Title: Time Series Forecasting Methods for Socio-Economic Indicators: A Case Study of Kazakhstan

Abstract:
This study aims to compare the performance of traditional statistical forecasting methods—ARIMA (AutoRegressive Integrated Moving Average), ETS (Exponential Smoothing), and STL (Seasonal-Trend Decomposition using Loess)—with a deep learning approach using LSTM (Long Short-Term Memory) in predicting values of key socio-economic indicators in Kazakhstan. The indicators considered for prediction are the Gross Domestic Product (GDP) and Population Growth. Historical data, provided by the Bureau of National Statistics, for these indicators, spanning several years, is used to train and test the forecasting models. The study evaluates the models' accuracy and reliability in providing forecasts for a period of one year. In doing so, this research will contribute to the understanding of the strengths and weaknesses of different time series forecasting methods in the context of socio-economic data for Kazakhstan and deliver a robust prognosis for the future year.

Population data: https://stat.gov.kz/en/industries/social-statistics/demography/dynamic-tables/
GDP data: https://stat.gov.kz/en/industries/economy/national-accounts/dynamic-tables/

Tentative Plan:
Week 1-2: Literature Review and Data Collection
- Conduct a literature review on time series forecasting methods.
- Gather historical data for GDP, Population Growth Rate, and CPI in Kazakhstan.
- Analyze, clean and preprocess the data.

Week 3: Methodology and Data Preprocessing
- Outline the methodology for model training and evaluation.

Week 4-6: Model Implementation and Evaluation
- Implement ARIMA, ETS, STL, and LSTM models using the collected data.
- Train the models on historical data and validate them using appropriate metrics (e.g., RMSE, MAE).
- Compare the performance of the models and fine-tune parameters if necessary.

Week 7-9: Results Analysis and Paper Writing
- Analyze the results of the model comparisons.
- Make a prognosis using the best - performing model
- Write the paper, including sections on introduction, methodology, results, discussion, and conclusion.