Linear Regression: Complete Learning Roadmap for CS Students

STAGE 1: Beginner Level - Concepts & Visualization

- What is Linear Regression?

- Use cases, Terminologies (Dependent/Independent Variables)

- Formula: y = mx + c

Resources:

- StatQuest YouTube: Simple Linear Regression

- Khan Academy: Regression Intro

Task: Sketch graph (e.g., hours studied vs marks)

STAGE 2: Basic Python Implementation (Simple Linear Regression)

- Load data, use scikit-learn's LinearRegression

- Visualize line with matplotlib

Resources:

- Google Colab Starter Notebook

- Scikit-learn Docs

Task: Fit model, predict, and plot

STAGE 3: Math Behind Linear Regression

- m & c calculation

- Mean Squared Error (MSE), Cost Function, Gradient Descent

Resources:

- 3Blue1Brown: Gradient Descent video

- TowardsDataScience: Linear Regression Math

Task: Derive slope/intercept from scratch

STAGE 4: Multiple Linear Regression

- Multiple variables as input

Resources:

- GeeksforGeeks: Multiple Linear Regression in Python

Task: Use dataset like house prices

STAGE 5: Model Evaluation

- R^2, MAE, RMSE

Resources:

- Scikit-learn Evaluation Docs

Task: Evaluate model with 3 metrics

STAGE 6: Real Projects & Datasets

- Load real data, train and evaluate models

Datasets:

- Kaggle: Student performance, House prices

Task: Build end-to-end project, upload to GitHub

STAGE 7: Advanced Concepts

- Polynomial Regression, Regularization (Lasso, Ridge)

- Assumptions: Linearity, Independence, Homoscedasticity, Multicollinearity

- Feature Selection, Cross-Validation

Resources:

- Medium, Analytics Vidhya, TDS articles

Task: Apply Ridge/Lasso, Cross-validation

Final Step: Build Portfolio

- GitHub Repo: Practice notebooks, real projects, from-scratch model

- Write blog (Medium or Hashnode)

Yes, this roadmap includes ALL major topics from beginner to advanced level.

You can use it for self-paced learning, assignments, or interviews.