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[LSTM]Stock Price Time Series Forecasting using LSTM with Hyperparameter Tuning and Regularization Techniques

In this notebook, we developed a **Long Short-Term Memory (LSTM)** model to predict the closing stock prices of a company using historical stock data. The data was sourced from Kaggle and preprocessed to clean, transform, and normalize the data. The data was then split into training and testing sets, with 80% of the data used for training and 20% used for testing.

We used the Keras library to build the **LSTM** model, with a specific architecture consisting of multiple layers, neurons, and activation functions. The model was trained using the `fit()` function in Keras, with a specified number of epochs and batch size. We also used the `evaluate()` function in Keras to evaluate the model's performance on the testing data, using metrics such as mean squared error and mean absolute error.

Once the model was trained and evaluated, we used it to make predictions on new data. We also plotted the predicted and actual stock prices to visualize the performance of the model. To further improve the model's performance, we applied regularization techniques such as dropout, weight decay, and batch normalization.

In addition, we also attempted to understand the model's predictions and decision-making process through interpretability techniques such as **SHAP values and LIME**.

Overall, this notebook serves as a comprehensive guide to building an LSTM model for stock price prediction, with a focus on preprocessing, model architecture, training and evaluation, prediction, visualization, and interpretability. The notebook is suitable for beginners to intermediate level machine learning practitioners and can be adapted for other use cases such as time series forecasting, stock market analysis, and financial modeling.