

# NumPy & Pandas Learning Roadmap

## NumPy Topics

- Introduction to NumPy (what, why, install)
- NumPy Arrays: create 1D, 2D, 3D arrays, data types
- Array Attributes: shape, size, ndim, dtype
- Indexing and Slicing: basic, advanced, boolean
- Array Operations: arithmetic, broadcasting, vectorized ops
- Array Manipulation: reshape, flatten, transpose, concatenate
- Math Functions: sum, mean, min, max, std, axis-wise ops
- Random Module: rand, randint, normal, seed
- Linear Algebra: dot, matmul, inverse, transpose, determinant
- Utility Functions: where, unique, sort, argsort

## Pandas Topics

- Introduction to Pandas (what, why, install)
- Core Data Structures: Series and DataFrame
- Creating DataFrames: from lists, dicts, CSV, Excel, JSON
- Inspecting Data: head, tail, shape, info, describe, dtypes
- Selecting and Filtering: loc, iloc, conditions, slicing
- Data Cleaning: isnull, dropna, fillna, rename, drop\_duplicates
- Modifying Data: add/remove columns, map, apply, string ops
- Sorting and Ranking: sort\_values, sort\_index
- Grouping and Aggregation: groupby, mean, sum, count
- Merging and Joining: concat, merge, join (left/right/inner/outer)
- Working with Dates/Time: to\_datetime, extract day/month/year
- Exporting Data: to\_csv, to\_excel
- Bonus: Basic plotting using .plot (line, bar, hist, scatter)