AI & Machine Learning Roadmap

This roadmap provides a structured path to learn Artificial Intelligence and Machine Learning from beginner to advanced level. It includes essential concepts, tools, and libraries that are widely used in the field.

1. Prerequisites

- Basic Python Programming
- Mathematics (Linear Algebra, Calculus, Probability, Statistics)
- Understanding of Algorithms and Data Structures

2. Python Libraries to Learn

- NumPy – Numerical computing
- Pandas – Data manipulation
- Matplotlib / Seaborn – Data visualization
- Scikit-learn – ML algorithms and preprocessing
- TensorFlow / PyTorch – Deep Learning
- NLTK / spaCy – Natural Language Processing
- OpenCV – Computer Vision

3. Core Machine Learning Concepts

- Supervised Learning (Regression, Classification)
- Unsupervised Learning (Clustering, Dimensionality Reduction)
- Model Evaluation and Validation (Confusion Matrix, ROC-AUC, Cross-Validation)
- Feature Engineering and Selection
- Hyperparameter Tuning (Grid Search, Random Search)

4. Deep Learning

- Neural Networks and Backpropagation
- Convolutional Neural Networks (CNNs)
- Recurrent Neural Networks (RNNs), LSTMs
- Transfer Learning
- Generative Adversarial Networks (GANs)

5. Natural Language Processing (NLP)

- Text Preprocessing (Tokenization, Lemmatization)

- Bag of Words, TF-IDF
- Word Embeddings (Word2Vec, GloVe)
- Transformers (BERT, GPT)

6. Tools and Platforms

- Jupyter Notebook / Google Colab
- Git & GitHub for version control
- Docker (optional, for deployment)
- MLflow / Weights & Biases – Experiment tracking

7. Projects and Practice

- Kaggle Competitions
- Build Projects: Chatbots, Recommender Systems, Image Classifiers
- Portfolio on GitHub

8. Bonus Topics

- Reinforcement Learning
- AI Ethics and Fairness
- Deployment (Flask, FastAPI, Streamlit, ONNX)