Project

Weather Forecasting Model

Abstract

Weather forecasting plays a crucial role in planning and decision-making across various industries, including agriculture, transportation, and disaster management. This project leverages deep learning, specifically Long Short-Term Memory (LSTM) networks, to predict future temperature trends based on historical weather data. The model is trained on time-series weather data, normalizing it for improved performance and utilizing sequential patterns to make accurate predictions. The project also includes a visualization of actual vs. predicted temperatures to assess model accuracy.

Project Summary

1. **Objective**
    - Develop a machine learning model to predict future weather patterns based on past data.
    - Utilize LSTM networks for time-series forecasting due to their efficiency in handling sequential data.
2. **Methodology**
    - **Data Collection**: Weather dataset containing historical temperature records.
    - **Data Preprocessing**: Normalization using **MinMaxScaler**, sequence creation for LSTM.
    - **Model Training**: LSTM model trained on past **10 days'** data to predict the next day's temperature.
    - **Performance Evaluation**: **Mean Absolute Error (MAE)** used as a metric to assess accuracy.
    - **Visualization**: Graphical representation of actual vs. predicted temperatures.
3. **Deployment**
    - The model can be deployed as an API using **FastAPI** and hosted on **Google Cloud Run** for real-time predictions.
    - The implementation is also compatible with **Google Colab** for research and testing.

Conclusion

This project successfully demonstrates the ability of **deep learning (LSTM)** in weather forecasting using historical temperature data. The trained model shows promising accuracy in predicting future temperature values, which can be further improved with additional features such as humidity, wind speed, and atmospheric pressure. Deployment using **FastAPI** enables real-time access to weather predictions, making it a useful tool for businesses and individuals. Future enhancements could include integration with real-time weather APIs and the application of more advanced AI models to improve forecasting accuracy.