Report on Stock Price Prediction Using GRU Model

Dataset

- **Stock Ticker:** NKE (Nike Inc.)
- **Data Source:** Yahoo Finance
- **Data Range:** 2010-01-01 to present
- **Features Used:** Close prices
- **Data Scaling:** Min-Max Scaling to normalize the data within the range [0, 1]

Data Preparation

- **Training Data:** Historical stock data until 15 days before the current date.
- **Prediction Period:** From 15 days before the current date to 30 days into the future.
- **Time Step:** 60 days of historical data used to predict the next day's price. (TUNED BY COMPARING IT T=45DAYS AND T=90 DAYS)

Model Architecture (tuned using optuna library)

- **Layers:**
  - **GRU Layer 1:** 50 units, return sequences
  - **GRU Layer 2:** 50 units, no return sequences
  - **Dense Layer 1:** 25 units
  - **Dense Layer 2:** 1 unit (output layer)
- **Optimizer:** Adam
- **Loss Function:** Mean Squared Error
- **Epochs:** 7
- **Batch Size:** 1

Predictions

- **Prediction Targets:** Next 45 days, including the last 15 actual days and the next 30 forecasted days.
- **Labels:** Specific day labels for the 7th and 14th days of actual prices, and every 7 days in the future predictions up to 30 days.

Visualization

- **Graph:** Plots the actual prices for the last 15 days and predicted prices for the next 30 days. Labels are provided at specified intervals to highlight predicted and actual prices.

Implementation

The implementation is divided into five main steps:

1. **Data Loading and Preprocessing**
   - Fetch historical stock data for Nike (NKE) using the `yfinance` library.
   - Use only the 'Close' prices and scale the data using Min-Max Scaler.

- Prepare the dataset for training by creating time steps.

2. **Model Building and Training**
   - Build the GRU model using TensorFlow/Keras with two GRU layers and two Dense layers.
   - Compile the model with the Adam optimizer and Mean Squared Error loss function.
   - Train the model on the prepared dataset.
3. **Prediction**
   - Predict stock prices for the last 15 days and the next 30 days using the trained GRU model.
4. **Visualization**
   - Plotting the actual and predicted prices on the same graph.
   - Adding labels for specific days to highlight actual and predicted prices.