TCS Stock Price Forecasting Report

1. Project Overview

This project focuses on predicting the future stock prices of **Tata Consultancy Services (TCS)**. It utilizes historical market data and advanced machine learning techniques to build and evaluate predictive models. The primary goal is to identify the most effective approach for time series analysis by comparing traditional machine learning models with deep learning architectures.

2. Key Objectives

The project aims to achieve the following key objectives:

- **Data Acquisition**: Implement automated retrieval of historical stock data using the `yfinance` library.
- **Exploratory Data Analysis (EDA)**: Conduct in-depth trend analysis, statistical summaries, and correlation studies to understand the underlying patterns in the stock data.
- **Predictive Modeling**: Develop and implement various predictive models, including Linear Regression, Random Forest, and Long Short-Term Memory (LSTM) networks.
- **Performance Evaluation**: Perform a comparative analysis of the models using standard metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R^2 to assess their accuracy and effectiveness.

3. Repository Structure

The `TCS_forecasting` repository is organized as follows:

Directory	Description
`notebooks/`	Contains core analysis and modeling Jupyter notebooks, specifically `TCS_forecasting.ipynb`.
`presentation/`	Stores project presentation materials, including `TCS_presentation.pdf`.
`requirements.txt`	Lists all necessary project dependencies.
`LICENSE`	Specifies the project's MIT License.
`README.md`	Provides an overview and documentation for the project.

4. Getting Started

Prerequisites

To run this project, ensure you have:

- Python 3.8 or higher
- Jupyter Notebook or Google Colab installed

Installation

1. **Clone the repository**:

```
git clone https://github.com/SeifEldenOsama/TCS_forecasting.git
cd TCS_forecasting
```

2. **Install dependencies**:

```
pip install -r requirements.txt
```

Usage

1. **Launch Jupyter Notebook**:

   ```
   jupyter notebook notebooks/TCS_forecasting.ipynb
   ```

2. Execute the cells sequentially within the notebook to reproduce the analysis and model training.

5. Model Comparison

The project compares different machine learning models for stock price forecasting:

Model	Type	Library	Performance Note
Linear Regression	Traditional ML	Scikit-learn	Provides a baseline for linear trend prediction.
Random Forest	Ensemble ML	Scikit-learn	Offers robustness against outliers and non-linear patterns.
LSTM	Deep Learning	TensorFlow	Demonstrates superior capability in capturing complex temporal dependencies.

6. License

This project is licensed under the MIT License. Refer to the `LICENSE` file in the repository for full details.

7. Conclusion

The TCS Stock Price Forecasting project provides a comprehensive framework for predicting stock movements using a blend of traditional and deep learning techniques. By systematically acquiring data, performing thorough EDA, and evaluating multiple models, the project offers valuable insights into effective time series forecasting strategies for financial analytics. The comparison highlights the

strengths of different models, particularly the LSTM network's ability to handle complex temporal data, making it a robust solution for stock price prediction.