

# Complete Python → Data → Machine Learning → AI Roadmap

This document is a complete step-by-step flow map to master Data Science, Machine Learning, and AI using Python.

## STEP 1: Python Foundation

- Variables, data types, conditions, loops
- Lists, dictionaries, functions
- File handling and exceptions
- OOP basics

■ Exit: You can solve Python problems without copying code.

## STEP 2: Math & Statistics

- Mean, median, standard deviation
- Probability basics and correlation
- Outliers and distributions

■ Exit: You can explain data behavior in simple words.

## STEP 3: NumPy

- Arrays and vectorized operations
- Indexing, slicing, reshaping
- Mathematical and random functions

■ Exit: You avoid loops and use arrays efficiently.

## STEP 4: Pandas

- DataFrames, CSV/Excel handling
- Filtering, GroupBy, merge & join
- Handling missing and dirty data

■ Exit: You can clean and analyze any dataset.

## STEP 5: Data Visualization

- Matplotlib and Seaborn
- Line, bar, scatter, histogram, heatmap

■ Exit: You can present insights clearly with charts.

## STEP 6: Machine Learning

- Supervised and unsupervised learning
- Regression, classification, clustering
- Model evaluation and tuning

■ Exit: You can select, train, and explain models confidently.

## STEP 7: SQL & Tools

- SQL queries and joins
- Git, GitHub, Jupyter, VS Code

■ Exit: You are industry-ready.

## STEP 8: Deep Learning / AI

- Neural networks and deep learning basics
- TensorFlow/Keras or PyTorch
- Image and text-based projects

■ Exit: You can build real AI models, not just run them.

## FINAL GOAL

- Handle real-world data
- Build end-to-end ML & AI projects
- Explain and deploy models

■ MASTER RULE: Follow the order. Depth beats speed.