

Python Libraries + Math for Machine Learning

1. NumPy <-> Linear Algebra

- Learn array operations, dot products, broadcasting.
- Math to learn:
 - * Scalars, vectors, matrices, tensors
 - * Matrix addition, subtraction, multiplication
 - * Dot product, cross product
 - * Identity matrix, inverse, transpose
 - * Determinant and rank
 - * Eigenvalues and eigenvectors (basic understanding)

2. Pandas <-> Descriptive Statistics

- Learn data manipulation, grouping, aggregation.
- Math to learn:
 - * Mean, median, mode
 - * Variance, standard deviation
 - * Percentiles and quantiles
 - * Covariance and correlation
 - * Handling missing data, outliers

3. Matplotlib & Seaborn <-> Probability & Data Visualization

- Learn visualizing data: line plots, histograms, scatter plots, KDE.
- Math to learn:
 - * Probability basics: independent/dependent events
 - * Probability distributions: uniform, normal (Gaussian), binomial

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- * Probability density function (PDF), cumulative distribution function (CDF)
- * Histograms, frequency distribution, kernel density estimation

4. Scikit-learn <-> Applied Math in Machine Learning

- Learn ML models: regression, classification, clustering.
- Math to learn:
 - * Linear regression math (least squares, gradients)
 - * Logistic regression math (sigmoid function, log loss)
 - * Loss functions: MSE, MAE, cross-entropy
 - * Distance metrics: Euclidean, Manhattan, cosine
 - * Feature scaling: normalization, standardization
 - * Model evaluation metrics: accuracy, precision, recall, F1-score
 - * Basics of calculus: derivatives, gradients, optimization (gradient descent)

5. TensorFlow/PyTorch <-> Deep Learning Math (Optional Advanced)

- Learn deep learning: neural networks, tensors, backpropagation.
- Math to learn:
 - * Calculus: partial derivatives, chain rule
 - * Activation functions (ReLU, sigmoid, tanh)
 - * Cost functions and backpropagation
 - * Matrix operations in neural networks
 - * Basic probability and statistics for regularization (dropout, etc.)