

Assignment 12.1 Research for Deep Learning with Time Series Data

Research 1: “Predicting Airline Passenger Traffic with Time Series Analysis”

Dataset: <https://www.kaggle.com/datasets/pattnaiksatyajit/air-passengers>

Air travel is super important for connecting people worldwide and boosting economies. The "Air Passenger" dataset is like a big history book of how many people flew over several years. It contains 2 variables: time period and number of passengers. This info helps experts spot trends, figure out when more or fewer people fly, and catch any weird stuff that happens with flights. When we look at the data, we can see if more people are flying over the years (good for airlines) or if fewer people are (might mean trouble like issues in airplanes or airlines). The reasons behind this can be things like economic conditions, how many people are around to travel, and technological advancement. We also know that on holidays or vacations, more people take flights. This is called seasonal variation. By understanding these patterns, airlines can plan better when to add more flights or when to offer deals/promos. To predict future flight numbers by the use of time-series techniques, we use fancy math like ARIMA or seasonal decomposition. They help airlines and airports know how many planes they'll need and when, so they don't end up with too many empty seats or not enough planes for everyone. This dataset helps us to see the factors influencing the air travel demand like to know what makes people want to fly, how many people have jobs, and if people feel good spending money (has money) affects how many flights happen which means more people will take flights or vacation. Overall, the dataset provides a comprehensive record of air travel dynamics offering valuable insights for stakeholders in flying business. By analyzing temporal patterns and forecasting future demand, airlines and airports can plan better and keep everyone's travel smooth.

Research 2: Time Series Forecasting for Store Sales

Dataset: <https://www.kaggle.com/competitions/store-sales-time-series-forecasting>

Store sales data holds valuable insights about consumer preference (like to buy), purchasing patterns (when and what to buy), and market dynamics (market conditions). Time series forecasting uses this data to predict future sales, helping stores manage inventory, staff, marketing, and resources better. This leads to more profits and happier customers. It includes daily, weekly, or monthly sales figures. The key components: seasonality, trend, and randomness. Store sales data tells us what people buy each day, week, or month. It has three important parts: seasonality (like holiday sales), trend (if sales are going up or down over time), and randomness (unexpected changes). Approaches to predict sales is with the ARIMA model, which looks at past sales to guess future ones. Another way is exponential smoothing, which pays more attention to recent sales. Forecasting isn't always easy. Retailers have to deal with lots of other factors like the economy, competition, and weather. Also, the accuracy of forecasts depends on how good the past data is and which method we use. Even with challenges, forecasting helps stores plan better, sell more, and make customers happier.

Research 3: “Tesla Stock Price”

Dataset: <https://www.kaggle.com/code/tahaahmedt/tesla-stock-time-series-analysis>

The Tesla stock dataset has records of its prices over time, usually daily, weekly, or monthly. Each record shows the closing price at the end of a trading day. Analyzing this data helps us spot patterns and trends in Tesla's stock performance. Time series analysis breaks down the data into four parts: trend (long-term direction), seasonality (repeating patterns), cyclic variation (long-term ups and downs), and irregularities (random changes). Trend shows if the stock is generally going up, down, or staying steady. Seasonality is about regular patterns like daily, weekly, or monthly ups and downs. Analyzing Tesla's stock data shows different trends and patterns. There are long-term trends like growth, decline, or stability in the stock price. Seasonal patterns might come from things like quarterly earnings or new product launches. Short-term changes happen because of market feelings, news, or big economic shifts, and they make Tesla's stock price go up and down. Models help investors predict future trends and make smart choices. Techniques like the ARIMA model or machine learning can guess where Tesla's stock price is headed. Looking at past prices, volume, and other factors helps investors predict risks and opportunities. Understanding trends and patterns guides investment strategies and risk assessment. But analyzing stock data has challenges like data quality and picking the right model. External factors like regulations and tech changes also affect Tesla's stock. Despite challenges, time series analysis helps investors make smart choices and understand Tesla's stock better for their investments.

References:

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- [2] Hyndman, R. J., & Athanasopoulos, G. (2018). Forecasting: principles and practice. OTexts.
- [3] Makridakis, S., Spiliotis, E., & Assimakopoulos, V. (2020). The M4 Competition: 100,000 time series and 61 forecasting methods. International Journal of Forecasting, 36(1), 54-74.