AI/ML Learning Plan

Phase 1 – Core Foundations (2–4 weeks)

Goal: Build the base to understand AI and code.

1. **Python Programming**
    - Syntax, loops, functions, OOP basics.
    - Libraries: NumPy, Pandas, Matplotlib, Seaborn.
2. **Math for AI**
    - Linear Algebra: vectors, matrices, dot product.
    - Probability & Statistics: distributions, mean, variance, Bayes theorem.
    - Calculus basics: derivatives, gradients.

Resource: https://www.udemy.com/course/complete-machine-learning-and-data-science-zero-to-mastery

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Phase 2 – Machine Learning Basics (4–6 weeks)

Goal: Understand how machines learn from data.

1. **Supervised Learning**
    - Regression: Linear, Logistic.
    - Classification: k-NN, Decision Trees, Random Forest, SVM.
2. **Unsupervised Learning**
    - Clustering: K-means, DBSCAN.
    - Dimensionality Reduction: PCA, t-SNE.
3. **Model Evaluation**
    - Accuracy, precision, recall, F1, ROC-AUC.
    - Overfitting, bias-variance trade-off.
4. **Hands-on Practice**
    - Titanic dataset classification.
    - Iris dataset classification.

- Predict house prices with regression.

Resource: https://www.udemy.com/course/machinelearning

Phase 3 – Deep Learning & Neural Networks (6–8 weeks)

Goal: Learn how to build & train neural networks.

1. **Deep Learning Basics**
   - Perceptron, activation functions, backpropagation.
   - Loss functions: cross-entropy, MSE.
2. **Neural Network Architectures**
   - Encoding and Embading (beg of word)
   - CNN (Convolutional Neural Networks) → image tasks.
   - RNN/LSTM → sequence tasks. **IMP**
   - Transformers → language tasks.
3. **Frameworks**
   - PyTorch (primary), TensorFlow (secondary).
4. Langchain, Langraph and Opik
5. **Projects**
   - Image classification (MNIST, CIFAR-10).
   - Text sentiment analysis.
   - Simple chatbot.

Resource: https://www.udemy.com/course/the-ai-engineer-course-complete-ai-engineer-bootcamp

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Phase 4 – Generative AI & LLMs (4–6 weeks)

Goal: Build modern AI apps like ChatGPT, Midjourney.

1. **Large Language Models (LLMs)**
   - How they work (transformers, attention).
   - Using OpenAI API, Hugging Face models (transformer API).
2. **Prompt Engineering**
   - Zero-shot, few-shot, chain-of-thought prompting.

- Role-based prompting for better results.

3. **Retrieval-Augmented Generation (RAG)**
   - Vector databases: Pinecone, Weaviate, FAISS.
   - Document embedding & semantic search.
4. **Generative Models**
   - Image: Stable Diffusion.
   - Text-to-audio: ElevenLabs, OpenAI TTS.
5. **Projects**
   - Build your own ChatGPT over custom data.
   - AI Q&A bot with LangChain.
   - Image captioning AI.
   - Fine tuning peft and lora
   - Unsloth
   - Streamlit

Resources: https://www.udemy.com/course/artificial-intelligence-az

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Phase 5 – AI Engineering & Deployment (3–4 weeks)

Goal: Put AI models into real-world applications.

1. **MLOps**
   - Model versioning: MLflow, DVC.
   - Deployment: Docker, FastAPI, Flask.
   - Scaling: Kubernetes basics.
1. **Real-time AI**
   - Streaming data processing.
   - Deploying AI to cloud (AWS Sagemaker, Vertex AI).
1. **Projects**
   - AI microservice API.
   - AI-powered web app (React + FastAPI backend).

Phase 6 – Specialization & Real Projects (Ongoing)

Goal: Go deeper into what interests you most.

- **Computer Vision** → object detection, image segmentation.
- **Natural Language Processing** → chatbots, summarizers.
- **Generative AI** → fine-tuning LLMs, AI content generation.
- **Reinforcement Learning** → game-playing AI.