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BACHELOR THESIS

Develop a web application to interact with predictive algorithms about the stock market.

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Resumen

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Palabras clave

Abstract

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Introduction

In recent years, machine learning has improved to the point that is a very powerful tool to analyse and improve the performance and predictions about future events. It has been used by many institutions and individuals as it has plenty of use cases. For financial purposes has heavily increased in the past years. I end up searching about the use cases of machine learning in the stock market.

The stock market is huge financial market where publicly traded companies' stocks (shares) are bought and sold. It is one of the most important sources of capital for companies, and it allows many individual investors and institutions to buy and sell ownership stakes in publicly traded companies.

One of the main advantages of using machine learning for stock market predictions is its ability to process large amounts of data and identify patterns that may not be visible for the human eye.

Many people in the world invest in this type of asset. Most of them do it based on the financial company results or sometimes based on technical analysis.

1.1. Motivation

Stock market is laborious asset that requires time a deep understanding of the financial markets. More and more people are entering this sector and because of the vast amount of data available its learning curve is increasing constantly. A web-based interactive tool could help investors and non-experience individuals to learn about the effectiveness of prediction models and make more informed decisions. Additionally, the interactive web-based tool will provide an intuitive and user-friendly platform for users to interact with the predictions making it accessible for a large range of users.

1.2. Objectives

The goal of this work is to develop a web-based application tool to provide and interactive platform that allows users to learn about stock market predictions and make informed decisions using different machine learning prediction algorithms.

The main objectives are now described:

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- Obtain the minimum possible error compared to the actual closing price; it will be visualized through the web-based tool. Historical data will be used for these predictions.
- Provide different techniques to predict the stock market to improve the user decision-making with visual representations.
- Facilitate data analysis. The tool will allow users to filter, search and analyse different prediction models and compare their effectiveness based on various parameters. I will help users to understand the performance of different models and identify patterns and trends in the data that may not be immediately apparent to the human eye.
- The tool will be up to date as it uses data from financial APIs, it will allow to have an updated, providing accurate up-to-date predictions.

, search and analyse different prediction algorithm models and compare them by its effectiveness based on different parameters. The data used will be extracted from different financial API's. The project will be developed in a python environment using Django as the main framework.
happen

State of the art

<div style="text-align: right">2</div>

Machine learning techniques, like Long Short-term Memory (LSTM) networks, have been widely used in recent years for stock market predictions. LSTM networks are a type of recurrent neural network that is used mainly for times series data, like stock predictions. It can learn and remember past patterns in the data, making them very useful for predicting future trends.

Apart from LSTM networks, other studies have also used other machine learning techniques such as Random Forest and Gated Recurrent Unit (GRU)

In the following section, we will see the explanation if each of the technologies involved in the development of the project.

2.1. Machine Learning

The technology used for predictions is called "Machine Learning" it is a division of artificial intelligence and computer science that uses data and algorithms to generate an imitation to an analysis improving its accuracy.

2.1.1. Long Short-Term Memory neuronal network

Long Short-term Memory (LSTM) networks is a type of neural network (RNN) used for a variety of tasks, including stock market predictions, machine translation, speech recognition, and more. They are designed
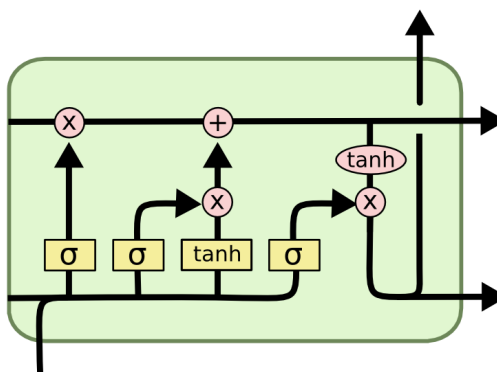

Figure 1: LSTM architecture

2.2. Python 3

Python is a popular, high-level programming language that is widely used for web develo

2.2.1. Framework Django

All code has been written on Django, it is one the most used frameworks in python 3.

2.2.2.

2.3. Alphavantage API

To get the data used as input of the neuronal network we will use [1].

In order to get the data of the times series, it is necessary to generate an API key.

2.4. Javascript

2.5. ChartJS

The library used to represent the stock predictions and price is ChartJS, it is a Javascript charting library that allows to customize and modify many graphs.

2.6. Matplot

2.7. Scikit learn

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<u>Analysis and Design</u>

This section will describe the design realised and the procedures

3.1 Deep Learning

There are different ways to try to predict the value of an asset. In this case, deep algorithms are used for the estimation. Inside of deep learning we find a variety of recurrent neural networks that are algorithms used for learning long term dependencies.

3.2 Datasets

The data provided for the development of the project as well as the data used to train the models to predict the future values of the company stock will be provided by [2]

3.3 Backend development

Python libraries

- **Tensorflow:** is an open-source library developed by Google for machine learning and artificial intelligence. It is used to train and deploy machine learning models.

- **Keras:** is an open-source software library that provides a Python interface of artificial neural networks.

- **Scikit-learn:** is an open-source Python library for machine learning. It provides a range of tools for tasks.

- **Numpy:** is a Python library that supports a large collection of high-level mathematical functions to operate multi-dimensional arrays and matrices.

-

3.4 Frontend development

For the front e

4

Implementation

Through this section, the development of the project will be described. It will be divided in different steps.

4.1 Introduction
The projects has been developed following a lean process. Starting from a first web version that worked with all the components of the project, from the API to the frontend development.

The most important part is the neuronal network used to predict the

4.2 Develop LSTM Model foreach stock

4.3 Backend development

4.4 Web development

4.5 User experience

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Testing and Results

In this section, we will go into detail on all the tests carried out including the development of results obtained.

Introduction

As we have mention, testing and results has been a very important role in the evolution of the project. Without testing different parameters and machine learning techniques, the results itself would not be as accurate as the obtained.

For this reason,

LSTM model tests

GRU model tests

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Conclusion

Bibliography

There are no sources in the current document.

[3] "Django." https://www.djangoproject.com/.

[4]   https://machinelearningmastery.com/gentle-introduction-long-short-term-memory-networks-experts/

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[1] "Alphavantage API," [Online]. Available: https://www.alphavantage.co/.

[2] [Online]. Available: https://www.alphavantage.co/.

Terminology

Appendices

A

Example of Alphavantage API response

Apéndice A