Objective:
We aim to implement an advanced time series forecasting solution to predict coffee shop sales across three European countries. This project will leverage the TSMixer model to improve sales forecasting accuracy, optimize resource allocation, and support better decision-making.

Key Goals:

1. **Accurate Forecasting**: Deliver precise daily sales forecasts across locations by minimizing prediction errors.
2. **Data Utilization**: Integrate both historical and future data, using relevant features to enhance model performance.
3. **Scalability**: Ensure the solution is scalable across multiple locations and adaptable to changes in data.
4. **Performance Optimization**: Use cross-validation and parameter tuning to achieve the best model performance.

Requirements:

- **Data Preparation**:
    - Process historical sales data and future covariates from provided datasets.
    - Clean and structure the data, converting time and location information into appropriate formats.
    - Scale the data for effective model training.
- **Exploratory Analysis**:
    - Analyze and visualize sales trends across locations.
    - Generate a correlation matrix to identify relationships between key variables.
- **Model Development**:
    - Train the TSMixer model using grouped time series for each location, leveraging past and future covariates.
    - Configure the model with appropriate input/output parameters and use GPU acceleration for efficiency.
- **Performance Validation**:
    - Perform rolling forecasts and backtesting, assessing model accuracy with Root Mean Squared Error (RMSE).
    - Visualize actual vs predicted sales to ensure forecast reliability.
- **Parameter Tuning**:
    - Optimize model performance through parameter tuning, testing multiple configurations to minimize RMSE.
- **Final Forecasting**:
    - Use the tuned model to generate 30-day sales forecasts for each location.
    - Present forecasts alongside visualizations for decision-making.