📄 Task Report: Forecasting TCS Stock Prices using LSTM

Internship Project – Time Series Stock Market Forecasting

Platform: Zidio.in | Duration: 1 Month

**🧑‍💻 Intern Details:**

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* **Department**: B.E. CSE – Artificial Intelligence and Machine Learning
* **Model Focus**: Model 3 – **LSTM Forecasting**

**🎯 Objective**

To build a deep learning model using **LSTM (Long Short-Term Memory)** to predict future TCS stock prices based on previous historical data.

**📦 Tools Used**

* Python 3.11 (Google Colab)
* Libraries: yfinance, numpy, pandas, tensorflow, matplotlib, sklearn
* Dataset: TCS stock data from Yahoo Finance (2018–2024)

**🔬 Methodology**

**✅ Step 1: Data Loading and Scaling**

* Used Yahoo Finance API to download TCS stock closing prices
* Applied MinMaxScaler to normalize data between 0 and 1

**✅ Step 2: Sequence Generation**

* Created input sequences of 60 past days to predict the next day’s price
* Split data into 80% training and 20% testing sets

**✅ Step 3: Model Building**

* Built an LSTM model with:
  + 2 LSTM layers (50 units each)
  + Dropout layers to reduce overfitting
  + Dense layer for final prediction

**✅ Step 4: Training**

* Trained model for **20 epochs**
* Achieved:
  + Final training loss: **~0.0017**
  + Final validation loss: **~0.0011**

**✅ Step 5: Prediction & Evaluation**

* Used the trained model to predict the test set
* Inverse-scaled predictions to match original price scale
* Plotted actual vs predicted prices — the forecast closely followed real prices

**📊 Result Highlights**

| **Metric** | **Value** |
| --- | --- |
| Epochs Trained | 20 |
| Final Validation Loss | ~0.0011 |
| Prediction Trend | Very accurate |
| Model Type | Deep Learning (LSTM) |

**🔄 Comparison with ARIMA and Prophet**

| **Model** | **Type** | **Handles Seasonality** | **Handles Trend** | **Flexibility** | **Accuracy** |
| --- | --- | --- | --- | --- | --- |
| ARIMA | Statistical | ❌ Manual (SARIMA) | ❌ Requires differencing | Medium | Good |
| Prophet | Hybrid (Additive) | ✅ Built-in | ✅ Built-in | Very High | Very Good |
| **LSTM** | Deep Learning | ✅ Learns patterns | ✅ Learns trend | Highest | **Best** (in this case) |

**✅ Conclusion**

The LSTM model provided **high accuracy** and demonstrated strong ability to model TCS’s complex price patterns.  
It outperformed ARIMA and matched Prophet in trend capture, while offering better prediction adaptability for longer sequences.

This completes the deep learning phase of the stock market forecasting project.

**📂 Attachments**

* Notebook: Model3\_LSTM\_Forecast.ipynb
* Final Forecast Plot: lstm\_forecast\_plots
* GitHub Link: https://github.com/Yashwahthmc/Time-Series-Stock-Forecasting-Zidio.git
* Google Colab Link: <https://colab.research.google.com/drive/1zdCBeyXylJJQdPKsd_xyj811zPgKkTfP?usp=sharing>

**✍️ Signature:**

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