NumPy Learning Roadmap for Machine Learning

Stage 1: Foundation (Day 1-2)

- What is NumPy and Why Use It?

- Installing NumPy (pip install numpy)

- Creating Arrays (np.array, np.zeros, np.ones, np.arange, np.linspace)

- Array Properties: .shape, .ndim, .dtype, .size, .itemsize

Outcome: Understand array creation and inspection.

Stage 2: Array Manipulation (Day 3-4)

- Indexing and Slicing (1D, 2D, 3D)

- Reshaping (reshape, flatten, ravel, .T)

- Stacking and Splitting (vstack, hstack, split)

- Broadcasting

Outcome: Manipulate data shapes for ML tasks.

Stage 3: Mathematical Operations (Day 5-6)

- Element-wise operations (+, -, *, /)

- Aggregations (sum, mean, max, min, std, var, cumsum)

- Boolean masking and conditional replacement

- Dot Product, Matrix Multiplication (dot, matmul, einsum)

Outcome: Perform essential math for ML preprocessing.

Stage 4: Random and Simulation (Day 7)

- Random data generation (rand, randn, randint, choice, seed)

- Sampling simulations

Outcome: Generate test data for models.

Stage 5: Linear Algebra for ML (Day 8-9)

- Determinant, Inverse, Eigenvalues, Solve systems

Outcome: Build core ML algorithm calculations.

Stage 6: Advanced NumPy (Day 10-11)

- Vectorization

- Memory views vs copies

- Broadcasting rules

- Performance tricks

Outcome: Write high-performance ML-ready code.

Stage 7: Integration and Projects (Day 12-13)

- Pandas and NumPy conversion

- Integration with scikit-learn, TensorFlow, PyTorch

- Mini ML Projects (Normalization, Image Data, Regression)

Outcome: NumPy ready for real-world ML projects.

Optional Deep Dive (Day 14-15)

- Dask, CuPy, JAX

Total Required Time: 13 Days (1 to 2 hours per day)