***StockGro Final Project Report***

# **1. Methodology and Models Used**

This project applies time series forecasting and risk-aware portfolio construction using historical stock data (2020–2024). We use the following models:  
  
 - ARIMA: Linear model capturing autocorrelations, tuned with default (5,1,0) order.  
 - Prophet: Additive model suited for trend and seasonality, with 2-day ahead prediction.  
 - LSTM: Deep learning model capturing non-linear temporal patterns using sequences of 60 days to predict next 2 days.  
  
 Evaluation metrics include MAPE, RMSE, and directional accuracy. Portfolio allocation combines forecast-guided allocation and volatility-aware sizing.

# **2. Stock Selection Rationale**

We selected 10 diversified NSE-listed stocks based on:  
 - Sector coverage (IT, banking, FMCG, energy, pharma, auto, infra)  
 - Volatility and trend decomposition  
 - Popularity and liquidity

Selected Stocks by Sector:

| Stock | Sector |
| --- | --- |
| RELIANCE.NS | Energy |
| INFY.NS | IT |
| HDFCBANK.NS | Banking |
| TCS.NS | IT |
| ITC.NS | FMCG |
| LT.NS | Infra |
| SUNPHARMA.NS | Pharma |
| MARUTI.NS | Auto |
| ADANIGREEN.NS | Renewable Energy |
| HINDUNILVR.NS | FMCG |

# **3. Forecast Results and Confidence Intervals**

We forecasted 2 trading days ahead using ARIMA, Prophet, and LSTM. Here’s a sample comparison for INFY:  
  
 | Model | MAPE | RMSE | Direction Accuracy |  
 |--------|--------|-------|---------------------|  
 | ARIMA | 0.0083 | 12.56 | Yes |  
 | Prophet| 0.0921 | 29.03 | No |  
 | LSTM | 0.0045 | 10.14 | Yes |  
  
 Prophet tends to underperform due to trend extrapolation. LSTM generally had the lowest errors.

# **4. Portfolio Composition and Rationale**

Weights were assigned using a combination of forecasted mean returns and 10-day rolling volatility.  
  
 | Stock | Weight (%) |  
 |---------------|------------|  
 | INFY.NS | 14.7 |  
 | SUNPHARMA.NS | 13.4 |  
 | TCS.NS | 12.2 |  
 | MARUTI.NS | 11.8 |  
 | ITC.NS | 10.6 |  
 | RELIANCE.NS | 10.1 |  
 | ADANIGREEN.NS | 9.4 |  
 | LT.NS | 8.3 |  
 | HDFCBANK.NS | 5.4 |  
 | HINDUNILVR.NS | 4.1 |

# **5. Performance on StockGro**

Total Turnover: ₹79,99,385.15  
 Transaction Charges: ₹7,614.85  
 Net Portfolio Value: ₹79,76,297.61  
  
 Top profitable trades:  
 - MARUTI: ₹1635.48  
 - TCS: ₹1575.00  
 - ITC: ₹1105.17  
 - SUNPHARMA: ₹1328.78  
 - ADANI GREEN: ₹1235.52  
  
 Major losses were small (e.g., HINDUNILEVER: -₹1588.04).

# **6. Model Accuracy and Prediction vs Reality**

ARIMA and LSTM were reliable. Prophet underperformed on short horizons.  
  
 Example (INFY last 2 days):  
 - Actual: ₹1556.68 → ₹1569.45  
 - LSTM: ₹1554.01 → ₹1568.99  
 - Prophet: over-smoothed trend  
  
 LSTM outperformed due to better handling of short-term volatility.

# **7. Reflections: What Worked, What Didn’t, What You’d Improve**

What Worked:  
 - LSTM forecasts were closest to actual  
 - Volatility-aware allocation reduced losses  
 - Sectoral diversification mitigated risk  
  
 What Didn’t:  
 - Prophet was weak for 2-day horizons  
 - Some trades (e.g. HINDUNILVR) gave unexpected outcomes  
  
 Improvements:  
 - Use log returns as features  
 - Add ensemble models for better stability  
 - Consider using GARCH for volatility modeling