Artificial Intelligence

1. Introduction to Artificial Intelligence

- What is AI, history, and evolution
- AI goals and major applications
- Types of AI: narrow, general, and superintelligence
- Overview of intelligent agents and problem-solving

2. Mathematical Foundations for AI

- Linear algebra basics: vectors, matrices
- Calculus essentials for optimization
- Probability & statistics for uncertainty
- Mathematical logic and reasoning

3. Programming for AI (Python & Libraries)

- Python syntax and data types
- Key AI libraries: NumPy, Pandas, Matplotlib
- Working with Jupyter Notebook and Google Colab
- Basics of Scikit-learn for model building

4. Data Preprocessing & Feature Engineering

- Data cleaning: missing values, outliers
- Feature scaling and transformation
- Encoding categorical variables
- Handling imbalanced datasets

5. Machine Learning Fundamentals

- Overview of ML and its role in AI

- **Types: supervised, unsupervised, reinforcement learning**
- **Model training basics and evaluation metrics**

---

6. Supervised Learning Techniques

- **Regression algorithms: linear, logistic**
- **Classification: SVMs, decision trees, KNN**
- **Model validation and performance metrics**

---

7. Unsupervised & Reinforcement Learning

- **Clustering: k-means, hierarchical**
- **Dimensionality reduction: PCA**
- **Reinforcement learning basics and applications**

---

8. Deep Learning & Neural Networks

- **Perceptrons and multilayer networks**
- **Convolutional Neural Networks (CNNs)**
- **Recurrent Neural Networks (RNNs)**
- **Activation functions and optimization**

---

9. Natural Language Processing (NLP)

- **Text preprocessing: tokenization, stemming**
- **Language models and embeddings**
- **Sentiment analysis and sequence modeling**

---

10. Computer Vision

- **Image processing fundamentals**
- **Object detection and image classification**

- **CNN applications in vision**

---

11. AI Ethics, Bias & Responsible AI

- **Ethical considerations in AI design**
- **Bias, fairness, and transparency**
- **Privacy, accountability, and governance**

---

12. AI Tools, Frameworks & Platforms

- **TensorFlow, PyTorch basics**
- **Model training tools and libraries**
- **Cloud services for AI: AWS, Azure, GCP**

---

13. Applications of AI in Industry

- **Healthcare, finance, retail, agriculture**
- **Autonomous systems and robotics**
- **AI in real-time decision systems**

---

14. AI Capstone Project & Deployment

- **End-to-end AI project development**
- **Data collection, modeling, evaluation**
- **Model deployment (Flask/Docker/Cloud)**
- **Presentation and industry report**