Project Documentation: Weather Forecast App

Project Title

Weather Forecasting Using LSTM and Streamlit

Project Description

The Weather Forecast App is a machine learning-based system that predicts temperature trends using historical weather data. This project applies deep learning techniques (LSTM - Long Short-Term Memory) to forecast short-term weather patterns and delivers predictions through an interactive web interface built with Streamlit. The goal is to simplify weather prediction using data science techniques without relying on real-time APIs, providing a clear demonstration of time-series forecasting using neural networks.

Existing System

Traditional weather prediction systems rely on complex meteorological models, real-time satellite data, weather APIs, and high-performance computing. These are resource-intensive and require live data.

Proposed System

The proposed system uses a pre-trained LSTM model on historical weather data to predict temperature values. It provides a lightweight, local forecasting solution with a user-friendly interface, eliminating the need for real-time sensors or APIs.

Project Workflow

1. Load raw weather CSV data.
2. Preprocess and normalize the data.
3. Create sequences for model training.
4. Train an LSTM model and save it.
5. Load the model in a Streamlit UI.
6. Predict and visualize future temperatures.

Project Functionality

- Upload and process historical weather data.

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- Use a pre-trained LSTM model to predict future temperature.
- Visualize actual vs predicted temperatures on charts.
- Allow adjustment of input window size and time range.
- Display interactive plots using Plotly and Matplotlib.

Tools and Technologies Used

- Python 3.8+
- Pandas, NumPy
- Scikit-learn
- TensorFlow / Keras
- Streamlit
- Plotly / Matplotlib

Conclusion

The Weather Forecast App demonstrates the effective use of LSTM models for forecasting temperature using historical data. With a clean UI and strong predictive model, it offers a simple alternative to traditional forecasting systems. Future work may include real-time API integration, multi-variable prediction, and cloud deployment.