I have used 3 models named sarima,sarimax,var for stock market prediction.i took historical data of 4 years.sarima model’s parameter are chosen based on grid search and trained based on AIC, for sarimax mode I randomly tried and used best parameter.for var also I tried various lag orders randomly and chose the best one.  
  
I have coded to compare the accuracies of the three modes, where I used split date to divide the dataset into training and testing set. Training set are utilized to train each model. For the dates in the testing set, values are forecasted for each model and rmse, mape, accuracy are calculated. Accuracies of the 3 models are compared and the best model for each ticker is found

there is a single flask application that has route for forecasting current day Adj Close and another route for forecasting Adj Close from tmr to 30 days. we found which model is best for which ticker in accuracy part previously. Using which certain models are loaded from pickle files and utilized for forecasting.

**Project Overview**

**Project Objective:** Predicting the Adjusted Close (Adj Close) prices of various company stocks using SARIMA, SARIMAX, and VAR models based on historical data.

**Models Used**

1. **SARIMA (Seasonal AutoRegressive Integrated Moving Average):**
   * **Parameter Selection:** Parameters (p, d, q, P, D, Q, m) are chosen using grid search based on AIC (Akaike Information Criterion).
   * **Training:** The SARIMA model is trained on historical data to capture both seasonal and non-seasonal trends in the stock prices.
2. **SARIMAX (SARIMA with Exogenous Variables):**
   * **Parameter Selection:** Experiments are conducted with various combinations of parameters, and the best-performing set is selected based on empirical testing.
   * **Training:** SARIMAX incorporates additional exogenous variables, such as the Close price, to enhance forecasting accuracy.
3. **VAR (Vector AutoRegression):**
   * **Parameter Selection:** Different lag orders are tested randomly, and the lag order that yields the best results is chosen for each stock.
   * **Training:** VAR models the interdependencies among multiple variables (e.g., Close, Volume) to predict Adj Close prices over time.

**Accuracy Evaluation**

* **Dataset Splitting:** Historical data spanning four years is divided into training and testing sets using a specified split date. The training set is used to fit each model, while the testing set evaluates predictive performance.
* **Metrics:** For each model (SARIMA, SARIMAX, VAR), the following metrics are computed on the testing set:
  + **RMSE (Root Mean Squared Error):** Measures the average magnitude of the error between predicted and actual Adj Close prices.
  + **MAPE (Mean Absolute Percentage Error):** Calculates the average percentage difference between predicted and actual values.
  + **Accuracy:** Determines which model provides the most accurate forecasts for each stock based on RMSE and MAPE.
* **Model Selection:** The best-performing model for each stock ticker is identified based on accuracy metrics calculated during the evaluation phase.

**Flask Integration**

* **Functionality:**
  + **Route 1 (/forecast\_adj\_close):** Predicts the Adj Close price for the current day. The Flask application loads the pre-trained best model (determined by accuracy evaluation) for each stock from pickle files and generates forecasts.
  + **Route 2 (/forecast\_adj\_close\_range):** Predicts Adj Close prices from tomorrow to 30 days ahead. Similar to Route 1, this endpoint utilizes the best model for each stock stored in pickle files.
* **Implementation:**
  + Flask serves as the backend API, handling requests for current and future Adj Close price predictions.
  + Models are serialized and stored in pickle files after training, allowing quick loading and prediction within the Flask application.

**Conclusion**

This project leverages SARIMA, SARIMAX, and VAR models to predict Adj Close prices for various company stocks, employing Flask for API integration and model deployment. By evaluating and comparing model accuracies, it ensures robust forecasting capabilities tailored to each stock's historical data patterns. Adjustments and enhancements can be made based on ongoing performance evaluations and market dynamics.