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DS 4002
12/8/2025

Building Weather Insights for Charlottesville

You are joining the Resilient Together project, a collaborative Climate Adaptation and Resilience Planning initiative between the City of Charlottesville, Albemarle County, and the University of Virginia to support their ongoing effort to better understand local temperature patterns. The team is exploring whether long-term historical data can be used to create simple, reliable forecasts that help inform planning and resource decisions. Your role is to assess whether past temperature trends contain enough structure to meaningfully predict the conditions of an upcoming year.

Context

Charlottesville's temperature patterns from 2000–2023 show periods of stability as well as years with unusual fluctuations. City planners have become increasingly interested in how these patterns evolve, especially as weather has become more inconsistent across seasons. Short-term forecasts from standard weather services are useful, but the city is also exploring whether a data-driven, locally focused historical model can complement those tools.

Before they incorporate any long-term forecasting into their planning workflows, the team needs evidence that a model built on past data can produce reasonable expectations for a recent, known year. You have been provided a cleaned dataset containing monthly average temperature observations from 2000 through 2024. Your task is to analyze the historical period, develop a time series model using data from 2000–2023, and determine how well it predicts the temperatures in 2024.

Mission

Using R and the provided dataset you will:

1. Explore long-term temperature trends in Charlottesville
2. Construct a time-series forecasting model using data from 2000–2023
3. Generate a forecast for 2024
4. Evaluate your model by comparing your forecast to the actual 2024 data

Deliverable

By the end of this case study, you will produce a concise analysis demonstrating whether a historical time-series approach can support basic local forecasting. Your findings will help determine how useful this modeling strategy could be for future planning within the city.

All project files and resources are available here: **insert github link**