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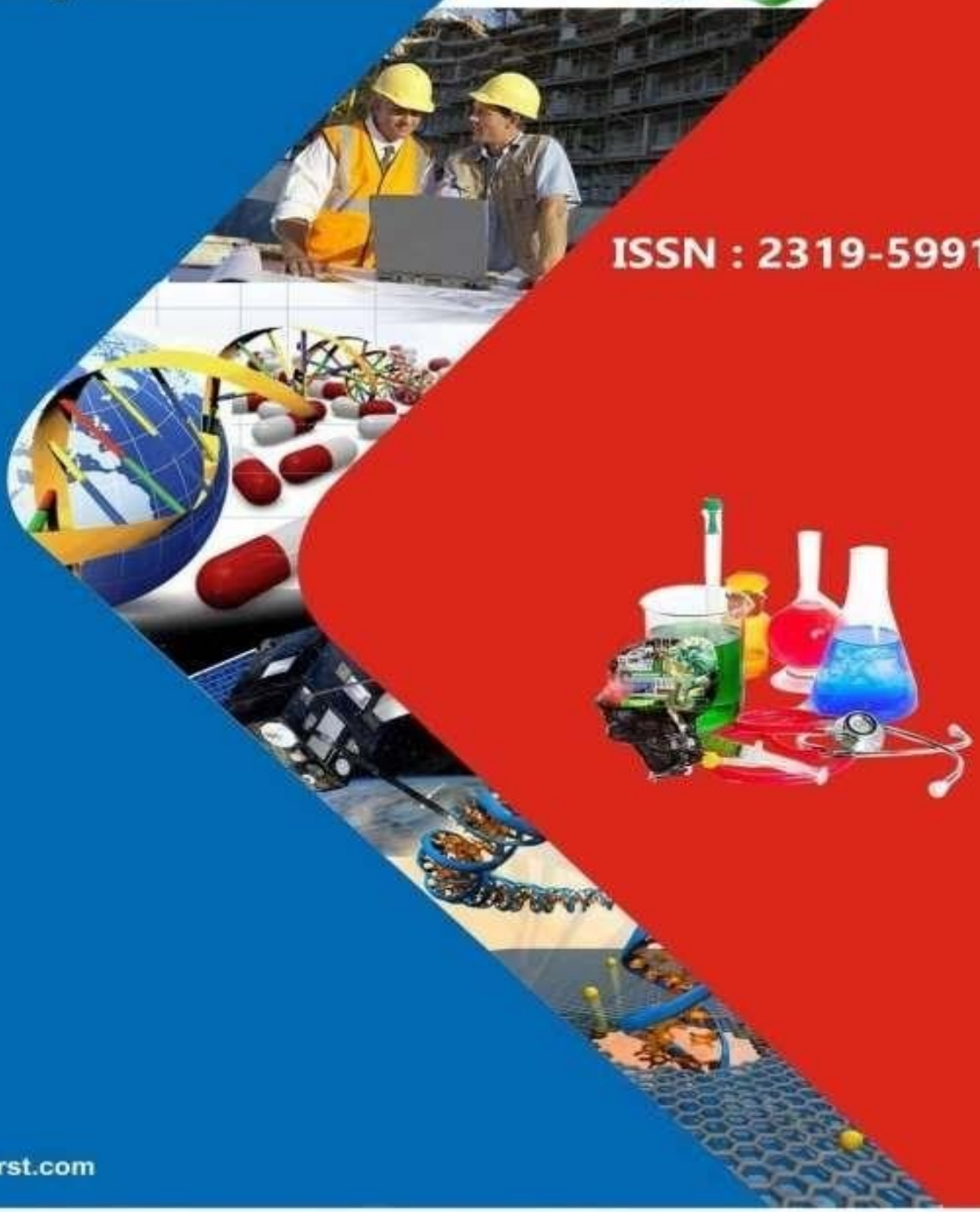

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Forecasting the future: Analysing Netflix Stock price

D. Vijaya Kumari[1], S. Akhila[2], I. Indira[3], N. Sasi Priyanka [4], G. Bhavani[5]

[1] Assistant Professor, Dept. of Computer Science & Engineering, Vijaya Institute of Technology for Women, Enikepadu, Vijayawada-521108

[2,3,4,5] Students, Dept. of Computer Science & Engineering, Vijaya Institute of Technology for Women, Enikepadu, Vijayawada-521108

Email id: kvijaya598@gmail.com[1], sanakaakhila053@gmail.com [2], 20np1a0544vitw@gmail.com [3], jhansisanampudi@gmail.com[4],

ABSTRACT

The primary objective of this research is to predict stock prices of Netflix for analyzing profit on day closing. The research predicts stock market as profit in form of a Chart using Python. The attributes include in the model are Date, Open, Close, High, Low, Volume and Adj Close. The profit of various years are calculated and shown in the form of graphs. This project explores using computer smarts to guess how Netflix's stock price might change. We'll try out different methods like finding similar past situations (KNN), drawing a best-fit line based on past data (linear regression), making a tree-like decision chart (decision tree), and finding a separation line in the data (SVM). We'll feed the computer historical stock prices and other relevant info to train these methods and see which one makes the most accurate predictions for Netflix's future stock price.

Keywords: Predicting Netflix Stock (NFLX), Machine Learning, Simple Math (Linear Regression), Finding Similarities (KNN), Making Choices (Decision Tree), Drawing Lines (SVM)

INTRODUCTION

Netflix is a combination of two words Net (Internet) and Flix (Flick used as an abbreviation for movie/film). In 1997, Netflix, in full Netflix, Inc., media streaming and video-rental company founded by American entrepreneurs Reed Hastings and Marc Randolph in Los Gatos California. In 1999, Netflix started its business by offering an online subscription service through the Internet. Netflix started a DVD-by-mail rental service which provided an online catalogue of movies. Subscribers chose movies and television shows from the Company's website, and the shows were then mailed to them in the form of DVDs, along with prepaid return envelopes, from one of the company's more than 100 distribution locations.

Predicting stock prices is a challenging task that has long fascinated investors, analysts, and researchers. Machine learning is a powerful tool that can be used to make predictions based on historical data, market trends, and other relevant factors. Netflix is a popular streaming service that has seen significant growth over the past few years. Its stock price has also been volatile, making it an interesting candidate for stock price prediction using machine learning. To make predictions about the future price of Netflix stock, we can use a variety of machine learning techniques, such as regression, time-series analysis, and deep learning. These techniques can be used to analyze historical stock prices, news articles, social media sentiment, and other factors that may affect the stock price. The accuracy of the predictions will depend on the quality and quantity of data used, as well as the complexity of the machine learning models employed.

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It's important to note that no model can accurately predict stock prices with 100% certainty, as there are always unforeseen events that can impact the market. Overall, machine learning can be a powerful tool for predicting stock prices, but it should always be used in conjunction with other forms of analysis and investment strategies. Netflix is one of the world's leading streaming entertainment services, offering a wide range of TV shows, movies, documentaries, and more. As a publicly traded company, its stock price can be subject to volatility and fluctuations based on various market and industry factors. Machine learning has emerged as a powerful tool for predicting stock prices, as it can analyze large amounts of data and learn complex patterns and relationships that may be difficult for humans to discern. By applying machine learning algorithms to historical stock price data, market trends, financial statements, news sentiment, and economic indicators, it may be possible to build predictive models that can forecast future Netflix stock prices.

LITERATURE SURVEY

Netflix founded in Scotts Valley, California, by Marc Randolph [1][2] and Reed Hastings, who previously had worked together at Pure Software. Netflix launches its website [3] with 925 titles available for rent through a traditional pay-per-rental model (50¢US per rental U.S. postage; late fees applied). Netflix launches its monthly subscription concept. Netflix offers itself for acquisition to Blockbuster for $50 million; however, Blockbuster declines the offer. Redbox is founded. It offers DVD rentals via automated retail kiosks. A year later, it poaches Mitch Lowe, who was a founding executive at Netflix.

Netflix started as a mail-in DVD business in 1996 with the invention of the DVD player. 1998 saw Netflix launch a website with less than 1,000 DVDs. 2000 saw Netflix launch a personalized movie recommendation system. The company used a user rating system to predict how much members would like a movie. The algorithm was called Cinematch, a collaborative filtering algorithm. It wasn't until Netflix, a Netflix company, launched its streaming service in 2007. It was a free add-on to the DVD-by-mail service. the first pure streaming service was launched in Canada in 2010. Until 2022, Netflix has been working on the ultimate personalization: that is, the customer turns on the TV and Netflix will magically play a movie, that the customer likes. Netflix's 20 years of growth cannot be separated from its strategic choices and algorithmic advancements, and the journey reflects Netflix's long- term commitment to building a personalized experience.

Netflix's largely subscription-based business model earns money through three simple plans: Basic, Standard, and Premium, with access to streaming series, movies, and shows. With the streaming platform, Netflix generated more than $202.1 billion in revenue in 29.6 years, with an operating income of more than $600 million and a net income of more than

$500 million. Since 2013, Netflix is shifting from primarily providing licenses within to the media giant which means primarily producing its own content. U.S. video streaming service provider Netflix rose more than 8 percent after hours on Tuesday after the company reported second-quarter 2022 earnings that showed it lost fewer paying subscribers than expected during the quarter. Netflix's revenue for the second quarter of 2022 was $7.970 billion, up 8.6 percent compared with $7.342 billion in the same period last year; net income was $1.441

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billion, up 6.5 percent compared with $1.353 billion in the same period last year; and diluted earnings per share were $

Existing system

Time series forecasting consists of a research area designed to solve various problems, mainly in the financial area Support vector regression (SVR), a variant of the SVM, is typically used to solve nonlinear regression problems by constructing the input output mapping function. The least squares support vector regression (LSSVR) algorithm is a further development of SVR and its use considerably reduces computational complexity and increases efficiency compared to standard SVR. Predicting stock prices is a complex task that requires a combination of technical analysis, fundamental analysis, and market sentiment analysis. Machine learning algorithms can be used to Analyse past trends and patterns in the stock market data, and make predictions based on these patterns. However, it is important to note that stock prices are influenced by a wide range of factors, including market trends, economic indicators, company performance, and global events, among others, and machine learning models may not be able to capture all of these factors

Proposed System:

Proposed System To generalize the application of the existing system, our work uses the system to estimate other stocks in similar emerging markets and mature markets The system can be extended to analyze multivariate time series data and import raw dataset directly. This project proposes a system for predicting Netflix stock price movements using machine learning techniques. The system will leverage historical data, potentially incorporating external factors, to forecast future trends and provide valuable insights for investors and financial analysts. This section explains the six-step proposed methods to predict the stock trend based on profit for up to last year.

METHODOLOGY

When developing a classifier using various functions from different classifiers, it is important to compare the performances of the classifiers. Simulation results can provide us with direct comparison results for the classifiers with a statistical analysis of the objective functions. The hybrid KNN-Probabilistic model was compared with the supervised learning and classification algorithms, including ‘KNN’, ‘Naïve Bayes’, ‘OneR’ and ‘ZeroR’

Data Collection

The dataset used for this work was collected from Kaggle site for four years (from 5 Feb., 2018 to 4DEc. 2023). The data consist of 1009 instances and 7 features: date, the highest price of the day, the lowest price of the day, open price, close price, volume and adjacent close price.
DATA SETS:

- Date: Everyday Netflix stock price
- Open: Price at which Netflix stock is opened
- High: The highest price at which Netflix stock traded during the trading day
- Low: The lowest price at which Netflix stock trades over a trading day
- Close: The last price at which Netflix stock trades during a trading day
- Adj Close: The closing price of Netflix stock after paying off dividends and/ or capital gain distributions
- Volume: Volume of stock traded during a trading day

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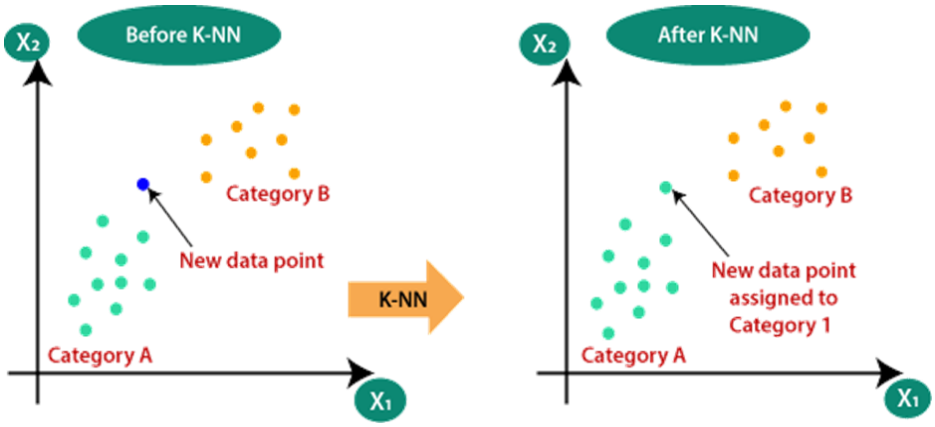
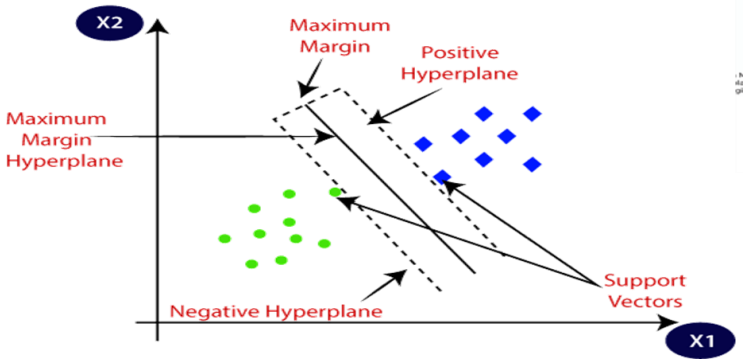
K-Nearest Neighbors Classifier:

The KNN algorithm is used to measure the distance between the given test instance and all the instances in the data set, this is done by choosing the 'k' closest instances and then predict the class value based on these nearest neighbors. The 'k' is assigned as number of neighbors voting on the test instance. As such KNN is often referred to as case-based learning or an instance- based learning where each training instance is a case from the problem domain. KNN is also referred to as a lazy learning algorithm due to the fact that there is no learning of the model required and all of the computation works happen at the time a prediction is requested.



Support Vector Machine:

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.



Decision Tree Learning

For general use, decision trees are employed to visually represent decisions and show or inform decision making. When working with machine learning and data mining, decision trees are used as a predictive model. These models map observations about data to conclusions about the data's target value. The goal of decision tree learning is to create a model that will predict the value of a target based on input variables.

RESULTS AND DISCUSSION

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The proposed model was tested and compared with four other standard algorithms, including KNN, SVM, Decision Tree and Linear Regression. The test examined how accurate the tested algorithms predict the stock price trends, and evaluated the MAE, MSE and RMSE. Table presents the test results. The Linear Regression model has allow to get 100% accuracy and the Decision Tree accuracy of 99.98%. The accuracy rates for SVM and KNN classifiers were 99.94% and 82.38% respectively. Linear Regression model has MAE rate of 0.0%, MSE rate of 0.0% and RMSE rate of 0.0% by using all Classifiers linear regression only give the full Accuracy

Table: Prediction Results of Classifiers

Classifier	Accuracy (%)	MAE	MSE	RMSE
KNN	82.38	71.322	8114.307	90.0794
SVM	99.94	2.0347	7.7504	2.7839
Decision Tree	99.98	0.5734	2.5268	1.5896
Linear Regression	100.0	0.0	0.0	0.0

Discussing Netflix's stock price using various machine learning algorithms like Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Linear Regression, and Decision Tree can provide valuable insights into predicting and understanding stock price movements. Each algorithm has its strengths and weaknesses, and when applied to stock price prediction, they can offer different perspectives on the data. Support Vector Machine (SVM) is a powerful algorithm commonly used for classification and regression tasks. In the context of Netflix's stock price, SVM can be utilized to classify the stock price movement as either bullish (increase) or bearish (decrease) based on historical data features. SVM aims to find the optimal hyperplane that best separates the data points into different classes, making it useful for predicting stock price trends

IMPLEMENTATION

- **Data Collection:** Modules for collecting historical stock price data, financial indicators, and other relevant data sources such as APIs, web scraping tools, or financial databases.
- **Data Preprocessing:** Modules for cleaning and preparing the data for analysis, including handling missing values, scaling features, and encoding categorical variables.
- **Feature Engineering:** Modules for creating new features or transforming existing features to improve the performance of machine learning models.
- **Model Selection**: Modules for selecting the appropriate machine learning algorithms for predicting stock prices, such as linear regression, random forests, or neural networks.
- **Model Training:** Modules for training the selected machine learning models on the historical data to learn patterns and relationships.
- **Model Evaluation:** Modules for evaluating the performance of the trained models using metrics like mean squared error, accuracy, or precision-recall curves.
- **Prediction:** Modules for making predictions on future stock prices based on the trained machine learning models.

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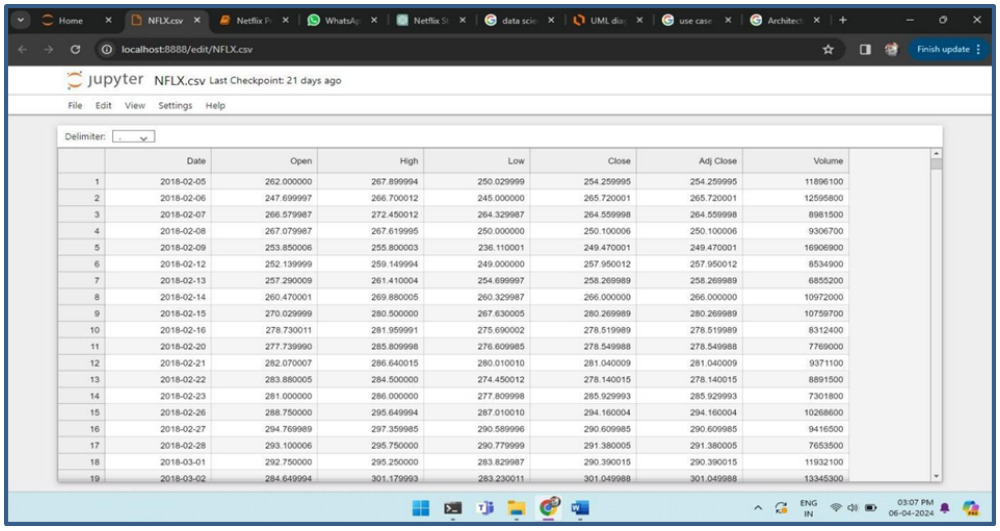

	Date	Open	High	Low	Close	Adj Close	Volume
1	2018-02-05	262.000000	267.899994	250.029999	254.259995	254.259995	11896100
2	2018-02-06	247.699997	266.700012	245.000000	265.720001	265.720001	12595800
3	2018-02-07	266.579987	272.450012	264.329987	264.559998	264.559998	8981500
4	2018-02-08	267.079987	267.619995	250.000000	250.100006	250.100006	9306700
5	2018-02-09	253.850006	255.800003	236.110001	249.470001	249.470001	16906900
6	2018-02-12	252.139999	259.149994	249.000000	257.950012	257.950012	8534900
7	2018-02-13	257.290009	261.410004	254.699997	258.269989	258.269989	6855200
8	2018-02-14	260.470001	269.880005	260.329987	266.000000	266.000000	10972000
9	2018-02-15	270.029999	280.500000	267.630005	280.269989	280.269989	10759700
10	2018-02-16	278.730011	281.959991	275.690002	278.519989	278.519989	8312400
11	2018-02-20	277.739990	285.809998	276.609985	278.549988	278.549988	7769000
12	2018-02-21	282.070007	286.640015	280.010010	281.040009	281.040009	9371100
13	2018-02-22	283.880005	284.500000	274.450012	278.140015	278.140015	8891500
14	2018-02-23	281.000000	286.000000	277.809998	285.929993	285.929993	7301800
15	2018-02-26	288.750000	295.649994	287.010010	294.160004	294.160004	10268600
16	2018-02-27	294.769989	297.359985	290.589996	290.609985	290.609985	9416500
17	2018-02-28	293.100006	295.750000	290.779999	291.380005	291.380005	7653500
18	2018-03-01	292.750000	295.250000	283.829987	290.390015	290.390015	11932100
19	2018-03-02	284.649994	301.179993	283.230011	301.049988	301.049988	13345300

Figure: NFLX dataset

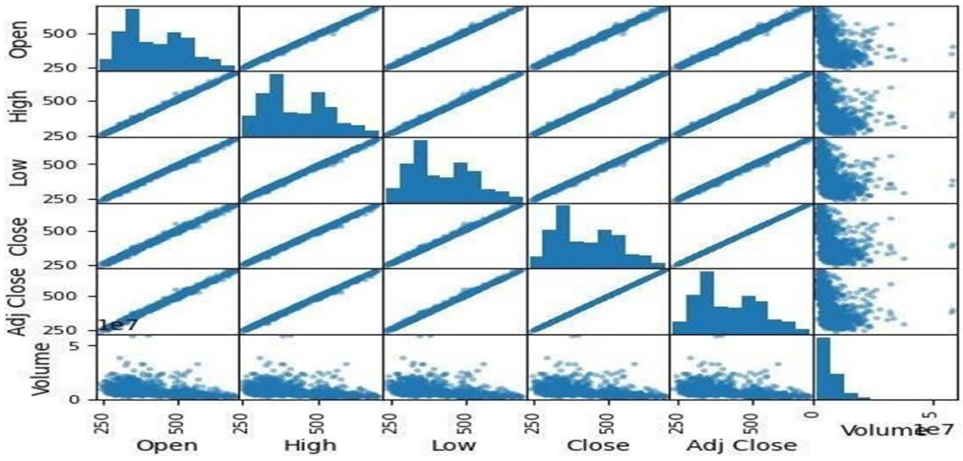

Figure: Boxplot

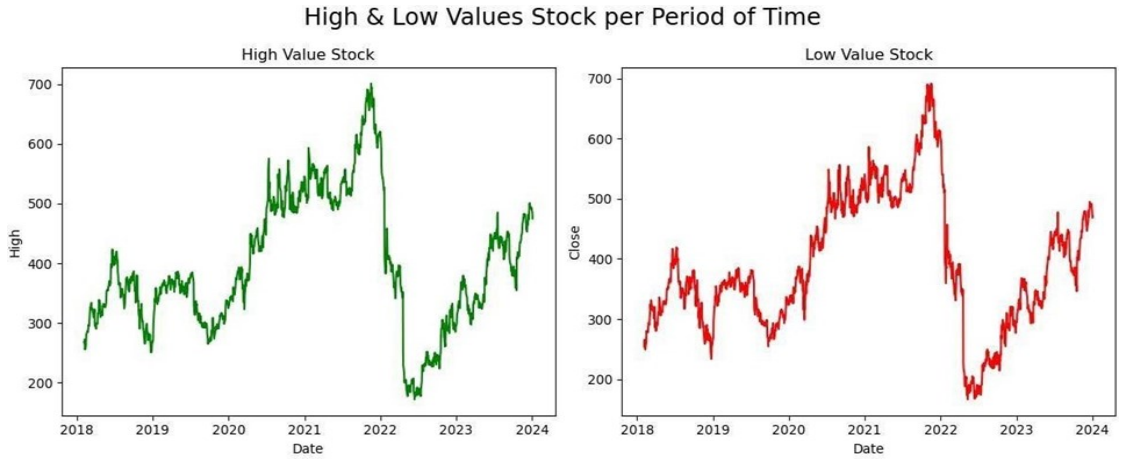

Figure: High &low values stock period

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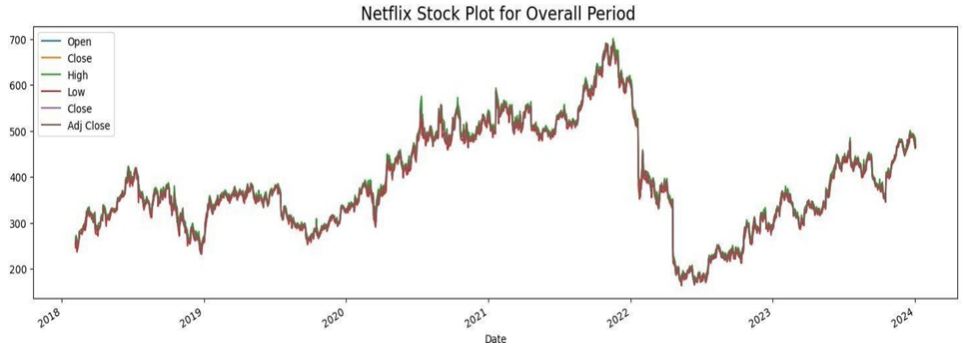

Figure: Netflix Stock plot for overall period

```
Mean Absolute Error: 4.6151
Mean Squared Error: 53.3243
Root Mean Squared Error: 7.3023
(R^2) Score: 0.9953
Train Score : 99.71% and Test Score : 99.53% using KNN.
Accuracy: 98.89 %.
```

Figure: KNN model accuracy

```
Mean Absolute Error: 2.0347
Mean Squared Error: 7.7504
Root Mean Squared Error: 2.7839
(R^2) Score: 0.9993
Train Score : 99.94% and Test Score : 99.93% using Support Vector Machine.
Accuracy: 99.52 %.
```

Figure: SVM model accuracy

```
Mean Absolute Error: 0.8023
Mean Squared Error: 4.9505
Root Mean Squared Error: 2.225
(R^2) Score: 0.9996
Train Score : 100.00% and Test Score : 99.96% using Decision Tree.
Accuracy: 99.83 %.
```

Figure: Decision tree model accuracy

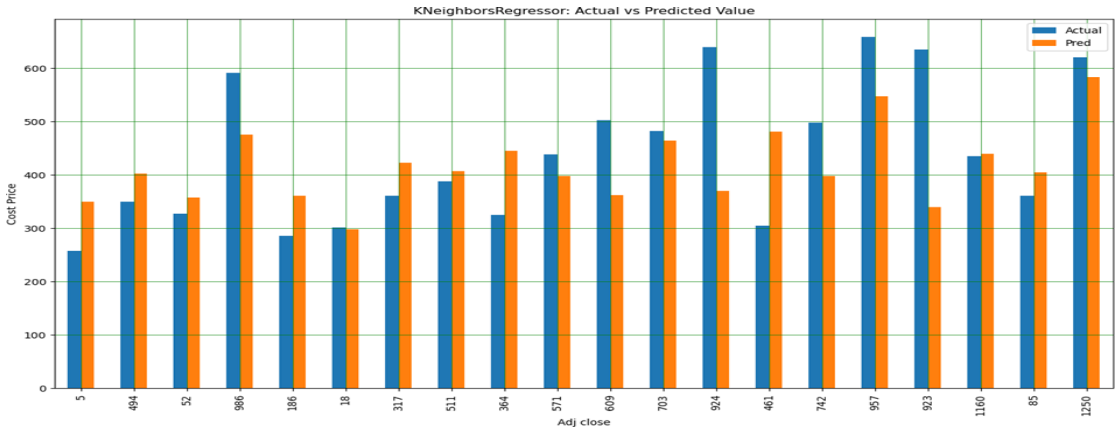

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Figure: KNN output Bar graph

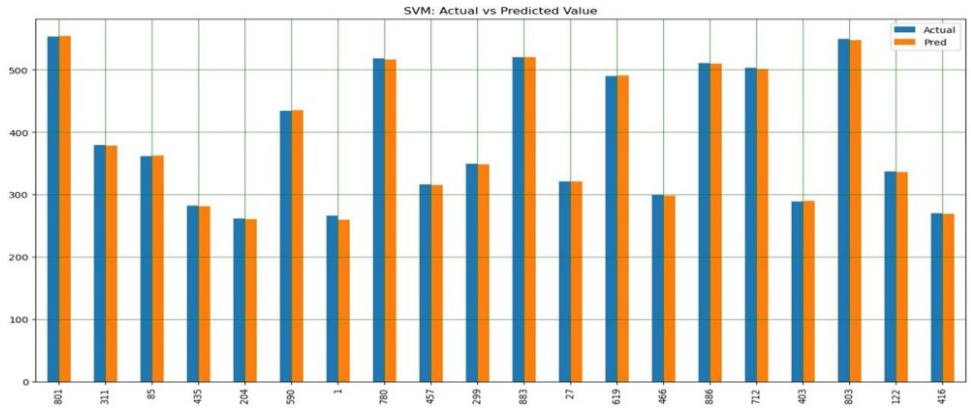

Figure: SVM output Bar graph

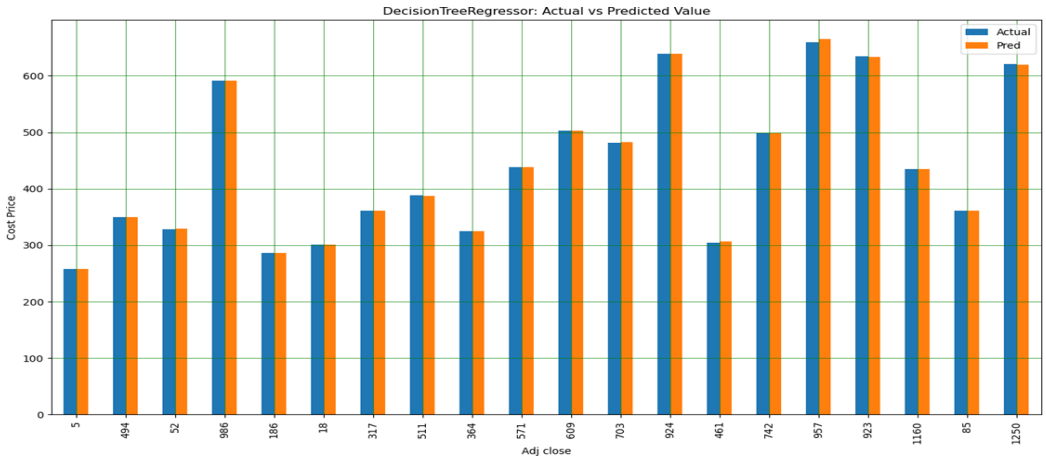

Figure: Decision Output Bar graph

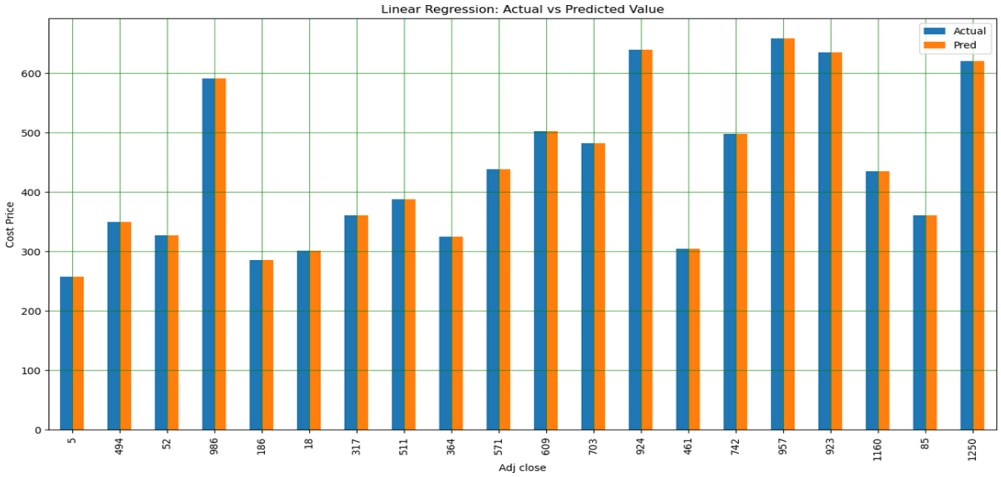

Figure: Linear Output Bar graph

Conclusion

Analysing Netflix stock prices is a multifaceted process that requires the integration of various methodologies, techniques, and technologies. Through this project, we have explored different aspects of analysing Netflix stock prices, including data retrieval, pre-processing, analysis, visualization, and

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reporting. By leveraging machine learning algorithms, statistical techniques, and financial analysis methods, we can gain valuable insights in to the performance of Netflix stock and make informed investment decisions. Throughout the project, we have implemented a systematic approach to analysing Netflix stock prices, including gathering historical data from financial databases, pre-processing the data to clean and format it for analysis, applying machine learning algorithms and statistical models to identify trends and patterns, visualizing the analysis results using charts and graphs, and generating reports summarizing the findings. We have also considered various factors and considerations, such as fundamental analysis, technical analysis, market sentiment, and external factors, that can impact Netflix stock prices. By incorporating these factors into our analysis, we can obtain a comprehensive understanding of the factors driving Netflix's performance in the stock market.

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