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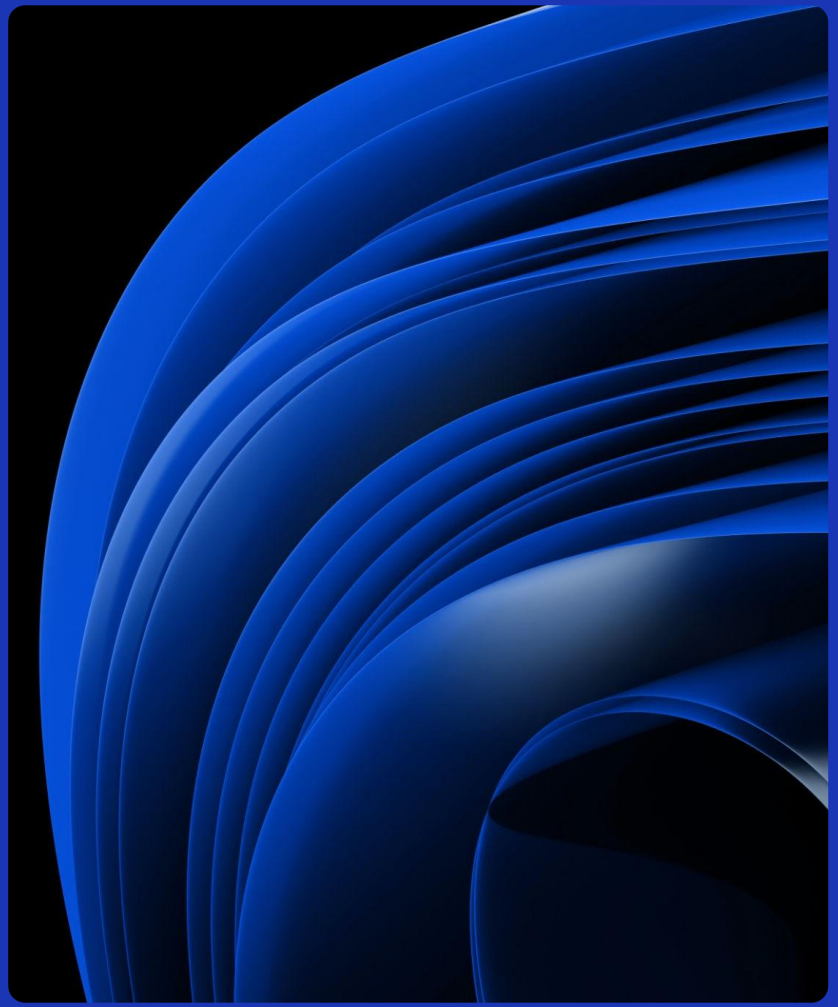
Weather Forecasting Using Data Science: A Comprehensive Analysis

Using Time Series Forecasting to Predict Global Weather Trends

Date

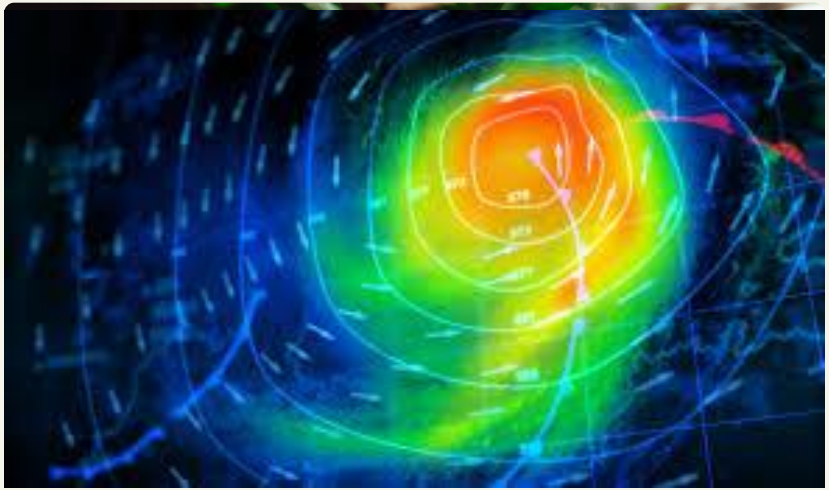


PM Accelerator Mission: Empowering Data-Driven Change

By making industry-leading tools and education available to individuals from all backgrounds, **we level the playing field for future PM leaders.** This is the PM Accelerator motto, as we grant aspiring and experienced PMs what they need most – Access. We introduce you to industry leaders, **surround you with the right PM ecosystem**, and discover the new world of AI product management skills.

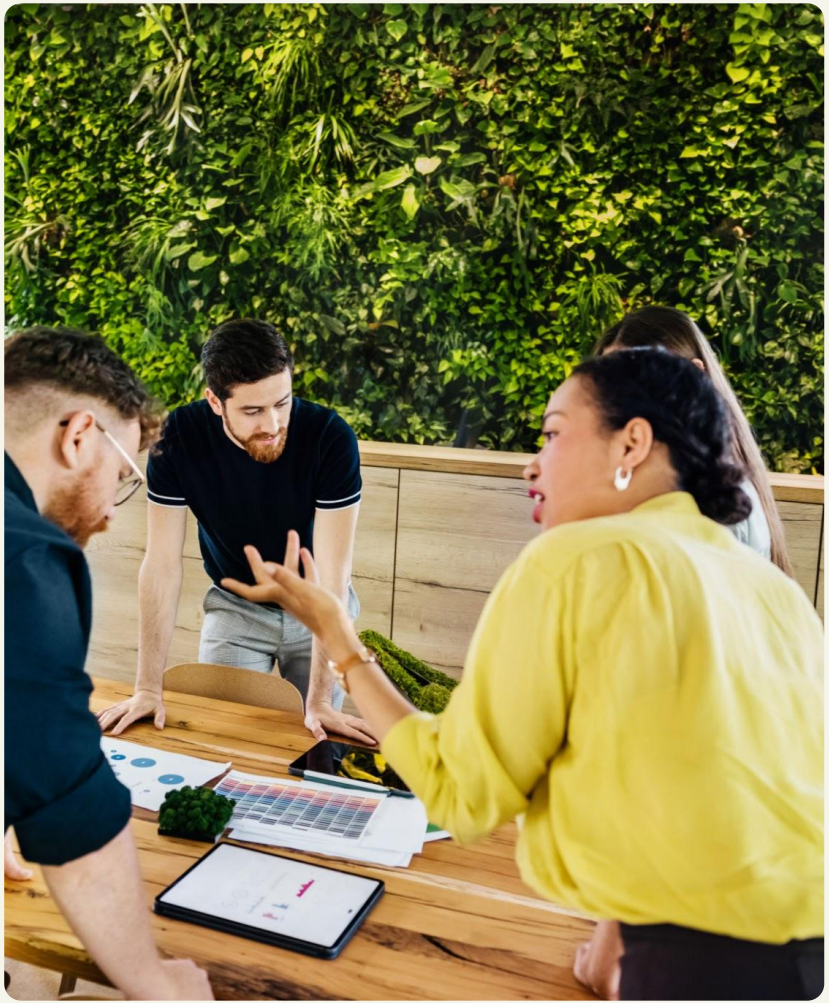
Introduction to the Project

- Weather forecasting is a key application of data science, and understanding global weather patterns helps in various industries, from agriculture to urban planning.
- In this project, we aim to build a forecasting model to predict future weather trends, focusing on temperature and precipitation, using historical weather data from the Global Weather Repository.



Data Overview

The data is sourced from the "Global Weather Repository" dataset available on Kaggle. The dataset includes over 40 features such as temperature (Celsius), precipitation (mm), wind speed, and more, across different cities around the world.

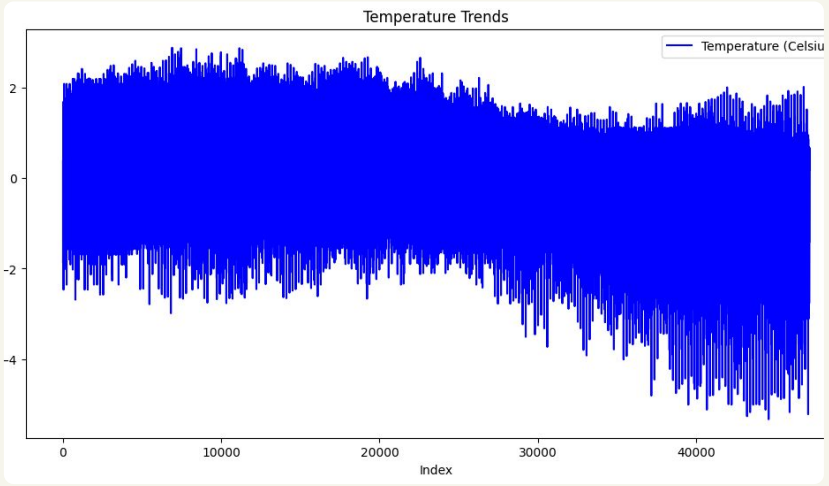


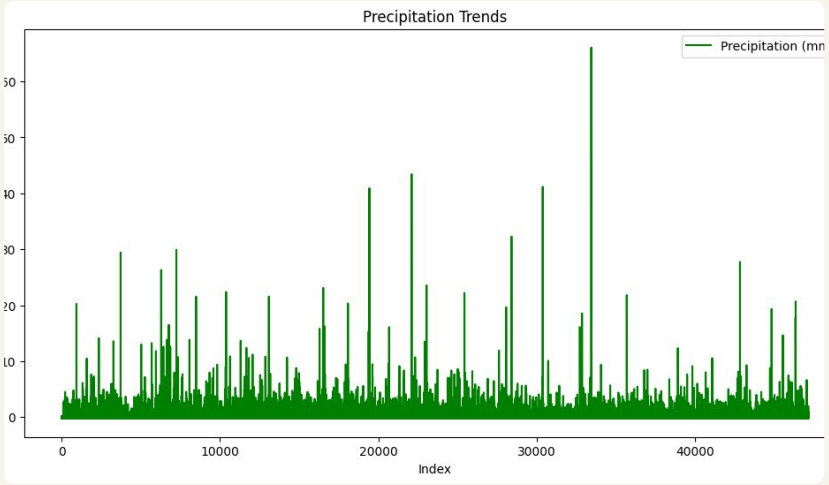
Data Cleaning and Preprocessing

- Missing data was handled by filling numerical columns with the median values, ensuring no gaps in the dataset
- Numerical features, including temperature and precipitation, were normalized using StandardScaler to standardize the data.
- The last_updated column was converted into a datetime format, enabling time series analysis.

Exploratory Data Analysis (EDA)

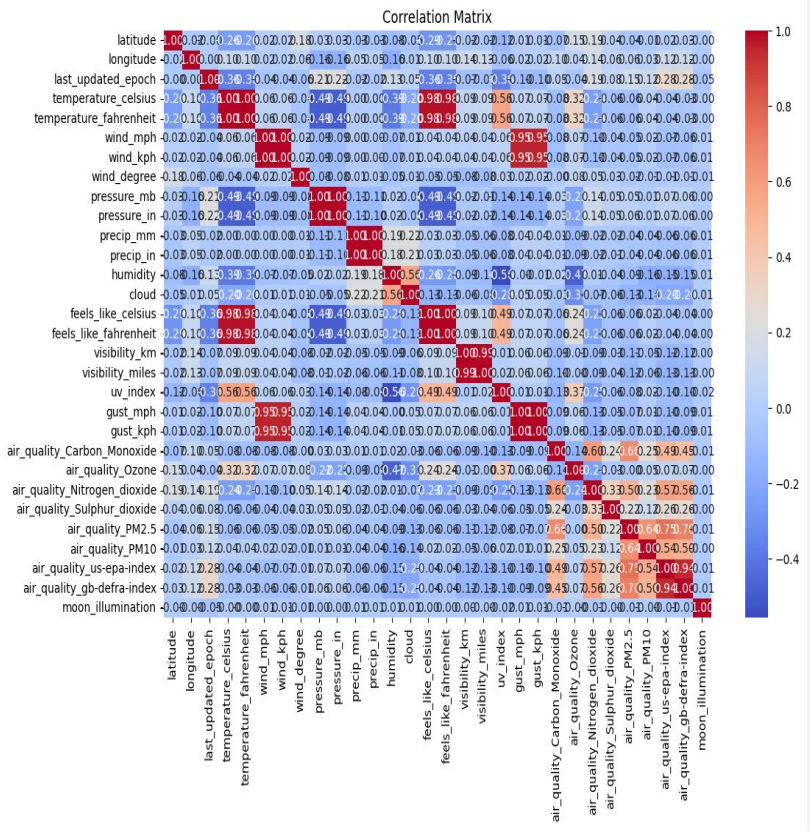
- We visualized temperature and precipitation trends to identify any seasonal patterns and long-term variations.
- Slight Negative Correlation with Temperature Trends
- Left Tail in Precipitation Trends with outliers throughout graph





Correlation Analysis

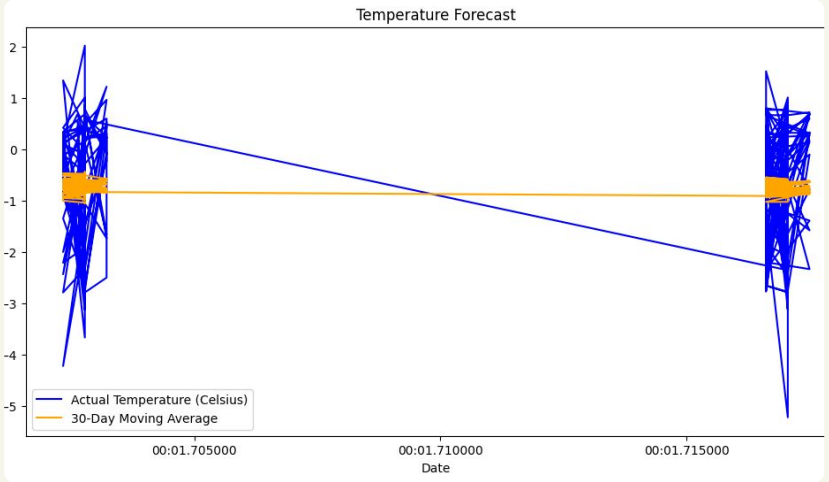
A correlation matrix was generated to understand the relationships between different weather features.



Basic Forecasting Model: Moving Average

A simple 30-day moving average model was used to forecast future temperature values. This model helps smooth out short-term fluctuations and identify longer-term trends. The data was split into training and test sets, where the last 365 days were used for testing, and the rest for training.

MAE (Mean Absolute Error): Measures the average magnitude of errors in predictions.
RMSE (Root Mean Squared Error): Measures the average magnitude of errors with higher penalties for larger deviations.

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Basic Forecasting Model - MAE: 1.06, RMSE: 1.23
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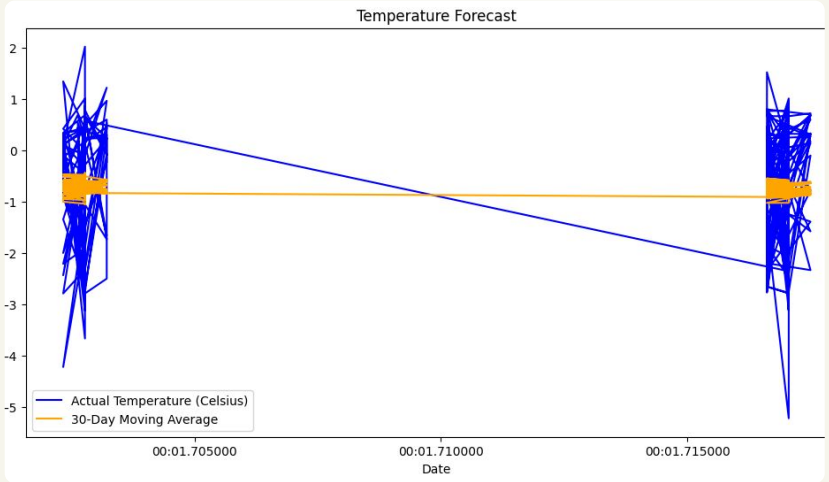
Basic Forecasting Model Evaluation

- The SMA model successfully forecasts temperature trends with an MAE of 1.06 and RMSE of 1.23, indicating good model accuracy and minimal errors in predictions.



Thank you!