AI/ML Learning Roadmap

■ Phase 1: Foundations (1–2 months)

- Programming (Python-focused): basics, libraries (numpy, pandas, matplotlib), Git/GitHub
- Mathematics: Linear Algebra, Calculus, Probability & Statistics
- Resources: Mathematics for Machine Learning, Khan Academy, Python tutorials

■ Phase 2: Core Machine Learning (2–3 months)

- ML Basics: Regression, Classification, Clustering
- Model Training: Cost functions, gradient descent, overfitting/underfitting, cross-validation
- Hands-on: scikit-learn projects (house price prediction, spam detection, customer segmentation)
- Resources: Hands-On Machine Learning (Aurélien Géron), Kaggle

■ Phase 3: Deep Learning (2–3 months)

- Neural Networks: Perceptron, activation functions, backpropagation, loss functions
- Architectures: CNN, RNN/LSTM, Transformers
- Frameworks: TensorFlow/Keras or PyTorch
- Resources: Andrew Ng Deep Learning Specialization, Fast.ai

■ Phase 4: Advanced Topics (3–4 months)

- NLP: embeddings, transformers (BERT, GPT), HuggingFace
- Computer Vision: Object detection (YOLO, R-CNN), GANs, diffusion models
- Reinforcement Learning: Q-learning, DQN, OpenAI Gym
- MLOps & Deployment: FastAPI, Flask, Streamlit, Docker, Cloud (AWS/GCP/Azure)

■ Phase 5: Specialization & Projects

- Career paths: AI Engineer, ML Engineer, Data Scientist, Researcher
- Projects: Chatbot, Image classifier, Recommendation system, Stock price predictor

■■ Tools to Learn Along the Way

- ML Stack: numpy, pandas, scikit-learn, matplotlib, seaborn
- Deep Learning: TensorFlow, PyTorch, Keras
- Data: SQL, BigQuery, Spark
- Deployment: FastAPI, Docker, GitHub Actions, Cloud platforms

■ Suggested Timeline

- Foundations → 2 months
- Core ML → 3 months
- Deep Learning → 3 months
- Advanced Topics → 4 months

- Specialization → Continuous
- Total: ~12 months to skilled AI/ML engineer