirectional RNNs: improving performance on sequential tasks.
- Sequence-to-sequence models (Encoder-Decoder architecture).
- Practical exercise: building a sequence-to-sequence model for machine translation.

Module 6: Convolutional Neural Networks (CNNs)

Lesson 1 : Introduction to CNNs and Image Processing

- Basics of image processing: filters, edges, and image histograms.
- Introduction to CNNs: convolution layers, pooling, and fully connected layers.
- Understanding the ImageNet dataset and image classification tasks.

Lesson 2 : Deep Dive into CNN Architectures

- Exploring popular CNN architectures: AlexNet, VGG, ResNet, etc.
- How to design and implement your own CNN from scratch.
- Practical exercise: image classification using a custom CNN.

Lesson 3 : Transfer Learning and Pre-Trained Models

- What is transfer learning and when to use it?
- Using pre-trained models for image classification.
- Practical exercise: leveraging a pre-trained ResNet for image classification.

Module 7: Transformers and BERT for NLP

Lesson 1 : Introduction to Transformers

- What are transformers? Overview of the transformer architecture.
- Self-attention mechanism and its importance.
- Practical application of transformers in NLP tasks.

Lesson 2 : BERT (Bidirectional Encoder Representations from Transformers)

- Understanding BERT architecture and how it improves NLP tasks.
- Pre-training and fine-tuning BERT for specific NLP tasks.
- Practical exercise: text classification using BERT.

Lesson 3 : Advanced NLP with Generative AI (ChatGPT)

- Introduction to generative models (GPT, GPT-3, ChatGPT).
- Understanding the generative process for text generation.
- Practical exercise: building a simple text generation model.

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Module 8: Reinforcement Learning

Lesson 1 : Introduction to Reinforcement Learning

- Overview of reinforcement learning concepts (agent, environment, reward).
- Q-learning and policy gradients.

Lesson 2 : RL in Computer Vision

- Applying reinforcement learning techniques in image-based tasks.
- Using OpenAI Gym and PyTorch to build reinforcement learning models.
- Practical exercise: training a deep reinforcement learning agent.

Module 9: Deep Learning Applications in Computer Vision

Lesson 1 : Advanced Image Classification

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- Implementing complex CNN architectures for image classification.
- Fine-tuning CNNs for small datasets.
- Practical exercise: image classification using data augmentation techniques.

Lesson 2 : Object Detection and YOLO

- Introduction to object detection: YOLO (You Only Look Once) algorithm.
- Installing and setting up YOLO for object detection tasks.
- Practical exercise: real-time object detection with YOLOv3.

Lesson 3 : Transfer Learning and Pre-trained Models

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- Transfer learning for image classification using VGG, ResNet, Inception, etc.
- Fine-tuning pre-trained models for specific tasks.
- Practical exercise: transfer learning using TensorFlow and Keras.

Module 10: Capstone Projects

Capstone 1 : Image Classification with CNNs

- Build a CNN for image classification using TensorFlow.
- Fine-tune the CNN using hyperparameter tuning.
- Evaluate model performance on a custom dataset.

Capstone 2 : Text Generation with RNNs

- Create a text generation model using LSTM and RNN.
- Train the model on a large text corpus.
- Generate text based on input prompts.

Capstone 3 : Object Detection with YOLO

- Build a real-time object detection system using YOLOv3.
- Implement the system with live video feed from a webcam.
- Deploy the model on edge devices (Raspberry Pi or Jetson Nano).