# Multiple Stock Price Prediction Using GRU


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# Introduction

**Objective**

- "The goal of this project is to build a predictive model that forecasts the next day's closing price for selected stocks using historical data."
- Mention that the model leverages deep learning (GRU neural networks) to learn from historical trends and patterns in stock prices.

**Why Stock Price Prediction?**

- Importance for Stakeholders:
  - Accurate stock predictions can guide investors, financial analysts, and portfolio managers in making informed decisions.
- Market Insight: Stock prices are affected by various factors, including market trends, economic indicators, and company performance.
- By using a deep learning model, this project aims to capture complex patterns and dependencies within stock price data.

# Problem Statement

Stock price prediction is challenging due to the volatility and complexity of financial markets, which traditional methods struggle to model effectively. This project leverages Gated Recurrent Units (GRU), a type of Recurrent Neural Network (RNN), to better capture sequential patterns in stock price data for improved forecasting.

The goal is to develop a predictive model using historical stock data, deployed as a user-friendly Streamlit web app. This application enables users to input stock ticker symbols for real-time price predictions, helping investors and analysts make informed decisions through an accessible AI-driven tool.

# Database

1.Data Source:
- Yahoo Finance:
  - The historical stock price data is sourced from Yahoo Finance, a trusted provider of financial market data, ensuring accuracy and accessibility.
  - This data is regularly updated, providing a comprehensive and up-to-date record of stock prices for major companies.

2. Key Data Features:
- Closing Prices:
  - The closing price of a stock, representing the last price at which the stock traded at the end of the trading day.
  - Chosen as the primary indicator for prediction due to its relevance in reflecting market sentiment and value at the end of each day.
- Additional Features (if available):
  - Open, High, Low, Volume: These features may be included if further prediction capabilities or analysis are needed in future model updates.

3. Data Range:
- Time Period:
  - Data covers a significant historical range from January 2010 to January 2023.
  - This long-term dataset enables the model to recognize both short-term patterns and long-term trends, enhancing predictive accuracy.

# Data Preprocessing & Model Architecture

## 01

Scaling with MinMaxScaler:
The MinMaxScaler was applied to normalize the closing price values, scaling them between 0 and 1. This transformation ensures all data points fall within a consistent range, which improves the GRU model's efficiency in learning patterns and accelerates the convergence during training.

## 02

Sequence Creation and Train/Test Split:
A sequence length of 60 days was set, where each 60-day window is used as the input to predict the stock price on the following day. This sequence captures time-dependent patterns in stock prices. The data is split 80% for training and 20% for testing, allowing the model to learn from the majority of the data while reserving the rest for evaluating predictive accuracy on unseen data.

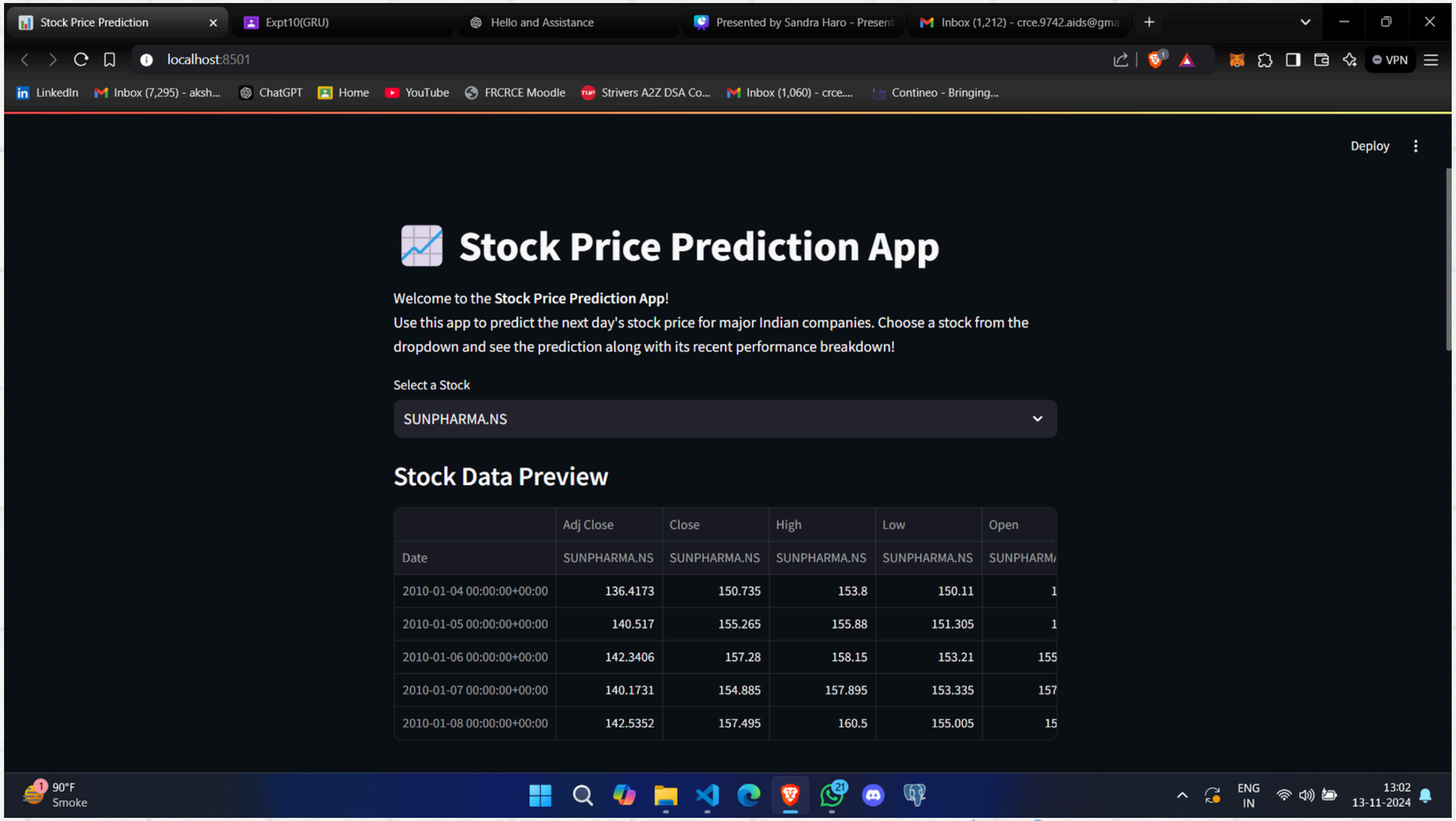
## 03

GRU Model for Time Series Prediction:
The GRU (Gated Recurrent Unit) is ideal for time series forecasting due to its ability to capture sequential dependencies efficiently, making it effective in modeling trends in stock prices while being computationally efficient.

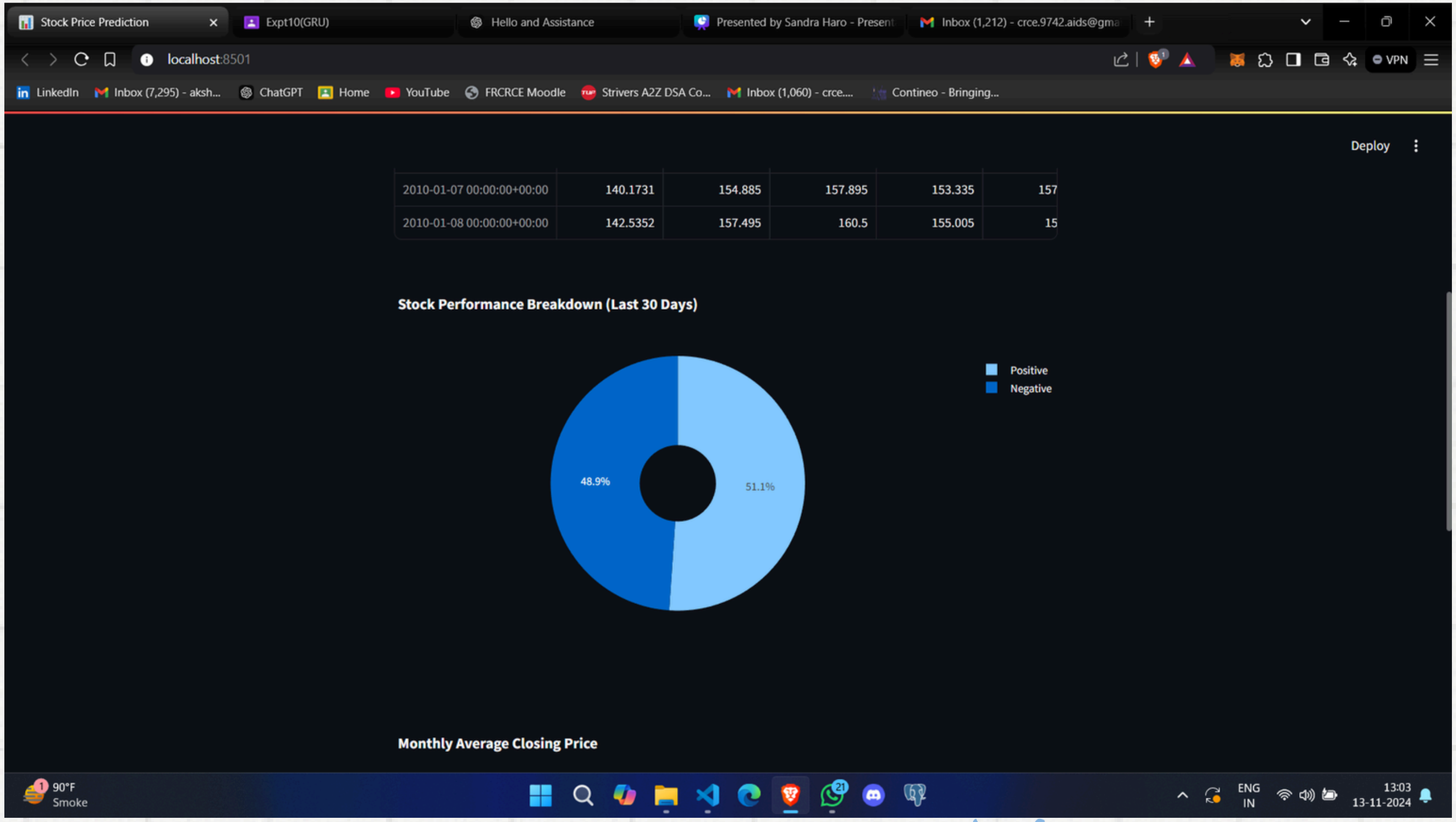
## 04

Model Structure and Training:
The model includes GRU layers with 50 units each to capture temporal patterns, Dropout layers to reduce overfitting, and a final Dense layer to generate the predicted stock price. It uses the Mean Squared Error (MSE) as the loss function for optimized error reduction during training.

# Implementation



# Implementation



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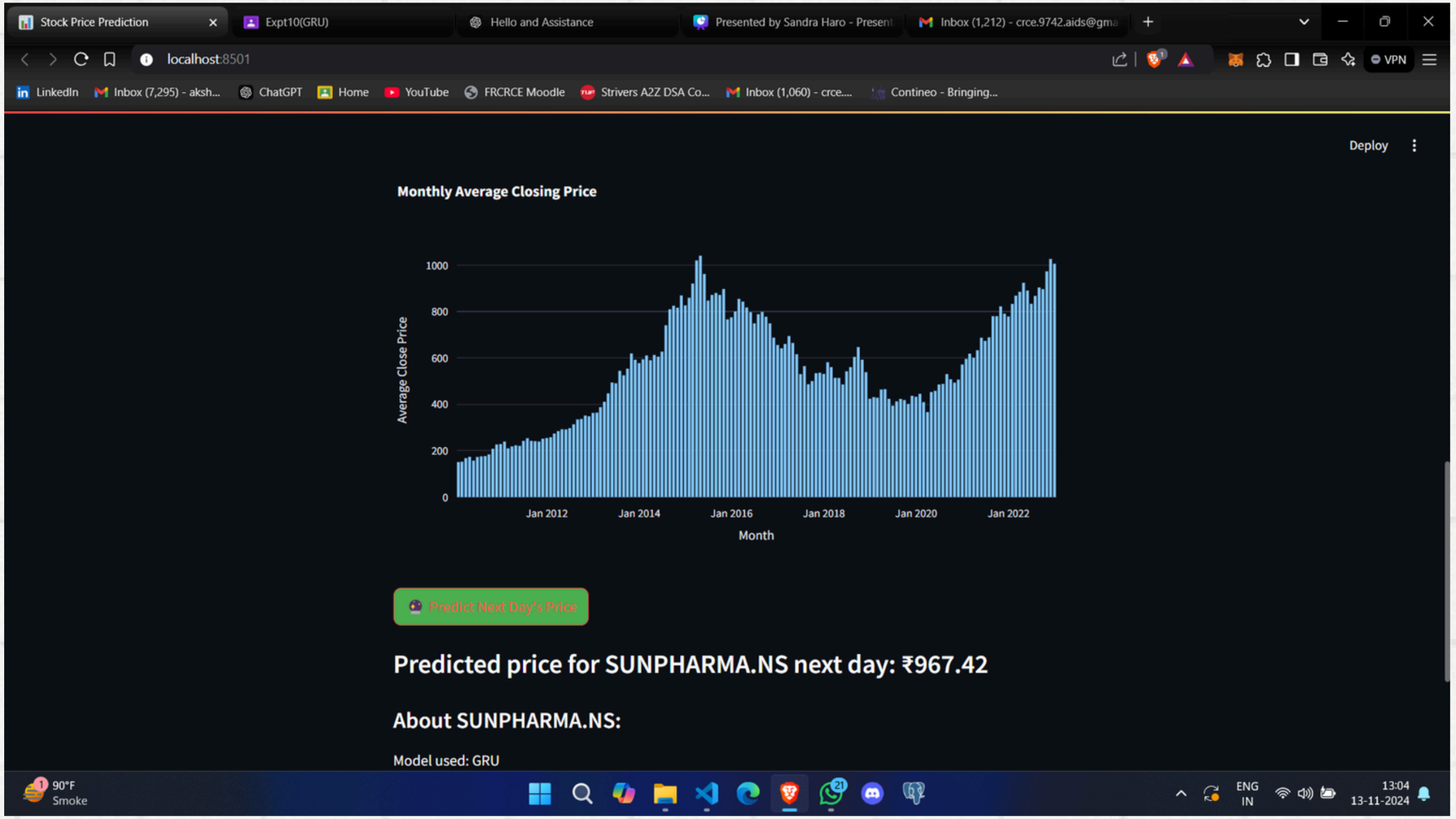

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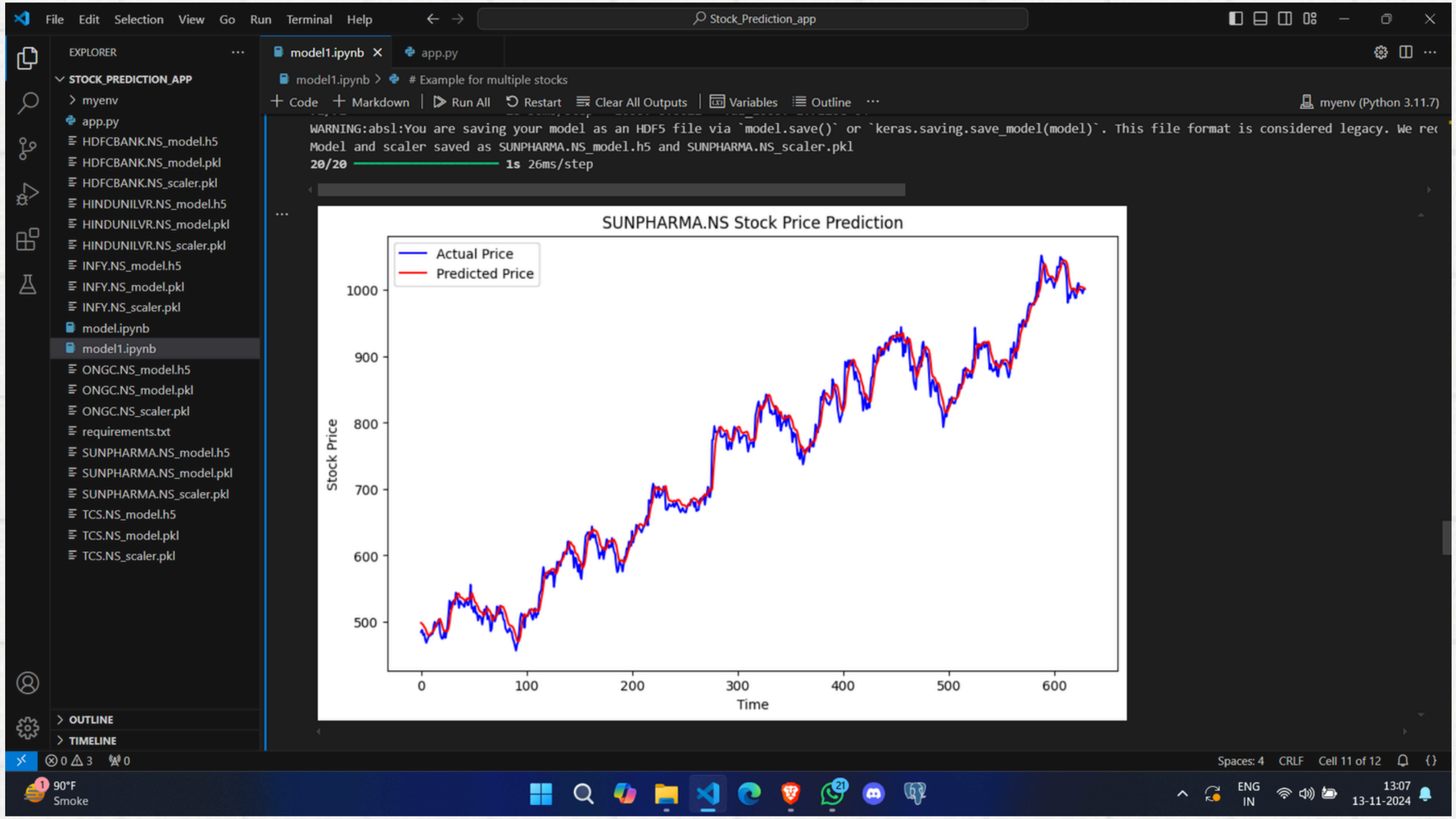

# Implementation

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Performance metrics for SUNPHARMA.NS:
Mean Squared Error (MSE): 230.40042383790995
Root Mean Squared Error (RMSE): 15.178946730188823
Mean Absolute Error (MAE): 11.587471468486486
R-squared (R²): 0.9913998654678372
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 42ms/step
[**********************100%**********************]  1 of 1 completed
Predicted next day's stock price for SUNPHARMA.NS: 1003.3108520507812
```

# Conclusion

This project demonstrates the effective use of Gated Recurrent Units (GRU) for stock price prediction by capturing complex, sequential patterns in historical price data. Through careful data preprocessing, sequence creation, and model design, the GRU model achieves a reliable level of prediction accuracy, assisting investors and analysts in making more informed decisions. The Streamlit web app further enhances accessibility, offering users a simple, no-code interface to view real-time predictions. This approach exemplifies how AI can make financial forecasting more insightful, accessible, and user-friendly.

# Thank you very much!