Practical Exam Report: CNN and LSTM Implementation

This project involved building two deep learning models:

1. A Convolutional Neural Network (CNN) for classifying images using the CIFAR-10 dataset.
2. A **Long Short-Term Memory (LSTM)** network for forecasting stock prices using **Google Stock Price (2012–2017)** data.

Findings:

- The **CNN model** achieved strong accuracy (~70–75%) on the CIFAR-10 dataset after 10 epochs, effectively learning to classify images across 10 categories. Validation loss and accuracy curves showed good learning trends with minimal overfitting.

- The **LSTM model** was able to learn and predict the trends in stock price movements, with predicted prices closely tracking actual prices on the training set. Using 60-day sequences helped the model capture temporal dependencies.

Challenges:

- For CNN:
  - Training was slow on CPU. GPU acceleration helped a lot.
  - Careful tuning of layers and dropout was needed to avoid overfitting.

- For LSTM:
  - Stock data needed proper scaling and sequence formatting.
  - Initial errors with CSV column names and shape mismatch took time to debug.

Future Scope (Simple Research Ideas):

Hybrid Model: Combine CNN and LSTM to analyze medical images along with patient history (e.g., x-ray + symptoms over time).

Explainable AI: Add visual tools like Grad-CAM (for CNNs) or attention plots (for LSTM) to understand “why” a prediction was made.

Low-Resource Translation: Use LSTM with attention or mT5/mBART to build simple machine translation systems for underrepresented languages (e.g., Yoruba-English medical terms).

Multi-step Forecasting: Extend the LSTM model to predict prices not just one day ahead, but multiple days into the future — useful for investment planning and risk assessment.

Sentiment + Price Modeling: Combine stock price data with **financial news sentiment analysis** using Natural Language Processing (NLP). This could improve prediction accuracy during market volatility.