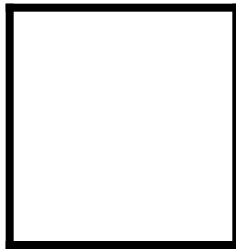


# **Emerging Technologies in CpE 2**

Assignment 12.1

## **Research for Deep Learning with Time-series Data**



Score

*Submitted by:*

**de Leon, Bryan Paul A  
CPE32S3**

*Date Submitted*

**May 8, 2024**

*Submitted to:*

**Engr. Roman Richard**

# PART 1: Study References

---

Title of the Study 1: **Big Data Analytics and Mining for Effective Visualization and Trends Forecasting of Crime Data**

Author: **Feng, Mingchen; Zheng, Jiangbin; Hussain, Amir; Li, Xiuxiu; Xi, Yue; et al.**

Date of Publication: **July 22 2019**

Title of Publication: **IEEE Access**

---

Title of the Study 2 : **Time-series Forecasting and Modelling for Food Demand Supply Chain Based on Regression Analysis**

Author: **Panda, Sandeep Kumar; Mohanty, Sachi Nandan**

Date of Publication: **April 11 2023**

Title of Publication: **IEEE Access**

---

Title of the Study 3 : **Deep Learning Technologies for Time Series Anomaly Detection in Healthcare: A Review**

Author: **Yang, Xue; Qi, Xuejun; Zhou, Xiabo**

Date of Publication: **October 19 2023**

Title of Publication: **IEEE Access**

---

## PART 2: Introduction

- Time Series is a sequential collection of data points gathered at specific time periods, it represents observations and measurements taken at regular intervals during a specified amount of time. Unlike regular data that we had grown accustomed to, time-series data maintains a clear chronological sequence, this allows the model to explore the underlying trends, seasonality and other time-dependent patterns that may otherwise not be observed in regular data. Moreover, as evident by the previous activities performed, time-series data exhibits autocorrelation, which means that each iteration of observation is influenced by the previous iteration. This relationship allows us to observe trends and observe whether the data is increasing or decreasing over the years, as well as observe whether a spike in data is dependent on the time of year. As such, it is a powerful tool for making predictions and forecasts.

## PART 3: Studies Review

### **A) Big Data Analytics and Mining for Effective Visualization and Trends Forecasting of Crime Data**

- As various cities specifically, Chicago, Philadelphia and San Francisco, continue towards rapid urbanization, their population also experiences exponential growth, however these factors also contribute to the rise of crime rates. With the rise of crime rates in various cities, it has become difficult to observe the underlying patterns, trends and relations within a large volume of crime data using conventional methods, this revelation has led to a deficit in resource deployment and decision making processes.
- With this, the paper aims to utilize big data analytics in order to extract the patterns within the data, as well as applying the necessary visualization tools to improve decision-making processes of police forces. It also aims to provide them insights into when crime rate is likely to increase
- The issue was addressed using exploratory data analysis and deep learning techniques on criminal data from San Francisco, Chicago and Philadelphia. Statistical analysis was first applied in order to extract features that were relevant to the study, the study then utilized the Prophet model as it outperformed the other models. After various testing and training, it was determined that 3 years worth of data resulted in the highest predictive accuracy.

## **B) Time-series Forecasting and Modelling for Food Demand Supply Chain Based on Regression Analysis**

- It has become integral for the food industry to accurately forecast product demand due to short shelf lives of many products, as inaccurate forecasting can lead to significant wastages and a substantial loss for the company. A dataset released by Genpact consisting of 4,500,00 entries and 15 features was utilized.
- In order to solve the given problem, the researchers first identified which features were most relevant to the study, this process involved comparing the effects of various factors on demand. Furthermore, these features were then used to train and evaluate several models, most notably LSTM and BiLSTM, these models were used to create a forecast depicting the number of orders or demand of a specific product.

## **C) Deep Learning Technologies for Time Series Anomaly Detection in Healthcare: A Review**

- With the rise of various advancements in medical technology, diagnosis and other processes have been streamlined exponentially, effectively increasing efficiency and reducing manual intervention albeit with higher reliability. Anomaly detection in healthcare is characterized by a noticeable spike in data, completely deviating from the other samples, this could often be a sign of an underlying health condition, such is the case for heart rate. If we were to gather heart rate from a patient at a specific interval and notice that a one iteration exhibits a spike in data, this could most likely mean that the patient has an underlying heart condition, this process effectively streamlines the diagnosis process.