Assignment 11

Dataset

Daily Minimum Temperatures dataset from Kaggle.
Link: https://www.kaggle.com/datasets/suprematism/daily-minimum-temperatures

Assignment Sections

1. Data Preparation

1.1 Data Import and Exploration

Task: Import the dataset and examine key features. Note any trends, seasonality, or other patterns in the data.
Visualization: Plot the time series data to visually inspect any seasonal trends.

1.2 Data Preprocessing

Task: Handle any missing values, if present, and split the data into training and test sets (e.g., 80/20 split).
Scaling (Optional): Normalize or scale data if required by the model.

2. ARIMA Models

2.1 Basic ARIMA (AutoRegressive Integrated Moving Average) Model

Task: Implement a simple ARIMA model with manually chosen parameters (p, d, q).
Parameter Selection: Describe the approach you used to select initial parameters.
Evaluation: Evaluate the model using Mean Absolute Error (MAE) and Mean Squared Error (MSE).

2.2 Seasonal ARIMA (SARIMA)

Task: Implement SARIMA to capture seasonal trends in the temperature data.
Parameter Tuning: Define the seasonal order (P, D, Q, s), and use auto_arima to fine-tune parameters if possible.
Analysis: Discuss how SARIMA compares to basic ARIMA in capturing seasonality.

2.3 Auto ARIMA

Task: Use the auto_arima function to automatically select the best parameters for ARIMA/SARIMA.
Comparison: Compare performance with manually chosen parameters and analyze the results.

2.4 ARIMA with Exogenous Variables (ARIMAX)

Task: Identify potential external variables (e.g., calendar effects, other weather metrics if available) and add them to an ARIMAX model.

Evaluation: Describe any improvements in forecast accuracy compared to the basic ARIMA model.

3. ETS Models

3.1 Basic ETS Model

Task: Implement a basic ETS model using statsmodels or equivalent libraries, testing each ETS component for best fit.
Model Types: Experiment with different configurations for Error, Trend, and Seasonality (e.g., Additive vs. Multiplicative).
Analysis: Discuss how each combination affects forecast accuracy.

3.2 ETS with Damped Trend

Task: Apply trend-damped ETS models to the dataset.
Analysis: Explain how dampening the trend affects short-term and long-term forecast accuracy.

3.3 ETS with Seasonal Adjustments

Task: Implement ETS models with seasonality settings to capture repetitive patterns in the data.
Comparison: Compare performance with non-seasonal ETS models and ARIMA models.