■ Project Description: Model Evaluation and Generalization

The purpose of this project is to explore the concepts of **model evaluation** and **generalization** in Machine Learning. The task focuses on understanding how different regression models, particularly linear and polynomial regression, perform on training, validation, and test datasets. The main goals of the project are: 1. **Data Handling**: Load datasets for training, validation, and testing, and prepare them for modeling. 2. **Linear Regression**: Build and evaluate a simple linear model, calculating its Root Mean Squared Error (RMSE) on all datasets. Visualize the model's predictions against actual data. 3. **Polynomial Regression**: Investigate polynomial models of varying degrees (from 1 to 9). Evaluate and compare their RMSE values across datasets to identify underfitting and overfitting behavior. 4. **Model Selection**: Determine the polynomial degree that achieves the best trade-off between accuracy on training data and generalization to unseen data. **Expected Outcome:** The project provides practical insights into the importance of model complexity and its direct impact on generalization performance. By analyzing RMSE curves and visualizations, one can clearly see how low-degree models underfit the data, while high-degree models overfit. The optimal solution in this case is a polynomial regression model of degree 4, which balances both fitting accuracy and generalization ability.