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Financial Trend Forecasting using Support Vector Machine (SVM)

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ABSTRACT: Financial market prediction plays a big role in financial analysis. Traditional methods depend a lot on fundamental & technical analysis. But now, machine learning (ML) methods like Support Vector Machines (SVM) show better success in predicting financial data trends. This project shares a prediction system that uses SVM along with a real-time dashboard. It uses both historical data and live financial data info, giving real-time updates on predictions. Plus, it presents insights through an easy- to-use web interface. This system helps improve decision- making by using dynamic visuals & automation, which cuts down on manual work and makes forecasts more reliable.

KEYWORDS: Financial market Prediction, Support Vector Machine, Machine Learning, Real-Time Data, Financial Forecasting, Dashboard Interface

I. INTRODUCTION

The financial market is always changing. Many factors affect it, including economic, political, & psychological ones. Traditional prediction models don't keep up well with fast market changes. Thanks to machine learning, we now have better models that adapt and predict more accurately. This paper looks at how Support Vector Machines (SVM) can help forecast financial trends, aiming to create better strategies for investment.

II. LITERATURE SURVEY

1. Jabed, M. I. K. (2024), "Financial Market Price Forecasting Using Machine Learning

2. Pathak, P. (2024), "Financial Market Forecasting Using Machine Learning.

3. Yu, Q. (2024), "Financial Trend Forecasting and Comparative Analysis Using

4. Verdickt, G., & Stradi, F. (2024), "Algorithmic Analyst Aversion

5. Phillips, T., & Kobor, A. (2024), "Simplifying Forecasts of Decade-Long Financial Market Returns

6. Li, X., & Zhang, Y. (2023), "Emerging Trends in AI-Based Financial Market Prediction

III. PROPOSED METHODOLOGY AND DISCUSSION

This project uses SVM to predict financial trends from past data. It employs Python tools like yfinance, pandas, scikitlearn, & Flask for a real-time dashboard. The method covers data gathering, preprocessing using MinMaxScaler, training the SVM model, and deploying it on a web platform. Users can simply input a financial data symbol to see future price predictions. These predictions are shown with the help of matplotlib.



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System Architecture:

System Architecture



Figure: 3.1 System Architecture

Here's how it works: The user starts by interacting with the system through a friendly user interface. They can enter data or ask for financial trend predictions. Once they submit their input, it goes through a cleaning step. This step helps format the data for analysis. Additionally, historical financial data information is utilized to improve the prediction process. After cleaning, the data moves to feature extraction where important features for predicting financial trends are picked out. These features then go to an SVM (Support Vector Machine) model that learns from the historic data, spotting patterns & trends. After learning, the model predicts future financial trends based on what the user entered. In the end, users see the predicted values as financial data output.

Process Flow

This project begins with the user logging in or registering. After logging in, the user selects a financial instrument (like a stock), sets a date range, and chooses the features they want to analyze, such as open price, close price, or volume. The system then fetches historical data, cleans it, and splits it into training and testing sets. After scaling the data, the Support Vector Machine (SVM) model is trained and validated. If the accuracy is good, the model predicts future trends and displays the results on a user-friendly dashboard. Otherwise, the model is adjusted and retrained for better performance.



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III. METHODOLOGY

The method for predicting financial trends starts with the user giving input through an easy-to-use interface. They might pick a financial data or type in a symbol. This input gets combined with historical market data, which is then preprocessed. This means handling missing information, removing noise, & making sure values are consistent. From this cleaned-up data,

Implementation

The frontend is made with HTML & Flask templates. Over on the backend, it handles fetching data & prediction logic. The SVM model uses a special RBF kernel. This is perfect for nonlinear relationships, especially in time-series data. Now, the system is designed like a client-server model. So, when users give inputs, the server works on them. It then generates predictions and shows them with visual graphs.

Discussion

This project demonstrates the practical use of machine learning, specifically Support Vector Machine (SVM), in predicting financial trends based on historical data. The approach offers a structured way to forecast future prices using key parameters such as Open, Close, and Volume. Unlike traditional methods, which rely heavily on manual analysis and static models, this system adapts better to data patterns and user-defined inputs.

The integration of a Streamlit-based interface makes the tool user-friendly and accessible, allowing users to visualize predictions and make informed decisions. However, the accuracy of predictions can vary based on market volatility and the quality of data. There is potential to enhance the model by combining SVM with other techniques like LSTM, or by incorporating external indicators such as news sentiment or economic events..

IV. EXPERIMENTAL RESULTS

The dashboard offers a simple interface for forecasting financial trends using machine learning. It shows predicted prices, key market stats, and evaluation metrics like MAE and RMSE. With visual graphs of past and future data, it helps users easily understand market movements and make informed decisions.



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Figure: 4.1 TSLA Stock Dashboard

The forecast section of the dashboard displays a detailed graph of TSLA's historical prices along with predicted future values. This visual representation helps users clearly track the price trend and understand how the model anticipates future movements based on past data.



Figure: 4.2 TSLA Forecast



Figure: 4.3 Zoomed Forecast



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lext Predictions	
Date	Predicted Price
2025-04-18	\$241.49
2025-04-19	\$241.42
2025-04-20	\$241.37
025-04-21	\$241,31
025-04-22	\$241,26
025-04-23	\$241,21
025-04-24	\$241.16
025-04-25	\$241.12

Figure: 4.4 Next Predictions

The TSLA financial data prediction system thinks the price will be \$241.12 on April 25, 2025. That's a high accuracy of 94.73%. The system shows it has a Mean Absolute Error (MAE) of 1.26 & an RMSE of 1.54, which means it works well. Right now, the closing price is \$239.32. The system believes the financial trend will go up steadily over the next few days. There are graphs that make it easy to see the difference between past and predicted prices. The forecast table lists daily predictions from April 18 to April 25. It shows a slow increase from \$241.49 to \$241.12.

V. CONCLUSION AND FUTURE WORK

This project shows that Support Vector Machines (SVM), especially with the RBF kernel, can predict financial trends fairly well for short to medium-term forecasts. By using feature scaling & preparing data well, the system gives good results. The web interface is user-friendly, making these complex financial data predictions simple to understand. Performance metrics & visual graphs allow users to check how good the predictions are, making the system useful for investors

There's room for improvement! Adding more features would help, like trading volume, technical indicators, & sentiment analysis. We could also make it more accurate by mixing SVM with other models like LSTM or Random Forest. Future versions might have real-time updates, custom alerts, and portfolio tracking. A mobile app would be great for providing users with instant access to predictions, alerts, and their investment performance on the go.

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