PART: 1

TRADITIONAL

AI

Foundations Of AI

Build a solid conceptual foundation before jumping into ML, Deep Learning, or GenAI.

- Introduction To AI
- Types of AI
- Subfields of AI
- Traditional vs GenAI
- How AI works ?
- Ethics and Limitations of AI
- Foundational Tools & Language Required

Module 2. Maths and Stats

Maths and Stats For AI

Develop the mathematical thinking required to understand and work with ML models, without being overwhelmed by formal proofs.

1.Linear Algebra For AI
- Vectors
- Matrices
- Dot Product
- Matrix Multiplication

3.Calculus For AI
- What is a Derivative?
- Gradient & Gradient Descent (Graphical)
- Loss Functions (Simple Intuition)
Mean Squared Error, Cross Entropy

2.Probability & Stats For AI
- Mean, Median, Mode (Central Tendency)
- Variance & Standard Deviation (Spread of data)
- Distributions (Normal, Uniform, etc.)
- Conditional Probability
- Bayes Theorem
- **Expectation & Entropy**
  Why randomness matters in AI decisions

Machine Learning

Build strong fundamentals in traditional ML — understand the algorithms, concepts, and real-world use cases.

1.What is Machine Learning?

- Definition of ML vs Traditional programming.
- Types of ML:
- Supervised Learning (with labeled data)
- Unsupervised Learning (no labels)
- Reinforcement Learning (reward based learning)

2.ML Pipeline Overview

– Data Collection
– Data Preprocessing
– Model Building
– Model Evaluation
– Model Deployment

3.Supervised Learning Algorithms

– Linear Regression
– K-Nearest Neighbors (KNN)
– Decision Trees
– Naive Bayes

4.Model Evaluation

- Train/Test Split
- Accuracy (correct predictions)
- Precision (true positives / predicted positives)
- Recall (true positives / actual positives)
- F1 Score (harmonic mean of precision & recall)

5.Bias-Variance Tradeoff

- Overfitting (memorizing noise)
- Underfitting (too simple model)
- Regularization (L1/L2)

6.Unsupervised Learning Basics

– K-Means Clustering (group similar data)
– Dimensionality Reduction (PCA, t-SNE)

7.Basic Math Intuition

– Distance Metrics: Euclidean, Manhattan
– Probability for Naive Bayes
– Entropy for Decision Trees

Deep Learning Foundation

Build strong intuition and hands-on skill with neural networks — the core of modern AI.

- What is a Neural Network?
- The Perceptron (Building Block of NN)
- Activation Functions
- Forward Pass and Backpropagation (Intuition)
- Framework Familiarity (PyTorch or TensorFlow)
- Underfitting, Overfitting, and Regularization

Natural Language Processing & Language Models

Understand how machines work with language and prepare the foundation for GenAI and Transformers.

– What is NLP?
– Text Preprocessing Basics
– Vectorizing Text
– Word Embeddings — Vector Representations
– Core NLP Tasks (Classical Approach)
– Language Modeling Basics
– Tools for Modern NLP
– NLP Evaluation Metrics
– Bonus (Bridge to Transformers/LLMs)