

PM Accelerator Mission & Weather Trend Forecasting Analysis

PM Accelerator Mission

PM Accelerator is dedicated to empowering aspiring Product Managers by providing practical resources, real-world projects, and expert guidance. Our mission is to bridge the gap between learning and execution, enabling individuals to build essential product management skills and accelerate their careers.

Project Overview

This project focuses on forecasting global weather trends using advanced data science techniques. The goal was to analyze a comprehensive weather dataset, build multiple forecasting models, and derive actionable insights related to climate patterns and environmental impacts.

Methodology Summary

1. Data Cleaning & Preprocessing

- **Outlier Detection:** Applied Isolation Forest to detect and remove anomalies.
- **Missing Values:** Handled appropriately to maintain data quality.
- **Normalization:** Performed where necessary for accurate model performance.

2. Exploratory Data Analysis (EDA)

- Identified trends in **temperature** and **precipitation** over time.
- Conducted **spatial analysis** to observe geographical trends.
- Detected anomalies and unusual patterns in weather data.

3. Forecasting Models

- **ARIMA Model:** Built for time-series forecasting based on past temperature data.
- **Prophet Model:** Used for flexible and intuitive forecasting.
- **Ensemble Model:** Combined ARIMA and Prophet predictions for improved accuracy.

- **Evaluation Metrics:** MAE and RMSE were used for performance evaluation.

4. Unique Analyses

- **Feature Importance:** Identified key factors like humidity and air quality metrics affecting temperature trends using Random Forest Regressor.
- **Environmental Impact Analysis:** Analyzed correlations between temperature and air quality metrics (PM2.5 and PM10).

Key Results & Insights

- The **Ensemble Model** offered superior forecast accuracy.
- **Humidity** and **air quality metrics** emerged as significant influencers of temperature trends.
- Moderate correlations were identified between temperature and air quality metrics.

Conclusion

This project effectively demonstrates the ability to handle complex datasets, build and evaluate multiple forecasting models, and derive actionable insights. The ensemble approach showed strong forecasting capability and is recommended for future analyses.