AI/ML RoadMap

Phase 1: Foundation Building (Weeks 1-4)

Goal: Acquire essential programming, mathematics, and data handling skills.

1. Python Programming (2 Weeks)

- **Topics to Cover**:
  - Python basics: Variables, loops, conditional statements, functions.
  - Data structures: Lists, dictionaries, sets, tuples.
  - OOP: Classes, objects, inheritance, polymorphism.
  - Libraries: NumPy, Pandas, Matplotlib, Seaborn.
- **Practice**:
  - Implement basic scripts and explore datasets (e.g., Titanic dataset).
  - Solve 3-5 problems daily on platforms like HackerRank or LeetCode.
- **Time**: 2 hours daily.
- **Resources**: "Automate the Boring Stuff with Python" + YouTube tutorials.

2. Version Control with Git (1 Week)

- **Topics to Cover**:
  - Basic commands: init, add, commit, push, pull.
  - Collaboration: Branching, merging, pull requests.
- **Practice**:
  - Create and manage repositories on GitHub.
  - Contribute to open-source projects or practice with dummy projects.
- **Time**: 1 hour daily.
- **Resources**: GitHub Learning Lab.

3. Mathematics for ML (2 Weeks)

- **Topics to Cover**:

    - Linear algebra: Matrices, eigenvalues, vector spaces.
    - Calculus: Derivatives, gradients, chain rule.
    - Probability: Distributions, Bayes' theorem, variance.
    - Statistics: Mean, median, standard deviation, hypothesis testing.
- **Practice**:
    - Work through problems from Khan Academy or Brilliant.
    - Apply concepts using Python libraries like NumPy.
- **Time**: 2 hours daily.
- **Resources**: "Mathematics for Machine Learning" (Coursera).

Phase 2: Data Handling & ML Basics (Weeks 5-10)

Goal: Learn to manipulate data and master foundational ML algorithms.

1. Data Handling (2 Weeks)

- **Topics to Cover**:
    - Data cleaning: Missing values, duplicates, outliers.
    - Transformation: Encoding categorical variables, feature scaling.
    - Exploratory Data Analysis (EDA): Visualization with Matplotlib, Seaborn.
- **Practice**:
    - Perform EDA on datasets (e.g., Kaggle's Titanic or Iris dataset).
- **Time**: 2-3 hours daily.
- **Resources**: "Pandas Cookbook" + Kaggle notebooks.

2. Machine Learning Fundamentals (4 Weeks)

- **Topics to Cover**:
    - Supervised Learning: Linear regression, logistic regression, decision trees, k-NN.
    - Model evaluation: Cross-validation, precision, recall, F1 score.
    - Unsupervised Learning: K-means clustering, PCA.
    - Overfitting and underfitting, bias-variance tradeoff.

- **Practice**:
  - Build models using scikit-learn (e.g., house price prediction, clustering customer data).
  - Explore Kaggle's "Titanic" and "Boston Housing" datasets.
- **Time**: 3-4 hours daily.
- **Resources**: "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.

Phase 3: Deep Learning Foundations (Weeks 11-16)

Goal: Build and deploy neural networks for complex problems.

1. Neural Networks with TensorFlow (4 Weeks)

- **Topics to Cover**:
  - Basics: Perceptrons, activation functions, backpropagation.
  - CNNs: Convolutional layers, pooling, image classification.
  - RNNs: LSTMs, GRUs for sequence modeling.
- **Practice**:
  - Build a CNN for CIFAR-10 and an LSTM for text generation.
  - Fine-tune models using hyperparameter optimization.
- **Time**: 4-5 hours daily.
- **Resources**: TensorFlow tutorials + Deep Learning Specialization (Coursera).

2. Natural Language Processing (2 Weeks)

- **Topics to Cover**:
  - Basics: Tokenization, TF-IDF, embeddings (word2vec).
  - Advanced: Transformers (BERT, GPT).
- **Practice**:
  - Fine-tune a BERT model using Hugging Face for sentiment analysis.
- **Time**: 3 hours daily.

- **Resources**: Hugging Face Transformers course.

Phase 4: Advanced Topics and Deployment (Weeks 17-24)

Goal: Master advanced ML concepts and deploy a full-stack ML project.

1. Advanced ML Concepts (4 Weeks)

- **Topics to Cover**:
  - Ensemble methods: Random Forests, Gradient Boosting.
  - Reinforcement learning: Q-learning, deep Q-networks.
- **Practice**:
  - Train and compare ensemble models on real-world datasets.
  - Build a Q-learning agent in OpenAI Gym.
- **Time**: 3 hours daily.
- **Resources**: "Reinforcement Learning: An Introduction" by Sutton & Barto.

2. Model Deployment and MLOps (4 Weeks)

- **Topics to Cover**:
  - Deployment: Flask/Streamlit for APIs, Docker for containerization.
  - MLOps: CI/CD pipelines, monitoring, retraining workflows.
- **Practice**:
  - Deploy a recommendation system using Flask.
  - Integrate with a frontend using React/Next.js.
- **Time**: 3 hours daily.
- **Resources**: "Building Machine Learning Pipelines" by Hannes Hapke.

Final Phase: Job Readiness (Weeks 25-26)

Goal: Prepare for interviews and build a strong portfolio.

1. Portfolio Projects

- Sentiment analysis with NLP (e.g., movie reviews).

- Image classification with CNNs (e.g., CIFAR-10).
- Reinforcement learning agent for a simple game (e.g., CartPole).

2. Interview Preparation

- Solve coding problems on LeetCode (medium-hard level).
- Practice explaining ML projects in mock interviews.

3. Networking

- Publish projects on GitHub and Kaggle.
- Attend AI/ML meetups and hackathons.

Summary Timeline

Phase	Duration (Weeks)	Daily Hours
Foundations	4	2-3
Data Handling & ML Basics	6	3-4
Deep Learning Foundations	6	4-5
Advanced Topics & Deployment	8	3-4
Job Readiness	2	3-4

This roadmap, paired with discipline and consistent practice, will equip you with the skills needed to excel as an AI/ML engineer in 2025.