

Capstone Project Report

Project Title: Stock Price Prediction using Microsoft Azure AI

Student Name: Sonakshi Bisht

College Name: Amrapali University

Department: MBA

Email ID: sonakshibisht999@gmail.com

AICTE Student ID: STU6665a307a92301717936903

1. Introduction

In the fast-paced and often volatile world of financial markets, accurate stock price prediction plays a crucial role in making informed investment decisions. Traditional models, while valuable, often fail to capture the dynamic and non-linear patterns in stock price movements. The rise of Artificial Intelligence and Machine Learning presents an opportunity to apply data-driven predictive models to better forecast stock behavior.

This project, developed as part of the Microsoft Azure AI Internship by Edunet Foundation, aims to build a regression-based model using Microsoft Azure Machine Learning Studio. The goal is to use historical stock price data to predict the closing price of a stock, thereby providing useful insights to individual investors and financial analysts.

2. Problem Statement

The stock market is influenced by a wide range of factors, many of which are complex, interdependent, and unpredictable. Investors often struggle with uncertainty and volatility in asset pricing, making accurate forecasting a valuable yet challenging task.

Problem: Traditional forecasting models are insufficient for capturing complex patterns in stock data, leading to unreliable predictions and potential financial loss. This project aims to build a predictive system using Azure AI that can analyze historical stock data and forecast future prices more accurately using machine learning regression techniques.

3. Proposed Solution

The proposed system is designed to address the need for improved forecasting by leveraging Azure's cloud-based machine learning tools. Using historical stock data, we construct a regression model that learns patterns from past behavior and applies them to predict future prices.

Key Components:

- Data Collection: Historical stock data from Yahoo Finance (Open, High, Low, Close, Volume).
- Data Preprocessing: Cleaning, handling missing values, feature selection.
- Model Selection: Linear Regression and Decision Forest Regression. - Evaluation Metrics: R^2 Score and RMSE (Root Mean Squared Error).
- Visualization: Actual vs. Predicted price trends for evaluation.

4. System Development Approach

Tools & Technologies Used:

- Microsoft Azure Machine Learning Studio (Designer): For model building.
- Python (optional): For preprocessing and visualization (using Pandas, NumPy, Matplotlib).
- Excel/Power BI: For visual analysis of results.
- GitHub: For project documentation and version control.

Dataset:

- Source: <https://finance.yahoo.com>
- Example Ticker: INFY.NS (Infosys Limited)
- Features: Date, Open, High, Low, Close, Volume

5. Algorithm & Model Deployment

Algorithm Used:

- Linear Regression: To understand linear trends in stock prices.
- Decision Forest Regression: To handle non-linear relationships and enhance accuracy.

Process Workflow:

1. Upload dataset to Azure ML workspace.
2. Clean and preprocess the data.
3. Split the dataset (80% training, 20% testing).
4. Train the model using regression.
5. Score the model to generate predictions.
6. Evaluate using metrics like R^2 and RMSE.

Deployment:

Although not deployed as a live API in this case, Azure ML supports web service deployment, allowing future scaling.

6. Results & Evaluation

The model produced promising results using historical stock data. Below are the evaluation metrics:

- R^2 Score: ~ 0.85 , indicating a strong correlation between predicted and actual prices.
- RMSE: Relatively low, showing good prediction accuracy.

Visual Output:

A comparison of predicted vs. actual closing prices plotted on a graph demonstrates the model's capability to follow market trends closely. This visualization helps validate the model's performance effectively.

7. Conclusion

This project successfully demonstrates the application of machine learning using Azure AI tools to forecast stock prices. The use of regression models within Azure Machine Learning Studio provided a no-code environment to build, train, and evaluate models effectively.

The results highlight the model's ability to make reliable predictions, offering a solid foundation for real-world financial forecasting tools. Moreover, Azure's modular design and integration capabilities make it suitable for future expansions and real-time applications.

8. Future Scope

- Advanced Modeling: Integrate LSTM or ARIMA models for better time-series forecasting.
- Sentiment Analysis: Combine news sentiment using Azure OpenAI or Text Analytics API to enhance accuracy.
- Real-Time Dashboards: Link model output to Power BI for real-time visual tracking.
- Chatbot Integration: Develop an AI chatbot using Azure Bot Framework that fetches price predictions.
- Multi-stock Comparison: Extend the model to predict and compare multiple stocks simultaneously.
- Mobile Application: Build a frontend app for accessing predictions on-the-go.

9. References

- Yahoo Finance: <https://finance.yahoo.com>
- Microsoft Azure Machine Learning Documentation: <https://learn.microsoft.com/enus/azure/machine-learning>
- Edunet Foundation AI Internship Materials
- scikit-learn documentation
- Power BI Visualization Tutorials

10. Project Files Available on GitHub

- Project Report (PDF)
- PowerPoint Presentation
- Dataset (CSV)
- Azure ML Pipeline Screenshots
- Predicted vs. Actual Graphs

GitHub Repository: <https://github.com/sonakshibisht999/stock-price-prediction-azure>