WESTERN UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 9603 – Data Analytics Foundations Assignment 1: Forecasting

Deadline: October 24th, 2025

In this assignment, you will experiment with different forecasting approaches and algorithms. As this is your first assignment in this course, you can keep it simple. The tasks to be completed are as follows:

1. Dataset Selection

Choose a forecasting problem supported by an open-source dataset (links will be posted on OWL) or another accessible source.

- The problem may be regression or classification, using time-series or cross-sectional forecasting.
- The dataset must contain at least 1,000 samples.
- If the dataset is very large and training takes too long, you may use a subset.
- **Important:** Do not use the same dataset you plan to use for your final project.

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2. Data Exploration & Transformation

Examine your dataset carefully:

- Provide a detailed description of your dataset and its features (size, attributes, ranges, context, quantity).
- Clearly indicate which attributes/parts you selected for your forecasting task.
- Apply transformations/normalizations as needed (e.g., scaling, encoding, differencing, log transform).
- For each transformation, explain its purpose and the reasoning behind your decision to transform. (e.g., "Scaling ensures features with different magnitudes contribute equally," "Differencing removes trend to improve stationarity").
- Keep both the original dataset and the transformed dataset so you can compare results later.

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3. Forecasting Approaches

Apply at least three substantially different algorithms.

- Approaches must be meaningfully different (e.g., two SVR models with different kernels = one approach).
- Examples: neural networks, support vector regression, multivariate regression, k-nearest neighbour, regression trees, ARMA, Markov chains, etc.
- You may only use one neural network-based method.
- Focus on experimentation across models, not tuning. (Parameter optimization will come in Assignment 2.)

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4. Evaluation & Discussion

Evaluate your models using hold-out validation or cross-validation:

- Use metrics appropriate for your forecasting problem.
- Compare results across different algorithms and across transformed vs. untransformed datasets. Present findings in tables and figures.
- In your discussion:
    - Explain how transformations impacted performance (positively, negatively, or no change).
    - Provide reasoning for why certain models or transformations performed as they did.

Deliverables:

Report

Your report must be structured, clear, and contain **no code**. Points will be awarded as follows:

- **Problem Description (3 points)**
    - Detailed description of the forecasting problem.
    - Include background information and explain relevance.
- **Data for Modelling (5 points)**
    - Describe dataset (size, attributes, ranges, context, quantity).
    - Identify which attributes/parts were used.
    - Describe transformations and explain their purpose.
- **Background (3 points)**
    - Overview of selected algorithms.
    - Explain how they work.
    - Justify why they are appropriate for your problem.
- **Methodology (4 points)**
    - Describe how algorithms were applied.
    - Note algorithm-specific transformations and why they were required.
    - Describe evaluation procedure (hold-out or cross-validation).
- **Results (5 points)**
    - Present results in figures/tables with appropriate metrics.
    - Compare algorithms on both transformed and untransformed data.
    - Discuss how transformations affected performance and why.

Code:

- Although there are no marks for the code itself, marks will be deducted if the code does not match the rest of the report.
- The code should be submitted using GitHub Classroom
    - Accept the assignment invitation: https://classroom.github.com/a/gkDty5nL
    - Submit the code, ideally you each commit your own work.

Submission:

- Report should be submitted on OWL and on Gradescope
- Code should be uploaded to GitHub classroom, please include a link to your repository in your submission to OWL.