CHAPTER1: INTRODUCTION

1.1 Introduction

Stock forecasting has long been a prominent topic in the field of finance research. The ability to accurately predict stock prices is crucial for investors, analysts and financial institutions. However, due to the uncertainty in stock price movements it is difficult to make a timely decision when to buy or sell stock in the market.

In the recent years with the advancement of AI, various research and studies have been carried out regarding stock forecasting. Plethora of machine learning models have been developed till now which can somewhat predict the direction of stock price movements. Deep learning models like CNN, RNN and LSTM have performed pretty well in providing stock price forecast. However, traditional architectures like CNN and RNN have limitations, such as information loss in CNN and gradient issues in RNN [1]. To get rid of these drawbacks, Vaswani et al. (2017) proposed an innovative deep learning architecture called Transformer, which uses the attention mechanism instead of traditional CNN and RNN frameworks and achieves great success in natural language processing (NLP) problems. Since Transformer model by itself is very new and only been rigorously use for NLP, it is not that well used for time-series data.

With the intent of exploring how Transformer performs on time-series data, transformer model is used on NEPSE stock data of different commercial banks. In addition to the open, high, close and volume features we have also included 55 other stock indicators such that the factors affecting the stock prices are well considered. LASSO and PCA are to perform dimension reduction on the multiple factors in the dataset. Then the dataset obtained from LASSO and PCA is fed to the model separately and the two models LASSO-Transformer and PCA-Transformer are compared.

1.2 Problem Statement

Predicting stock prices accurately is a tough job for investors and financial institutions. It requires finding the most important factors from large amounts of data and understanding how these factors affect prices over time. Traditional methods, like PCA-LSTM and optimized LSTM/GRU models, have been used to predict stock prices, but they have some issues [2]. These problems include the model becoming too specific to the training data (overfitting) and struggling to handle large datasets.

This project aims to solve these problems by developing and comparing two new models: LASSO-Transformer and PCA-Transformer. LASSO helps pick out the most important features, and PCA simplifies the data. Both are combined with the Transformer model, which is good at dealing with time-based data.

1.3 Objectives

The main aim of this project is to develop Stock Forecast System Using LASSO-Transformer and PCA-Transformer Models.

i. To create transformer model for stock forecast.

ii. To create a web interface that enables user to interact with the stock forecasting system.

1.4 Scope and Limitation

1.4.1 Scope

The scope of the project includes following:

i. The project focuses on developing a stock price prediction model using LASSO, PCA, and Transformer models.

ii. It works with historical stock data from selected companies (commercial banks) and evaluates prediction accuracy using MAPE.

iii. A simple web interface is included, allowing users to select a company and view predicted stock prices.

1.4.2 Limitation

The limitation of the project are as follows:

i. The model is trained on a limited dataset, so it may not generalize well to other companies or industries.

ii. Sudden market changes, such as economic crises, political changes are not accounted for in the model.

1.5 Development Methodology

Waterfall model as Software Development Life Cycle (SDLC) is utilized. This model is simple, as it requires completing each step before moving on to the next. Here's how the stock forecasting model is developed:

i. Requirement Analysis:

The project started by figuring out what was needed, such as gathering historical stock data and learning about different machine learning libraries to find the right tools for the job.

ii. System Design:

Once the requirements were clear, the next step was to design the system. This involved deciding how the data would flow and which models to use, specifically LASSO and PCA for dimension reduction and an Transformer models for making predictions. Simple diagrams were created to visualize how everything would connect.

iii. Implementation:

During this phase, the focus was on building the model. Stock data was collected, data preprocessed using LASSO and PCA and Transformer model were implemented. The model was trained on a few stock datasets to see how well it performed.

iv. Testing:

Even though the model is still a work in progress, some initial testing was done to ensure it functions correctly. This involved checking that the model could make predictions based on the data it received.

v. Future Steps:

Since the project isn't finished yet, the next steps will include developing a web interface so that user can interact with the system. Plans are in place to gather additional data and make improvements based on what has been learned during training.

vi. Documentation:

Documentation is also being prepared to help users understand how to use the model and what it can do once it is fully developed.

1.6 Report Organization

The organization of the report is as follows: Chapter 2 discusses the background study and literature review. Chapter 3 details the system analysis which includes requirement analysis and feasibility analysis. Chapter 4 describes system design and algorithm details. Chapter 4 discusses the work done and remaining works.