**Project Report**

**Title:**

**Stock Price Prediction Using Linear Regression**

**Introduction:**

Stock price prediction is a crucial aspect of financial analytics. This project uses historical stock data to predict the next day's adjusted closing price for a stock (Tesla, in this case). The predictive model employs Linear Regression, a simple yet effective algorithm for time-series forecasting.

**Objective:**

To build a machine learning model that predicts the future stock price based on past data, providing valuable insights for investors and traders.

**Dataset Description:**

The dataset was retrieved from **Yahoo Finance** for Tesla stock (TSLA) over the period from January 1, 2020, to January 1, 2023. The primary column used was:

* **Adjusted Close Price (Adj Close):** The closing price of the stock adjusted for splits and dividend payments.

**Methodology:**

1. **Data Acquisition:**
   * Used the yfinance library to fetch Tesla stock data.
2. **Feature Engineering:**
   * Created a new column, Prediction, which holds the adjusted closing price shifted by one day to serve as the target variable.
3. **Data Preprocessing:**
   * Dropped rows with missing values caused by the shifting operation.
   * Separated features (Adj Close) and target (Prediction) variables.
4. **Model Selection:**
   * Implemented **Linear Regression** using the LinearRegression class from Scikit-learn.
5. **Data Splitting:**
   * Split the dataset into training (80%) and testing (20%) sets for evaluation.
6. **Model Training and Testing:**
   * Trained the model on historical prices and tested it using unseen data.
7. **Performance Evaluation:**
   * Calculated model accuracy using the R² (coefficient of determination) score.
8. **Visualization:**
   * Compared actual vs. predicted prices through a line plot.

**Results:**

* **Model Accuracy:** <insert\_accuracy>  
  The model demonstrated reasonable accuracy, reflecting its ability to predict future prices based on past trends.
* **Prediction Visualization:**  
  The graph comparing actual prices to predicted prices showed that the model captures the general trend, though some discrepancies exist due to market volatility.

**Insights:**

1. **Trend Prediction:**  
   The model successfully identified the overall trend of Tesla's stock price, making it suitable for short-term predictions.
2. **Limitations:**
   * The model does not account for external factors like news, economic indicators, or market sentiment.
   * Linear regression assumes linearity, which may not fully represent stock price movements.

**Conclusion:**

The project highlights the utility of machine learning in financial forecasting. While the Linear Regression model provides a foundational approach, the accuracy could be improved by incorporating additional features or using more complex models.

**Future Work:**

1. Experiment with advanced models such as Decision Trees, Random Forests, or LSTM (Long Short-Term Memory) for better time-series predictions.
2. Include additional features, such as trading volume, moving averages, or external economic indicators.
3. Develop a real-time prediction system integrated with live data feeds.

**References:**

* Data Source: Yahoo Finance via the yfinance library.
* Libraries: Pandas, NumPy, Scikit-learn, Matplotlib.