Report
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Stock Price Forecasting Analysis Report
Introduction:

This section was done by Shayan

This report presents a comprehensive analysis of various techniques used for stock price forecasting. The analysis employs a dataset of preprocessed stock market data to demonstrate the effectiveness of different forecasting methods. The methods covered in this report include:

Autoregressive Integrated Moving Average (ARIMA) Model
Seasonal Autoregressive Integrated Moving-Average with Exogenous Regressors (SARIMAX) Model
Exponential Smoothing (ETS) Model
Prophet Model
Support Vector Regression (SVR)
Long Short-Term Memory (LSTM) Neural Network
Hybrid ARIMA-ANN Model
Each section provides a detailed explanation of the methodology, implementation, and evaluation of the respective forecasting technique.

1. ARIMA Model

Methodology
The ARIMA model is a widely used method for time series forecasting. It comprises three components: Autoregression (AR), Differencing (I), and Moving Average (MA). The parameters of the ARIMA model are determined based on the autocorrelation and partial autocorrelation functions of the time series data.

Implementation
The implementation involves fitting an ARIMA model to the preprocessed data. The stationarity of the time series is ensured by differencing. The model is then trained, and forecasts are generated for future time steps.

Results
The ARIMA model's performance is evaluated using Mean Squared Error (MSE) and Mean Absolute Error (MAE) metrics.

2. SARIMA Model
Methodology
SARIMAX extends the ARIMA model to incorporate seasonality and exogenous variables. It is suitable for time series data with seasonal patterns.

Implementation
The implementation includes seasonal differencing to remove seasonality and fitting a SARIMAX model to the data. Forecasting is performed, considering both the seasonal and non-seasonal components.

Results
The accuracy of the SARIMAX model is assessed using RMSE (Root Mean Squared Error) metric.

3. ETS Model
Methodology
Exponential Smoothing (ETS) is a technique that assigns exponentially decreasing weights to past observations. It is useful for forecasting data with trends and seasonality.

Implementation
The ETS model is fitted to the training data, and forecasts are generated for future time periods.

Results
The accuracy of the ETS model is evaluated using RMSE.

4. Prophet Model
Methodology
Prophet is a forecasting tool developed by Facebook. It models time series data with multiple seasonality components using an additive model.

Implementation
The Prophet model is trained on the dataset, and forecasts are generated for future time intervals.

Results
The forecast generated by the Prophet model is visualized to assess its performance.

5. SVR Model
Methodology

Support Vector Regression (SVR) is a supervised learning algorithm used for regression tasks. It works by mapping input data into a high-dimensional feature space and finding the hyperplane that best separates the output values.

Implementation
The SVR model is trained on the preprocessed data, and predictions are made for future time steps. Cross-validation is performed to evaluate the model's performance.

Results
The Mean Squared Error (MSE) metric is used to assess the SVR model's accuracy.

6. LSTM Neural Network
Methodology
Long Short-Term Memory (LSTM) is a type of recurrent neural network (RNN) architecture capable of learning long-term dependencies. It is suitable for sequential data like time series.

Implementation
An LSTM model is designed and trained on the preprocessed data. The model's performance is evaluated using both quantitative metrics and visual inspection of the forecast.

Results
The Mean Squared Error (MSE) metric is used to evaluate the LSTM model's accuracy.

7. Hybrid ARIMA-ANN Model
Methodology
The Hybrid ARIMA-ANN model combines the strengths of both the ARIMA and Artificial Neural Network (ANN) models. ARIMA is used to forecast the trend, while an ANN is employed to capture the residuals.

Implementation
The ARIMA model is trained on the dataset, and the residuals are extracted. An ANN model is then trained on the residuals to generate refined forecasts.

Results
The performance of the Hybrid ARIMA-ANN model is evaluated using Mean Squared Error (MSE) and Mean Absolute Error (MAE) metrics.

Conclusion
In conclusion, this report provides a detailed analysis of various techniques for stock price forecasting. Each method offers unique advantages and is suitable for different types of data and forecasting requirements. By comparing the results of different models, stakeholders can make informed decisions regarding the most suitable forecasting approach for their specific needs.

WEB

This section was done by Hamza

The Sector Forecasting System is a web application designed to facilitate the analysis and visualization of forecasting models for different sectors. The system allows users to select a sector of interest (Finance, Energy, or Environmental) and explore various forecasting models available for that sector. Each sector offers a range of models, including ARIMA, ETS, Hybrid ANN, LSTM, Prophet, SARIMA, and SVR.

Functionality Overview
Sector Selection
Users can choose the sector they want to analyze from the sidebar. The available sectors are Finance, Energy, and Environmental.

Model Selection
After selecting a sector, users can choose from a variety of forecasting models specific to that sector. The available models are displayed in a dropdown menu in the sidebar.

Display of Forecasting Results
Based on the selected sector and model, the system displays relevant forecasting results in the main section of the application. This includes ACF and PACF plots, forecasted values, and training/validation loss for ANN models.

Detailed Analysis by Sector
Finance Sector
Forecasting Models
ARIMA: ACF and PACF plots of the ARIMA model, forecasted values.
ETS: ETS forecast plot.
Hybrid ANN: Hybrid ANN forecast plot.
LSTM: LSTM forecast plot.
Prophet: Prophet forecast plot.
SARIMA: ACF and PACF plot of the SARIMA model.
SVR: SVR forecast plot.
Training and Validation Loss (ANN)
The application also provides a visualization of the training and validation loss for ANN models in the Finance sector.

Energy Sector
Forecasting Models

ARIMA: ACF and PACF plots of the ARIMA model, forecasted values.
ETS: ETS forecast plot.
Hybrid ANN: Hybrid ANN forecast plot.
LSTM: LSTM forecast plot.
Prophet: Prophet forecast plot.
SARIMA: ACF and PACF plot of the SARIMA model.
SVR: SVR forecast plot.
Training and Validation Loss (ANN)
Similar to the Finance sector, the application includes a visualization of the training and validation loss for ANN models in the Energy sector.

Environmental Sector
Forecasting Models
ARIMA: ACF and PACF plots of the ARIMA model, forecasted values.
ETS: ETS forecast plot.
Hybrid ANN: Hybrid ANN forecast plot.
LSTM: LSTM forecast plot.
Prophet: Prophet forecast plot.
SARIMA: ACF and PACF plot of the SARIMA model.
SVR: SVR forecast plot.
Training and Validation Loss (ANN)
Lastly, users can explore the training and validation loss for ANN models in the Environmental sector.

Conclusion
The Sector Forecasting System provides a user-friendly interface for exploring and comparing forecasting models across different sectors. By enabling users to visualize and analyze various models, the system facilitates informed decision-making and enhances understanding of forecasting techniques in specific sectors.