# 6-Month Machine Learning Engineer Study Roadmap

## Daily Commitment: 4–5 Hours

This roadmap is designed to take you from Python fundamentals to becoming a job-ready Machine Learning Engineer. It is based on Python foundations, computer science fundamentals, machine learning, and deployment skills.

## Daily Study Routine (4–5 Hours)

1. 1.5 hours – Learn new concepts (videos, docs, books)
2. 1.5 hours – Hands-on coding practice
3. 45 minutes – Mini-project or problem solving
4. 30–45 minutes – Revision, notes, GitHub commit

## Phase 1: Python Foundations (Month 1–2)

Goal: Become strong in Python, OOP, and Data Structures.

1. Week 1: Python basics – syntax, variables, data types, loops, conditionals, exceptions
2. Week 2: Functions, lists, tuples, sets, dictionaries, comprehensions
3. Week 3: Modules, lambdas, decorators, iterators, regular expressions
4. Week 4: Object-Oriented Programming, environments, package managers
5. Week 5–6: Data Structures – arrays, linked lists, stacks, queues, hash tables, trees
6. Week 7: Algorithms – recursion, sorting, searching, Big-O notation
7. Week 8: Concurrency, async basics, threading, multiprocessing, testing

## Phase 2: Math & Data Tools (Month 3)

1. Linear algebra: vectors, matrices, dot products
2. Probability and statistics for ML
3. NumPy for numerical computing
4. Pandas for data analysis
5. Matplotlib / Seaborn for visualization
6. Exploratory Data Analysis (EDA) projects

## Phase 3: Core Machine Learning (Month 4)

1. Supervised vs unsupervised learning
2. Linear & logistic regression

3    KNN, Decision Trees, Random Forest

4    Naive Bayes, SVM

5    Model training using scikit-learn

6    Projects: price prediction, spam detection, churn prediction

## Phase 4: Advanced Machine Learning (Month 5)

1    Feature engineering

2    Model evaluation & validation

3    Hyperparameter tuning

4    Pipelines and workflows

5    Intro to neural networks

6    TensorFlow / PyTorch basics

7    Kaggle competitions and advanced projects

## Phase 5: ML Engineering & Deployment (Month 6)

1    FastAPI for ML APIs

2    Model deployment strategies

3    Docker basics

4    Git, CI/CD workflows

5    Model monitoring

6    Intro to MLOps

7    Capstone end-to-end ML project

## Outcome After 6 Months

1    Strong Python and CS fundamentals

2    Solid understanding of ML theory

3    Hands-on ML and deployment experience

4    4–6 strong portfolio projects

5    Job-ready for Junior ML Engineer roles