# DOCUMENTATION OF PROJECT KILL:

# Temperature Forecasting using Linear Regression

## Introduction

Temperature forecasting is crucial for various applications, including agriculture, disaster preparedness, and energy management. This project aims to predict daily temperatures based on historical data using machine learning techniques, specifically Linear Regression.

## Objectives

- Develop a predictive model for daily temperature forecasting.

- Utilize Linear Regression to establish a relationship between the day of the year and temperature.

- Evaluate the model’s accuracy using performance metrics.

## Data Description

- \*\*Dataset:\*\* Synthetic dataset representing daily temperatures over a year.

- \*\*Features:\*\*

- `Day`: Represents the day of the year (1 to 365).

- `Temperature`: Recorded or simulated temperature values (in °C).

## Methodology

1. \*\*Data Generation & Preprocessing:\*\*

- A sinusoidal function with noise is used to simulate realistic temperature variations over a year.

2. \*\*Data Splitting:\*\*

- The dataset is split into training (80%) and testing (20%) sets.

3. \*\*Model Selection & Training:\*\*

- A Linear Regression model is trained on the training data.

4. \*\*Predictions & Evaluation:\*\*

- The model predicts temperatures on the test set.

- Performance is assessed using error metrics.

## Evaluation Metrics

- \*\*Mean Absolute Error (MAE):\*\* Measures the average absolute difference between actual and predicted values.

- \*\*Root Mean Squared Error (RMSE):\*\* Evaluates the average squared error magnitude.

- \*\*Prediction Accuracy:\*\*

- Computed as: `Accuracy = 1 - (sum of absolute errors / sum of actual values)`.

## Results

- The model provides reasonable temperature predictions but has inherent limitations due to its linear nature.

- Errors indicate potential improvements with more advanced models like Polynomial Regression or Neural Networks.

## Conclusion & Future Work

- \*\*Conclusion:\*\* Linear Regression offers a basic but effective approach for temperature forecasting.

- \*\*Future Improvements:\*\*

- Incorporate more features (e.g., humidity, wind speed, atmospheric pressure).

- Use advanced models such as Decision Trees, Random Forests, or Deep Learning.

- Experiment with real-world weather datasets for improved accuracy.