AI & Machine Learning Roadmap (7 Months)

Duration: 7 Months (8-10h/week)

Based on the 'AI-ML-Roadmap-from-scratch' Curriculum

Month 1: Fundamentals of AI/ML & Math

Weeks 1-4

Week 1: Overview & Environment

Day 1: AI Landscape Overview

Theory & Resources:
Watch 'AI Machine Learning Roadmap' video. Understand AI vs ML vs DL.

Practice:
Create a GitHub repo 'AI-Learning-Journey'.

Estimated Time: 2h | Completed: [ ]

Day 2: Python for ML Refresher (NumPy)

Theory & Resources:
Review NumPy arrays, broadcasting.

Practice:
Notebook: Matrix operations without loops.

Estimated Time: 2h | Completed: [ ]

Day 3: Python for ML Refresher (Pandas)

Theory & Resources:
DataFrames, indexing, cleaning.

Practice:
Notebook: Load and clean a dataset (e.g. Titanic).

Estimated Time: 2h | Completed: [ ]

Day 4: Visualization (Matplotlib/Seaborn)

Theory & Resources:
Plotting fundamentals.

Practice:
Visualize distributions of the Titanic dataset.

Estimated Time: 2h | Completed: [ ]

Week 2: Math: Linear Algebra

Day 1: Vectors & Spaces

Theory & Resources:
3Blue1Brown: Linear Algebra (Essence).

Practice:
N/A (Conceptual)

Estimated Time: 2h | Completed: [ ]

Day 2: Matrices & Operations

Theory & Resources:
Matrix multiplication, Transpose, Inverse.

Practice:
Implement Matrix Mult from scratch in Python.

Estimated Time: 2h | Completed: [ ]

Day 3: Eigenvectors & Eigenvalues

Theory & Resources:
Concept of transformation and axes.

Practice:
Calculate components using NumPy.

Estimated Time: 2h | Completed: [ ]

Week 3: Math: Calculus

Day 1: Derivatives & Rates of Change

Theory & Resources:
3Blue1Brown: Calculus (Essence).

Practice:
Calculate gradients of simple functions.

Estimated Time: 2h | Completed: [ ]

Day 2: Chain Rule

Theory & Resources:
Understanding composite functions.

Practice:
Manual exercises.

Estimated Time: 2h | Completed: [ ]

Day 3: Gradient Descent Intuition

Theory & Resources:
The ball down the hill analogy.

Practice:
Implement GD for y=x^2.

Estimated Time: 2h | Completed: [ ]

Week 4: Math: Probability & Statistics

Day 1: Distributions (Normal, Binomial)

Theory & Resources:
StatQuest: Distributions.

Practice:
Plot distributions in Python.

Estimated Time: 2h | Completed: [ ]

Day 2: Bayes Theorem

Theory & Resources:
Conditional Probability.

Practice:
Solve 2-3 Bayes inference problems.

Estimated Time: 2h | Completed: [ ]

Day 3: Module 1 Review

Theory & Resources:
Review Math concepts.

Practice:
Quiz yourself or explain concepts to a peer.

Estimated Time: 2h | Completed: [ ]

Month 2: Classical Machine Learning

Weeks 5-8

Week 5: Supervised Learning: Regression

Day 1: Linear Regression Concept

Theory & Resources:
Andrew Ng: Linear Regression.

Practice:
Implement Simple LR using Scikit-Learn.

Estimated Time: 2h | Completed: [ ]

Day 2: Cost Functions & Gradient Descent

Theory & Resources:
MSE, Learning Rate.

Practice:
Visualize Cost Function landscape.

Estimated Time: 2h | Completed: [ ]

Day 3: Multivariate Regression

Theory & Resources:
Multiple features.

Practice:
Predict Housing Prices (Kaggle).

Estimated Time: 2h | Completed: [ ]

Week 6: Supervised Learning: Classification

Day 1: Logistic Regression

Theory & Resources:
Sigmoid function, decision boundary.

Practice:
Classify Iris dataset (Binary).

Estimated Time: 2h | Completed: [ ]

Day 2: Metrics (Precision, Recall, F1)

Theory & Resources:
Confusion Matrix.

Practice:
Calculate metrics for your Iris model.

Estimated Time: 2h | Completed: [ ]

Day 3: KNN & SVM

Theory & Resources:
Distance metrics, Margins.

Practice:
Compare KNN vs LogReg on a dataset.

Estimated Time: 2h | Completed: [ ]

Week 7: Trees & Ensembles

Day 1: Decision Trees

Theory & Resources:
Entropy, Gini Impurity.

Practice:
Visualize a Decision Tree.

Estimated Time: 2h | Completed: [ ]

Day 2: Random Forests

Theory & Resources:
Bagging, Bootstrapping.

Practice:
Train RF on Breast Cancer dataset.

Estimated Time: 2h | Completed: [ ]

Day 3: Project: Predict Customer Churn

Theory & Resources:
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Practice:
End-to-end classification project.

Estimated Time: 3h | Completed: [ ]

Week 8: Unsupervised Learning

Day 1: Clustering (K-Means)

Theory & Resources:
Elbow method.

Practice:
Cluster Mall Customers.

Estimated Time: 2h | Completed: [ ]

Day 2: Dimensionality Reduction (PCA)

Theory & Resources:
Variance preservation.

Practice:
Apply PCA to MNIST data.

Estimated Time: 2h | Completed: [ ]

Day 3: Month 2 Capstone

Theory & Resources:
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Practice:
Full ML Pipeline on a new dataset.

Estimated Time: 3h | Completed: [ ]

Month 3: Deep Learning Basics

Weeks 9-12

Week 9: Neural Networks Foundations

Day 1: Perceptrons & Architecture

Theory & Resources:
Neural Network structure.

Practice:
Build a single perceptron.

Estimated Time: 2h | Completed: [ ]

Day 2: Activation Functions

Theory & Resources:
ReLU, Sigmoid, Tanh.

Practice:
Plot them, understand vanishing gradients.

Estimated Time: 2h | Completed: [ ]

Day 3: Forward Pass & Backprop

Theory & Resources:
The flow of data and errors.

Practice:
Conceptual tracing on paper.

Estimated Time: 2h | Completed: [ ]

Week 10: Deep Learning Frameworks

Day 1: Intro to PyTorch/TensorFlow

Theory & Resources:
Tensors, Autograd.

Practice:
Basic tensor manipulations.

Estimated Time: 2h | Completed: [ ]

Day 2: Building a NN in Code

Theory & Resources:
Sequential models.

Practice:
Build MLP for MNIST.

Estimated Time: 2h | Completed: [ ]

Day 3: Training Loops

Theory & Resources:
Epochs, Batches, Loss.

Practice:
Train your MNIST model.

Estimated Time: 2h | Completed: [ ]

Week 11: Tuning Deep Nets

Day 1: Regularization (Dropout, L2)

Theory & Resources:
Preventing overfitting.

Practice:
Add Dropout to your model.

Estimated Time: 2h | Completed: [ ]

Day 2: Optimizers (Adam, SGD)

Theory & Resources:
Momentum, Adaptive learning rates.

Practice:
Compare Adam vs SGD.

Estimated Time: 2h | Completed: [ ]

Day 3: Hyperparameter Tuning

Theory & Resources:
Learning Rate, Batch Size.

Practice:
Experiment with LR scheduling.

Estimated Time: 2h | Completed: [ ]

Week 12: Deep Learning Project

Day 1: Project Setup

Theory & Resources:
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Practice:
Select CIFAR-10 or FashionMNIST.

Estimated Time: 2h | Completed: [ ]

Day 2: Model Training

Theory & Resources:
-

Practice:
Achieve >85% accuracy.

Estimated Time: 2h | Completed: [ ]

Day 3: Evaluation

Theory & Resources:
-

Practice:
Confusion matrix, Error analysis.

Estimated Time: 2h | Completed: [ ]

Month 4: Natural Language Processing (NLP)

Weeks 13-16

Week 13: Text Basics

Day 1: Text Preprocessing

Theory & Resources:
Tokenization, Stemming, Lemmatization.

Practice:
Clean a raw text corpus.

Estimated Time: 2h | Completed: [ ]

Day 2: Vectorization (TF-IDF)

Theory & Resources:
Bag of Words, Sparsity.

Practice:
Build a Spam Classifier with TF-IDF.

Estimated Time: 2h | Completed: [ ]

Day 3: Regex & Parsing

Theory & Resources:
Pattern matching.

Practice:
Extract emails/dates from text.

Estimated Time: 2h | Completed: [ ]

Week 14: Word Embeddings

Day 1: Word2Vec & GloVe

Theory & Resources:
Dense vector representations.

Practice:
Use KeyedVectors to find analogies.

Estimated Time: 2h | Completed: [ ]

Day 2: RNNs for Text

Theory & Resources:
Sequential data processing.

Practice:
Simple RNN for sentiment analysis.

Estimated Time: 2h | Completed: [ ]

Day 3: LSTMs/GRUs

Theory & Resources:
Long-term dependencies.

Practice:
Upgrade RNN to LSTM.

Estimated Time: 2h | Completed: [ ]

Week 15: Modern NLP (Transformers)

Day 1: Attention Mechanism

Theory & Resources:
Self-Attention, Q/K/V.

Practice:
Watch 'Attention is all you need' explainer.

Estimated Time: 2h | Completed: [ ]

Day 2: BERT & GPT Concepts

Theory & Resources:
Encoder vs Decoder architectures.

Practice:
N/A (Conceptual).

Estimated Time: 2h | Completed: [ ]

Day 3: Hugging Face Library

Theory & Resources:
Using pre-trained models.

Practice:
Load BERT and run inference.

Estimated Time: 2h | Completed: [ ]

Week 16: NLP Project

Day 1: Project: Text Classification

Theory & Resources:
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Practice:
Fine-tune a model for IMDb reviews.

Estimated Time: 2h | Completed: [ ]

Day 2: Pipeline Integration

Theory & Resources:
-

Practice:
Build a clean inference function.

Estimated Time: 2h | Completed: [ ]

Day 3: Review

Theory & Resources:
-

Practice:
Compare TF-IDF vs BERT performance.

Estimated Time: 2h | Completed: [ ]

Month 5: Computer Vision

Weeks 17-20

Week 17: CNN Fundamentals

Day 1: Convolutions & Pooling

Theory & Resources:
Filters, Stride, Padding.

Practice:
Apply filters manually to images.

Estimated Time: 2h | Completed: [ ]

Day 2: CNN Architecture

Theory & Resources:
Building blocks of CNNs.

Practice:
Build a CNN for Cats vs Dogs.

Estimated Time: 2h | Completed: [ ]

Day 3: Training CNNs

Theory & Resources:
Overfitting in images.

Practice:
Train and monitor loss curves.

Estimated Time: 2h | Completed: [ ]

Week 18: Advanced Architectures

Day 1: Classic Architectures

Theory & Resources:
VGG, ResNet, Inception.

Practice:
Review model summaries in Keras/PyTorch.

Estimated Time: 2h | Completed: [ ]

Day 2: Transfer Learning

Theory & Resources:
Using pre-trained weights.

Practice:
Fine-tune ResNet50 for custom classes.

Estimated Time: 2h | Completed: [ ]

Day 3: Data Augmentation

Theory & Resources:
Flips, rotations, zooms.

Practice:
Implement augmentation pipeline.

Estimated Time: 2h | Completed: [ ]

Week 19: CV Tasks

Day 1: Object Detection Intro

Theory & Resources:
YOLO, R-CNN concepts.

Practice:
Run a pre-trained YOLO model.

Estimated Time: 2h | Completed: [ ]

Day 2: Image Segmentation Intro

Theory & Resources:
U-Net, Mask R-CNN.

Practice:
View segmentation outputs.

Estimated Time: 2h | Completed: [ ]

Day 3: CV Project

Theory & Resources:
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Practice:
Build a Real-time Face Mask Detector.

Estimated Time: 3h | Completed: [ ]

Week 20: Month 5 Review

Day 1: Review

Theory & Resources:
Consolidate CNN knowledge.

Practice:
Refactor your CV project code.

Estimated Time: 2h | Completed: [ ]

Month 6: Generative AI & RAG

Weeks 21-24

Week 21: LLM Fundamentals

Day 1: LLM Architecture

Theory & Resources:
Tokens, Context Window, Scaling Laws.

Practice:
Play with OpenAI Playground.

Estimated Time: 2h | Completed: [ ]

Day 2: Prompt Engineering

Theory & Resources:
Zero-shot, Few-shot, CoT.

Practice:
Optimize prompts for complex tasks.

Estimated Time: 2h | Completed: [ ]

Day 3: API Integration

Theory & Resources:
OpenAI/Anthropic APIs.

Practice:
Build a simple chatbot script.

Estimated Time: 2h | Completed: [ ]

Week 22: RAG (Retrieval Augmented Generation)

Day 1: RAG Concepts

Theory & Resources:
Why RAG? Embeddings + Vector DB.

Practice:
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Estimated Time: 2h | Completed: [ ]

Day 2: Vector Databases

Theory & Resources:
Pinecone, ChromaDB, FAISS.

Practice:
Store and query embeddings.

Estimated Time: 2h | Completed: [ ]

Day 3: Building a RAG Pipeline

Theory & Resources:
Retrieval metrics.

Practice:
Create a 'Chat with your Docs' MVP.

Estimated Time: 2h | Completed: [ ]

Week 23: Frameworks (LangChain)

Day 1: LangChain/LlamaIndex

Theory & Resources:
Chains, Agents, Tools.

Practice:
Build a chain with memory.

Estimated Time: 2h | Completed: [ ]

Day 2: Evaluation

Theory & Resources:
RAGAS, Evals.

Practice:
Test your RAG system accuracy.

Estimated Time: 2h | Completed: [ ]

Day 3: GenAI Project

Theory & Resources:
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Practice:
Build an AI Assistant with tool use.

Estimated Time: 3h | Completed: [ ]

Week 24: Month 6 Review

Day 1: Review

Theory & Resources:
Consolidate GenAI concepts.

Practice:
Polish your AI Assistant.

Estimated Time: 2h | Completed: [ ]

Month 7: Final Project & Portfolio

Weeks 25-28

Week 25: Project Ideation & Design

Day 1: Problem Selection

Theory & Resources:
Choose a solvable, high-impact problem.

Practice:
Define the user journey.

Estimated Time: 2h | Completed: [ ]

Day 2: Architecture Design

Theory & Resources:
Front-end, Back-end, Model, DB.

Practice:
Draw system diagram.

Estimated Time: 2h | Completed: [ ]

Day 3: Stack Setup

Theory & Resources:
Streamlit/FastAPI + Model.

Practice:
Init repo and environment.

Estimated Time: 2h | Completed: [ ]

Week 26: Implementation

Day 1: Core Logic / Modeling

Theory & Resources:
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Practice:
Train model or build RAG pipe.

Estimated Time: 3h | Completed: [ ]

Day 2: Backend API

Theory & Resources:
-

Practice:
Wrap model in FastAPI/Flask.

Estimated Time: 3h | Completed: [ ]

Day 3: Frontend UI

Theory & Resources:
-

Practice:
Build Streamlit/Gradio interface.

Estimated Time: 3h | Completed: [ ]

Week 27: Refinement & Theory

Day 1: Gap Filling

Theory & Resources:
Review weak areas from previous months.

Practice:
Study specific unclear concepts.

Estimated Time: 2h | Completed: [ ]

Day 2: Optimization

Theory & Resources:
Latency, Costs.

Practice:
Optimize your app code.

Estimated Time: 2h | Completed: [ ]

Day 3: Deployment

Theory & Resources:
HuggingFace Spaces / Render.

Practice:
Deploy the app live.

Estimated Time: 2h | Completed: [ ]

Week 28: Portfolio & Completion

Day 1: Documentation

Theory & Resources:
Writing a good README.

Practice:
Write documentation for Capstone.

Estimated Time: 2h | Completed: [ ]

Day 2: Showcase

Theory & Resources:
Presentation skills.

Practice:
Record a demo video.

Estimated Time: 2h | Completed: [ ]

Day 3: Final Audit

Theory & Resources:
Review the roadmap.

Practice:
Celebrate & Apply for jobs!

Estimated Time: 2h | Completed: [ ]
