

# STOCK PRICE FORECASTING

USING TIME SERIES ANALYSIS

# OBJECTIVE

- This project aims to compare and evaluate the performance of four popular machine learning models, namely Long Short-Term Memory (LSTM), Convolutional Neural Network - Long Short-Term Memory (CNN-LSTM), Convolutional Neural Network (CNN) and Autoregressive Integrated Moving Average (ARIMA) for stock price prediction.

# FINANCIAL MARKET FORECASTING

- Stock trading and investing are crucial for individuals and institutions as they provide opportunities to grow wealth, achieve financial goals, and contribute to economic development.
- Stock price forecasting helps investors make informed decisions, manage risk and optimize their investment portfolios based on predicted future price movements

# WHY TIME SERIES ANALYSIS ?

- Time series analysis is a statistical method used to analyze and interpret patterns, trends, and relationships within a sequence of data points collected over time.
- It can be used to identify complex patterns and make unbiased decision free from emotional and external influences

# ARIMA

- The ARIMA (Autoregressive Integrated Moving Average) model is a commonly used statistical technique for stock market forecasting. It combines the autoregression and moving average concepts to capture trends and patterns in the data.
- The model involves three main components: the autoregressive (AR), the integrated (I), and the moving average (MA).
- The AR component represents the relationship between the current value and its past values, while the MA component represents the relationship between the current value and the error term from past predictions. The I component is used to make the data stationary by differencing it.

- One of the strengths of the ARIMA model is its ability to handle non-stationary data.
- However, it may not perform well when dealing with complex relationships or outliers in the data.

# LSTM

- The Long Short-Term Memory (LSTM) model is a type of recurrent neural network that can capture long-term dependencies in time series data.
- In stock market forecasting, the LSTM model can be used to analyze historical price and volume data to make predictions about future trends.

- LSTM model is able to handle noisy and complex data, which is often the case in stock market data.
- Model can learn from past mistakes and adjust its predictions accordingly, making it well-suited for dynamic and unpredictable markets.
- However, one of the weaknesses of the LSTM model is its computational complexity, which can make it difficult to train and optimize for large datasets.



# CNN

- The Convolutional Neural Network (CNN) is a type of neural network commonly used in image recognition tasks. However, it can also be applied to time series analysis and stock market forecasting.
- The CNN works by taking a sliding window approach to the data, where it applies filters to subsets of the data to identify patterns and trends. This allows the model to capture both short-term and long-term dependencies in the data.

- One of the strengths of the CNN model is its ability to handle large amounts of data. It can process large datasets efficiently and effectively, making it a good choice for stock market forecasting where there are often many variables to consider.
- Additionally, the CNN model is robust to noise and can handle missing data. However, one potential weakness of the CNN model is its interpretability. Because it operates on subsets of the data, it can be difficult to understand how the model is making its predictions.

# CNN-LSTM

- The CNN-LSTM model is a powerful tool for stock market forecasting that combines the strengths of both convolutional neural networks and long short-term memory networks.
- The model works by first using a CNN to extract important features from the input data, such as trends and patterns, which are then fed into an LSTM network for further analysis and prediction.
- This approach allows the model to capture both short-term and long-term dependencies in the data, making it well-suited for predicting stock prices over extended periods of time.

- One of the key strengths of the CNN-LSTM model is its ability to handle large volumes of data. Because the model can process data in parallel, it is able to analyze vast amounts of historical stock market data quickly and efficiently.
- This model is able to adapt to changing market conditions, making it more robust than some other models that may struggle with sudden shifts in market trends.
- One potential weakness of the CNN-LSTM model is that it can be computationally expensive to train, requiring significant processing power and time.

# STATUS

- We have developed forecasting models using ARIMA and LSTM
- From the forecasted plot it is evident that as a statistical model ARIMA is not efficient in handling large and volatile data
- LSTM model performs better in comparison.