NumPy Roadmap: From Basic to Advanced

1. Introduction to NumPy

- What is NumPy?
- Installation and Setup
- Understanding ndarray (n-dimensional array)
- Basic array operations: creation, indexing, slicing
- Basic mathematical operations with arrays

2. Intermediate NumPy

- Array Manipulation: Reshape, Resize, Flatten, Ravel
- Broadcasting and its importance
- Stacking and Splitting arrays
- Statistical Functions: mean, median, std, var
- Logical operations and masking

3. Advanced NumPy

- Understanding NumPy's Data Types (dtype)
- Working with Structured Arrays
- Vectorized Operations for Performance Optimization
- Linear Algebra with NumPy (dot, eig, inv, solve)
- Fourier Transformations (numpy.fft)
- Random Number Generation (numpy.random)

4. Specialized Topics

- Working with Large Datasets and Memory Mapping

- Integration with Pandas and Matplotlib
- Using NumPy with JAX for GPU acceleration
- Customizing Universal Functions (ufuncs)
- Performance Profiling and Optimization Tips

5. Real-World Applications and Projects

- Data Analysis and Statistics
- Image Processing with NumPy
- Signal Processing
- Machine Learning Preprocessing with NumPy