**Tesla Stock Prediction Using Machine Learning and Deep Learning Models**

In today’s rapidly evolving financial world, accurate stock price prediction has become a vital tool for investors, analysts, and traders who aim to stay ahead in an unpredictable market. This project, titled **"**TeslaStock Prediction: Time Series Forecasting Using Machine Learning and Deep Learning Models," explores how artificial intelligence can be applied to financial forecasting by building a data-driven system to predict Tesla Inc.'s stock price trends.

The core idea behind this project is to harness the power of both traditional machine learning (ML) and advanced deep learning (DL) models to make informed forecasts about Tesla’s future stock prices. Using a variety of models—including Linear Regression, Random Forest, Support Vector Regression (SVR), XGBoost, LSTM (Long Short-Term Memory), and GRU (Gated Recurrent Unit)—the system is trained to understand patterns from historical stock data and generate predictions that reflect possible future trends.

The project starts by collecting real-time and historical stock data using public APIs such as Yahoo Finance and Alpha Vantage. The dataset includes Tesla’s daily Open, High, Low, Close prices along with trading volume. On top of this, technical indicators like Moving Averages, MACD, RSI, and Bollinger Bands are calculated to enrich the input features. These indicators provide a more nuanced understanding of price movements and potential market momentum.

To make the model more adaptive to real-world scenarios, the project also explores the integration of external features such as financial news sentiment (gathered using NLP tools like VADER or BERT), macroeconomic indicators like inflation and interest rates, and company-specific events such as earnings reports or delivery numbers. This step humanizes the prediction process by acknowledging that markets are not driven by numbers alone but by sentiment and broader economic signals.

The data is preprocessed by handling missing values, applying scaling methods like MinMaxScaler, and transforming it into a supervised learning format—where past data points are used to predict future values. Feature engineering is a key focus, ensuring the model captures not just historical patterns but also time-based trends like seasonality or weekday effects.

Model development follows a structured approach: starting with exploratory data analysis (EDA) to identify trends and anomalies, followed by training and validating different models using metrics like RMSE, MAE, and R² score. Deep learning models, especially LSTM and GRU, are tuned using techniques like dropout, learning rate scheduling, and epoch optimization to avoid overfitting and improve generalization.

One of the most engaging aspects of this project is the interactive visualization dashboard, built using Streamlit and Plotly. It enables users to visualize actual vs. predicted prices, observe confidence intervals, understand model performance, and even get buy/sell signal suggestions. These dashboards make the results accessible and actionable for non-technical stakeholders as well.