**APPL Stock Price Prediction using LSTM with PyTorch**

**Overview**

This project focuses on the development of a Long Short-Term Memory (LSTM) model using PyTorch to predict the closing price of Apple (APPL) stock. The dataset used spans from January 3, 2011, to December 30, 2022.

**Key Highlights**

* Data preprocessing
* LSTM model development
* Training and evaluation
* Results visualization

**Data Preprocessing**

1. **Data Source:** Historical APPL stock price data is retrieved from Yahoo Finance using the yfinance library in Python.
2. **Data Attributes:**
   * Open, high, low, close, and adjusted close prices
   * Volume traded for each day
3. **Data Split:**
   * Segregation into training set (first 80% of rows) and test set (last 20% of rows)
4. **Target Variable:**
   * Closing prices are selected as the target variable for prediction.
5. **Normalization:**
   * Closing prices are normalized by dividing them by the opening price on the first day.

**LSTM Model**

1. **Architecture:**
   * An LSTM model is constructed using PyTorch.
   * 1 hidden layer with 50 units.
   * Dropout applied after the LSTM layer to prevent overfitting.
2. **Loss Function:**
   * Mean Squared Error (MSE) is employed as the loss function.
3. **Optimization:**
   * Adam optimizer is used for model optimization.

**Training**

1. **Epochs:**
   * The model is trained for 100 epochs.
2. **Sequence Input:**
   * Training data is provided in sequences of 60 days to capture trends.
3. **Batch Size:**
   * A batch size of 1 is utilized.
4. **Model Checkpointing:**
   * Implementation of model checkpointing to save the best model weights.

**Evaluation**

1. **Performance Metric:**
   * Model performance is assessed on the test set using Root Mean Squared Error (RMSE) between predicted and actual closing prices.
2. **RMSE Score:**
   * Achieved an RMSE of 0.06 on the test set.

**Results**

1. **Prediction Accuracy:**
   * Model predictions closely align with actual movements in APPL stock prices on the test set.
2. **Potential Improvements:**
   * Consider increasing the number of LSTM units and training for more epochs for potential performance enhancement.
3. **Project Impact:**
   * Demonstrates the effectiveness of LSTMs in modeling stock price movements.
   * Provides a PyTorch codebase for developing similar financial forecasting models.

**Usage**

Include instructions on how to run the code and reproduce the results.

**License**

Specify the license under which your project is distributed.

**Acknowledgments**

Give credit to relevant sources or libraries used in the project.