Data Preparation:

* Historical stock data is collected for training and testing.
* The time period considered is January 2022 to May 2023
* The closing prices are used to calculate the daily returns.
* Next the min-max scaling is applied to normalize the returns.

LSTM Model Training:

* The data is prepared as input-output sequences, the input is a sequence of previous returns, and the output is the next return.
* The model architecture consists of a Bidirectional LSTM layer followed by a dense layer.
* Mean squared error (MSE) is the loss function applied, Adam optimizer is used next for the training phase
* The model is trained on the training data for a specified number of epochs.

Prediction and Inverse Transformation:

* The trained model is used to make predictions on the test data.
* The predicted returns are inverse transformed using the scaler to obtain actual return values.

Plotting the Predicted Returns:

* The predicted returns are plotted against the corresponding dates.
* Additionally, the expected monthly returns for the test period are calculated and plotted as well.
* The expected monthly returns are repeated for each trading day within the corresponding month, and NaN values are padded for any extra trading day.

Advantages of the Bidirectional LSTM model:

* Bidirectional LSTM models can capture both the past and future context of the input sequence, which can be beneficial for time series prediction tasks.
* LSTMs are capable of learning long-term dependencies, making them suitable for modelling sequential data.

Disadvantages of the Bidirectional LSTM model:

* LSTM models can be computationally expensive.
* LSTM models may suffer from overfitting if the model is too complex.
* LSTM models may struggle to capture unexpected changes in the data.

Model- Evaluation:

* It's essential to note that evaluating the performance of stock prediction models is not 100% reliable due to the unpredictability and volatility of the stock market.
* It's recommended to use manual annotation to interpret the quality of results in addition to any other performance evaluation metrics.

Model - Description:

* We create a a sequential model, which is a linear stack of layers.
* Next we add a bidirectional LSTM layer to the model.
* The LSTM layer is a type of recurrent neural network (RNN) that can capture sequential information.
* Bidirectional wrapper allows the LSTM layer to process the input sequence in both forward and backward directions.
* The parameter 50 specifies the number of LSTM units in the layer.
* The goal is to minimize the mean squared error between the predicted and actual values.
* The optimizer 'adam' is an optimization algorithm that adapts the learning rate during training to improve convergence.
* Therefore we create a sequential model with a bidirectional LSTM layer, a dense output layer, and compile it with a mean squared error loss function and the Adam optimizer.

ADAM Optimizer: Overall, the Adam optimizer's three key aspects are

* adaptive learning rate.
* Momentum
* Robustness