# Weather Data Analysis - Project 12

## 1. Introduction

This report analyzes city-level weather data focusing on temperature trends. The main objective is to understand how temperatures have changed over the past decade, identify regional differences, and forecast future temperature trends using time-series models.

## 2. Key Questions

- How have global temperatures changed over the past decade?  
- Are there regional differences in warming trends?  
- Can we predict temperature anomalies (heatwaves/cold spells)?

## 3. Tasks Performed

- Loaded and cleaned temperature datasets.  
- Resampled hourly data to daily and monthly averages.  
- Visualized temperature trends across major cities.  
- Built a forecasting model using Prophet.  
- Analyzed trend and seasonality components.

## 4. Analysis Approach

The dataset includes hourly temperature data from various global cities. Temperatures were converted from Kelvin to Celsius for better interpretability. Daily and monthly trends were visualized to observe seasonal patterns. Forecasting was performed using the Prophet model for selected cities.

## 5. Findings

- Strong seasonality observed with distinct summer and winter patterns.  
- Warmer cities like Miami show less seasonal variation compared to colder cities like Toronto.  
- Prophet model successfully captured yearly seasonality in temperature forecasts.  
- Long-term rolling averages reveal gradual temperature changes over years.

## 6. Conclusion

Climate change analysis through temperature trends is critical for understanding global warming. This project demonstrated how time-series modeling can predict future temperature patterns, highlight seasonal effects, and support climate research and urban planning decisions.