Department of Artificial Intelligence and Data Science

Sri Eshwar College of Engineering

(An Autonomous Institution – Affiliated to Anna University)

COIMBATORE – 641 202

STOCK - MARKET ANALYSER

INNOVATIVE / MULTI-DISCIPLINARY PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF **BACHELOR OF TECHNOLOGY** IN **ARTIFICIAL INTELLIGENCE AND DATA SCIENCE** OF THE ANNA UNIVERSITY

INNOVATIVE PROJECT
May 2024

PROJECT WORK

Submitted by

MUTHUVEERAPPAN K – 722821243034

SATHEESH S – 722821243053

VIDYA SAGAR M – 722821243061

BATCH 2021 - 2025

Under the Guidance of

Dr. Geetha . M. P, M.E., Ph.D.,

Assistant Professor, AI&DS.

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MUTHU VEERAPPAN K	**722821243034**
SATHEESH S	**722821243053**
VIDYA SAGAR M	**722821243061**

who carried out the project work under my supervision.

SIGNATURE
Dr. S. SUMATHI M.E., Ph.D.,
HEAD OF THE DEPARTMENT
Department of Artificial Intelligence and Data Science,
Sri Eshwar College of Engineering,
Coimbatore – 641 202.

SIGNATURE
Dr. M.P. GEETHA M.E., Ph.D.,
SUPERVISOR Assistant Professor,
Department of Artificial Intelligence and Data Science,
Sri Eshwar College of Engineering,
Coimbatore – 641 202.

Submitted for the **Autonomous Semester End Innovative / Multi-Disciplinary Project Viva-Voce** held on .....

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

The Stock Market Analyzer project is an innovative application of Language Models (LLM) and Langchain in the domain of stock investment analysis. The motivation behind this project is to simplify the stock analysis process for retail investors lacking a finance background, thus making informed investment decisions more accessible.

The project encompasses several key functionalities, including fetching historic stock price data using the Yahoo Finance API, scraping top Google news related to a given company, and retrieving financial statements from Yahoo Finance. These functionalities are designed to provide users with real-time and historic data essential for stock analysis.

The project has been developed using two distinct approaches. The first approach utilizes Langchain's zero-shot ReaAct agent for decision-making, albeit facing challenges with decision confidence and potential infinite loops. In contrast, the second approach leverages OpenAI Function Calling for structured output, providing a more robust and comprehensive analysis process.

Further improvements to the project include the addition of more tools, such as a math tool for complex technical analysis, enhancing prompting for stable output, and supporting other open-source Language Models (LLMs) for expanded capabilities.

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CHAPTER 1

INTRODUCTION

In the realm of stock market investment, the ability to make informed decisions is paramount. However, for retail investors without a finance background, navigating the complexities of stock analysis can be daunting and time-consuming. This challenge inspired the development of the Stock Market Analyzer, an AI-based tool designed to simplify the stock analysis process and empower retail investors with actionable insights.

The Stock Market Analyzer leverages cutting-edge technologies such as Language Models (LLM) and Langchain to streamline the collection, analysis, and presentation of crucial stock-related information. By harnessing real-time and historic data from sources like the Yahoo Finance API and top Google news, this tool equips users with the knowledge needed to make informed investment decisions.

This project is driven by a clear motivation: to bridge the gap between retail investors and sophisticated stock analysis tools. The goal is to democratize access to stock market insights, making them more accessible and understandable for individuals without a specialized financial background.

In this documentation, we delve into the functionalities, approaches, and improvements of the Stock Market Analyzer project. Through detailed exploration, we aim to showcase the project's impact in revolutionizing how retail investors approach stock analysis and investment decision-making.

1.1 PROBLEM STATEMENT

Retail investors often encounter challenges when analyzing stocks, primarily due to the complexity of financial metrics and market trends. Without a background in finance, understanding these factors can be daunting, leading to barriers in making informed investment decisions. Moreover, the vast amount of data available from sources like financial statements, stock prices, and market news can overwhelm retail investors, making manual analysis time-consuming and error-prone.

The Stock Market Analyzer project aims to bridge these gaps by simplifying stock analysis and streamlining data processing. By leveraging advanced technologies such as Language Models (LLM) and Langchain, the project seeks to provide retail investors with a user-friendly tool that distills complex stock-related information into actionable insights. This approach not only democratizes access to stock market insights but also empowers retail investors to make informed investment decisions with confidence and clarity.

1.2 OBJECTIVE AND SCOPE

The primary objective of the Stock Market Analyzer project is to simplify stock analysis for retail investors by leveraging AI technologies such as Language Models (LLM) and Langchain. The project aims to achieve the following objectives:

- Simplify Stock Analysis: Develop a user-friendly tool that simplifies the process of stock analysis, making it accessible to retail investors without a finance background.
- Streamline Data Processing: Efficiently collect, analyze, and present relevant stock-related data from various sources to provide actionable insights for investment decision-making.
- Empower Retail Investors: Empower retail investors with accurate and personalized insights tailored to their investment goals and risk tolerance, enabling them to make informed investment decisions.
- Enhance Accessibility: Democratize access to stock market insights by providing a tool that translates complex financial metrics and market trends into understandable information.

The scope of the Stock Market Analyzer project includes the following key components:

- Data Collection: Fetching real-time and historic stock-related data such as stock prices, financial statements, and market news from sources like Yahoo Finance and Google News.
- Data Analysis: Utilizing AI techniques to analyze collected data, perform fundamental analysis, and generate investment recommendations.
- User Interface: Designing a user-friendly interface that presents analyzed data and insights in an accessible and understandable format for retail investors.
- Tool Functionality: Implementing functionalities such as stock price analysis, financial statement evaluation, news sentiment analysis, and investment recommendation generation.

CHAPTER 2
SYSTEM ANALYSIS AND DESIGN

2.1 LITERATURE SURVEY

2.1.1 Stock Analyzer and Bot using Machine Learning

Publication Year: 2022

Author: Chintan Jethva, Saachi Dudani, Esa Malik, Manish Sonje, Gaurav Tanna

Methodology: Machine learning makes use of a variety of models in order to create correct estimates. This research focuses on using LSTM and ARIMA-based Machine Learning to anticipate stock prices.

2.1.2 An Intelligent Stock Market Automation with Conversational Web Based Build Operate Transfer (BOT)

Publication Year: 2022

Author: Aryan Bajaj, N Preethi, Benny J Godwin, Fr Jossy P George

Methodology: This project aims to build a speech recognition chatbot like Alexa & Google, which will use Recurring Neural Network-Long Short-Term Memory (RNNLSTM) and Natural Language Processing (NLP) to predict future intra-day prices.

2.1.3 Stock Price Prediction using Machine Learning

Publication Year: 2022

Authors: B N Varaprasad, Ch. Kundan Kanth, G. Jeevan, Y. Kalyan Chakravarti

Methodology: TIn this paper for estimating the stock values we are considering LSTM and Regression models of Machine Learning. Factors considered are opening values of stock; closing values of stock, lower and higher values of stock and volume.

2.1.4 Stock Market Prediction using Supervised Machine Learning Techniques:

Publication Year: 2020

Authors: Zaharaddeen Karami Lawal, Hayati Yassin, Rufai Yusuf Zakari

Methodology: Support Vector Machine (SVM) was found to be the most frequently used technique for stock price prediction due to its good performance and accuracy. Other techniques like Artificial Neural Network (ANN), K-Nearest Neighbor (KNN), Naïve Bayes, Random Forest, Linear Regression and Support Vector Regression (SVR)

CHAPTER 3
PROPOSED SOLUTION

3.1 OVERVIEW

The proposed solution, Stock Market Analyzer, offers a comprehensive approach to simplify stock analysis for retail investors by harnessing advanced AI technologies. It begins by gathering real-time and historical stock data from reputable sources like Yahoo Finance and Google News, ensuring a holistic perspective on stock performance and market trends. This data undergoes rigorous preprocessing and analysis, including cleaning for accuracy and utilizing AI techniques such as Natural Language Processing (NLP) and sentiment analysis to interpret financial news and market sentiments accurately. Additionally, fundamental analysis is conducted on financial statements to assess company performance.

One of the key features of the solution is the development of an intuitive user interface for the Stock Market Analyzer tool. This interface is designed to be user-friendly, enabling retail investors to access and understand the analyzed data effortlessly. The tool incorporates various functionalities such as stock price analysis, financial statement evaluation, news sentiment analysis, and the generation of investment recommendations based on AI-driven insights. These insights are tailored to individual investor goals and risk tolerance, providing personalized recommendations for informed decision-making.

3.2 METHODOLOGY

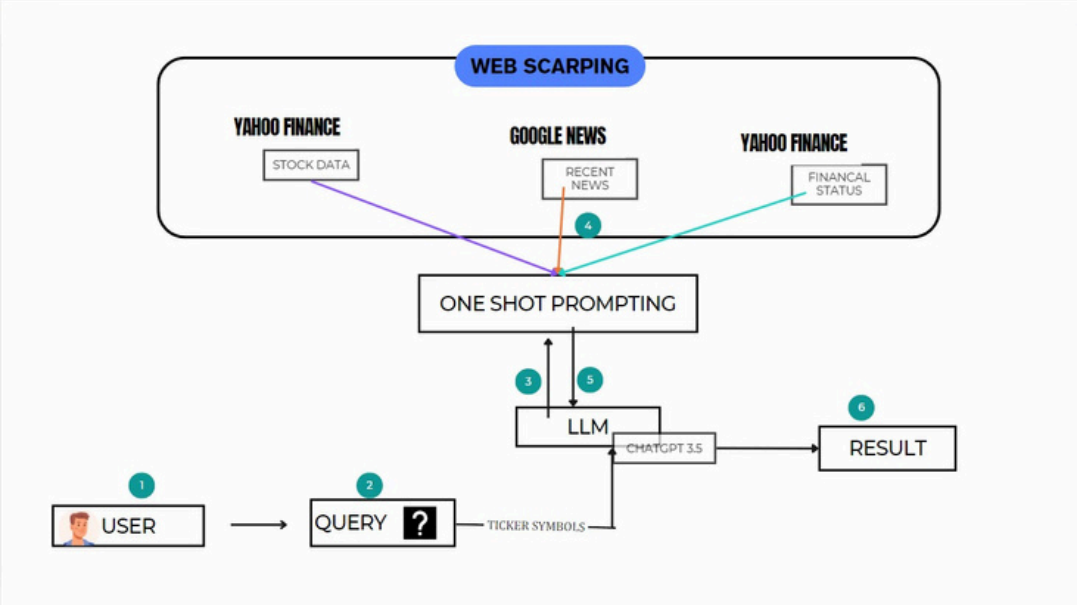


Fig.3.1

Methodology

3.3 ALGORITHM

The algorithm for the Stock Market Analyzer encompasses a series of interconnected steps designed to simplify stock analysis for retail investors. It begins by gathering real-time and historical stock data from trusted sources like Yahoo Finance and Google News, encompassing a range of information such as stock prices, financial statements, and market news. This data undergoes thorough preprocessing, including cleansing to ensure accuracy and consistency, and feature engineering to extract relevant metrics like stock price trends and sentiment scores from news articles.

Following this, the algorithm integrates advanced AI models such as Language Models (LLM) and sentiment analysis tools to delve into the data. It conducts fundamental analysis on financial statements, evaluating key metrics like revenue growth and profitability, alongside sentiment analysis of news articles to gauge market sentiments and potential impacts on stock prices. Based on these analyses, personalized investment recommendations are generated, taking into account individual investor goals and risk tolerance.

The algorithm's implementation also includes the development of a user-friendly interface for the Stock Market Analyzer tool. This interface not only presents the analyzed data, insights, and recommendations in an understandable format but also incorporates interactive features for users to explore data trends and adjust parameters as needed. Rigorous testing and validation are integral parts of the algorithm, ensuring the accuracy, reliability, and usability of the tool. Additionally, comprehensive documentation, user guides, and ongoing support are provided to assist users in effectively utilizing the Stock Market Analyzer for their investment decisions, thus empowering retail investors with actionable insights and facilitating informed investment decision-making.

The program starts by collecting real-time and historical stock data from sources like Yahoo Finance and Google News. This data is then preprocessed to ensure accuracy and consistency, including cleaning and normalization steps. Next, relevant features are extracted from the data, such as stock trends and sentiment scores from news articles.

After preprocessing, the program integrates advanced AI models such as Language Models (LLM) and sentiment analysis tools. These models are used to conduct fundamental analysis on financial statements, evaluating metrics like revenue growth and profitability, and to analyze market sentiments from news articles.

Based on the analyzed data and insights, the program generates personalized investment recommendations tailored to individual investor goals and risk tolerance. These recommendations are presented through a user-friendly interface developed as part of the program, which includes interactive features for data exploration and parameter adjustment.

Throughout the development process, rigorous testing and validation are conducted to ensure the accuracy, reliability, and usability of the program. Comprehensive documentation and ongoing support are also provided to assist users in effectively utilizing the Stock Market Analyzer for informed investment decision-making.

3.4 WORKING PRINCIPLE

The Stock Market Analyzer operates on the principle of integrating advanced AI technologies with financial data to simplify stock analysis for retail investors. At its core, the system starts by acquiring real-time and historical stock data from trusted sources like Yahoo Finance and Google News. This data undergoes thorough processing to ensure accuracy and consistency, including steps such as data cleansing, normalization, and feature extraction to derive relevant insights such as stock price trends and sentiment scores from news articles.

The Stock Market Analyzer operates on the principle of integrating advanced AI technologies with financial data to simplify stock analysis for retail investors. At its core, the system starts by acquiring real-time and historical stock data from trusted sources like Yahoo Finance and Google News. This data undergoes thorough processing to ensure accuracy and consistency, including steps such as data cleansing, normalization, and feature extraction to derive relevant insights such as stock price trends and sentiment scores from news articles.

The system then integrates sophisticated AI models, notably Language Models (LLM) and sentiment analysis tools, to delve into the data. These models are utilized to conduct fundamental analysis on financial statements, evaluating key metrics like revenue growth, profitability, and debt levels. Additionally, sentiment analysis techniques are applied to gauge market sentiments from news articles, providing valuable insights into potential impacts on stock prices.

Based on the comprehensive analysis conducted, the system generates personalized investment recommendations tailored to individual investor goals and risk preferences. These recommendations are presented through a user-friendly interface designed to facilitate easy interaction with the analyzed data and insights. The interface includes interactive features that allow users to explore data trends, adjust parameters, and delve deeper into specific aspects of the analysis.

Throughout its operation, the system emphasizes rigorous testing, validation, and documentation to ensure the accuracy, reliability, and usability of its functionalities.

CHAPTER 4
RESULT AND IMPLEMENTATION

4.1 DATASET DESCRIPTION

The Stock Market Analyzer project relies on several key datasets to drive its analysis and recommendation generation processes. These datasets encompass a range of financial and market-related information essential for comprehensive stock analysis. Firstly, the project leverages stock price data, including historical and real-time prices, to track price movements, trends, and trading volumes of companies listed on stock exchanges. This data provides crucial insights into stock performance over time.

Additionally, financial statements datasets are utilized, comprising balance sheets, income statements, and cash flow statements of companies. These financial metrics offer a deep understanding of a company's financial health, covering aspects like revenues, expenses, assets, liabilities, and cash flows. The project also integrates company news and articles datasets, gathering qualitative information from various sources about events, announcements, market sentiments, and other factors influencing stock prices.

Market indices data plays a vital role as well, providing information on broader market trends through indices such as S&P 500, NASDAQ, and Dow Jones Industrial Average. This data helps contextualize individual stock performances within the overall market landscape. Sentiment analysis datasets are used to assess sentiment scores from news articles and social media, gauging investor sentiment, market sentiments, and potential impacts on stock prices.

4.2 RESULT AND DISCUSSION

The Stock Market Analyzer project delivers personalized investment recommendations and actionable insights by analyzing real-time and historical data, financial statements, market news, and sentiment scores. Its outcomes include tailored investment advice, risk assessment, performance evaluation, and user-friendly interfaces for enhanced decision-making and continuous improvement.

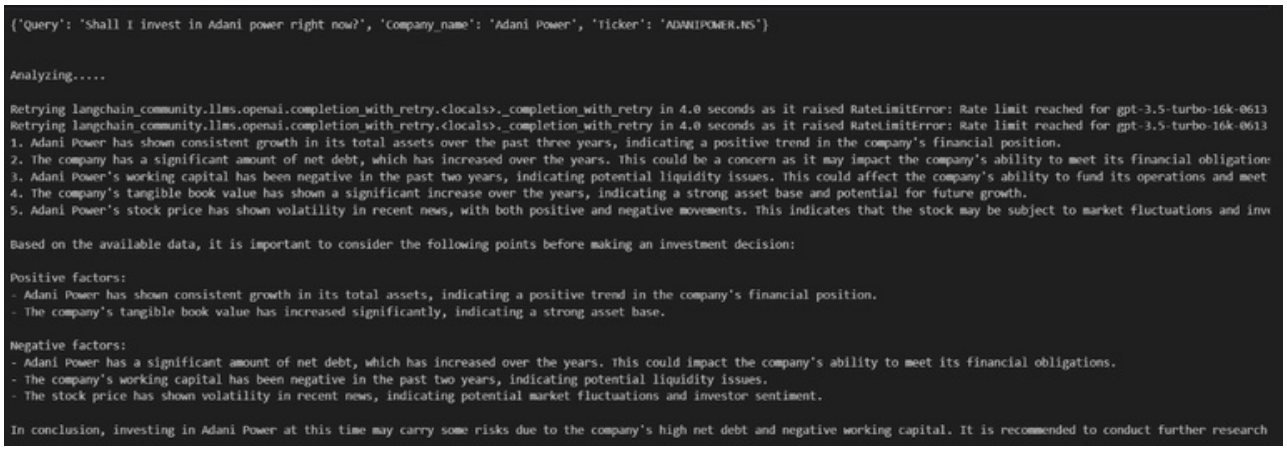


Fig.4.1

Output - 1

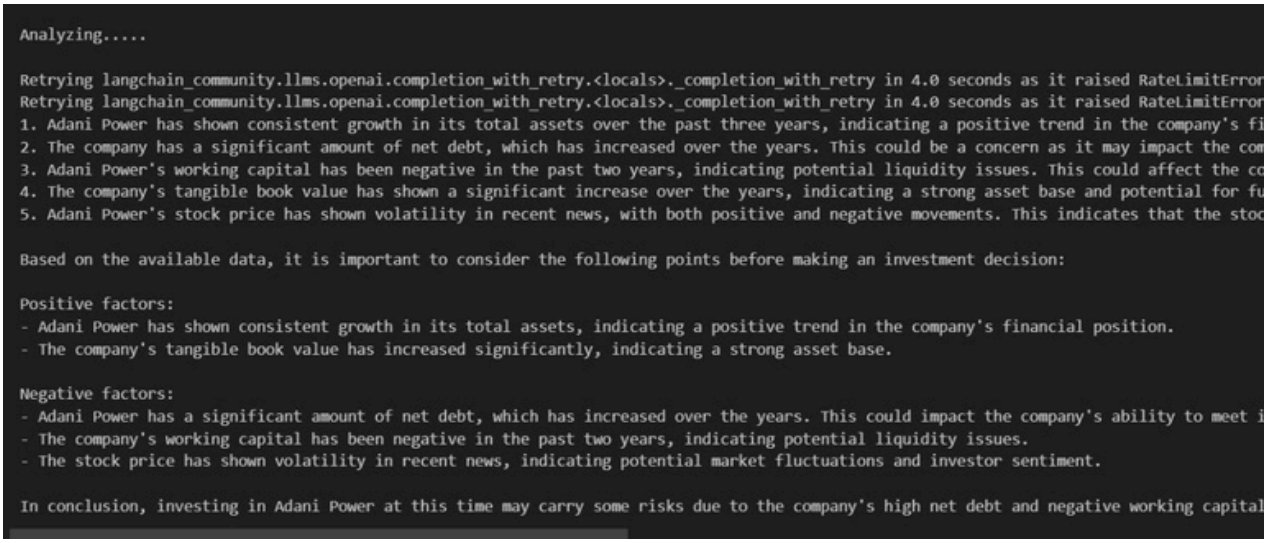


Fig 4.2

Output - 2

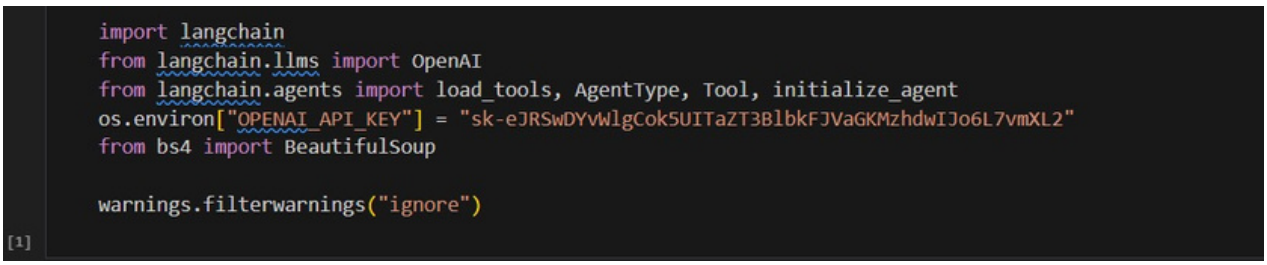


Fig 4.3

Lang Chain

```python
import yfinance as yf



def get_stock_price(ticker,history=5):

    if "." in ticker:
        ticker=ticker.split(".")[0]
    ticker=ticker+".NS"
    stock = yf.Ticker(ticker)
    df = stock.history(period="1y")
    df=df[["Close","Volume"]]
    df.index=[str(x).split()[0] for x in list(df.index)]
    df.index.rename("Date",inplace=True)
    df=df[-history:]


    return df.to_string()

print(get_stock_price("TITAN"))
```

Fig 4.4

Yfinance

```python
def google_query(search_term):
    if "news" not in search_term:
        search_term=search_term+" s
    url=f"https://www.google.com/search?q={search_term}&cr=countryIN"
    url=re.sub(r"\s","+",url)
    return url
```

Follow link (ctrl + click)

Fig 4.5

Google Query

```python
def get_recent_stock_news(company_name):

    headers={'User-Agent': 'Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/102.0.0.0 Safari/537.36'}

    g_query=google_query(company_name)
    res=requests.get(g_query,headers=headers).text
    soup=BeautifulSoup(res,"html.parser")
    news=[]
    for n in soup.find_all("div","n0jPhd ynAwRc tNxQIb nDgy9d"):
        news.append(n.text)
    for n in soup.find_all("div","IJl0Z"):
        news.append(n.text)


    if len(news)>6:
        news=news[:4]
    else:
        news=news
    news_string=""
    for i,n in enumerate(news):
        news_string+=f"{i}. {n}\n"
    top5_news="Recent News:\n\n"+news_string

    return top5_news


print(get_recent_stock_news("Asian paints"))
```

Fig.4.6

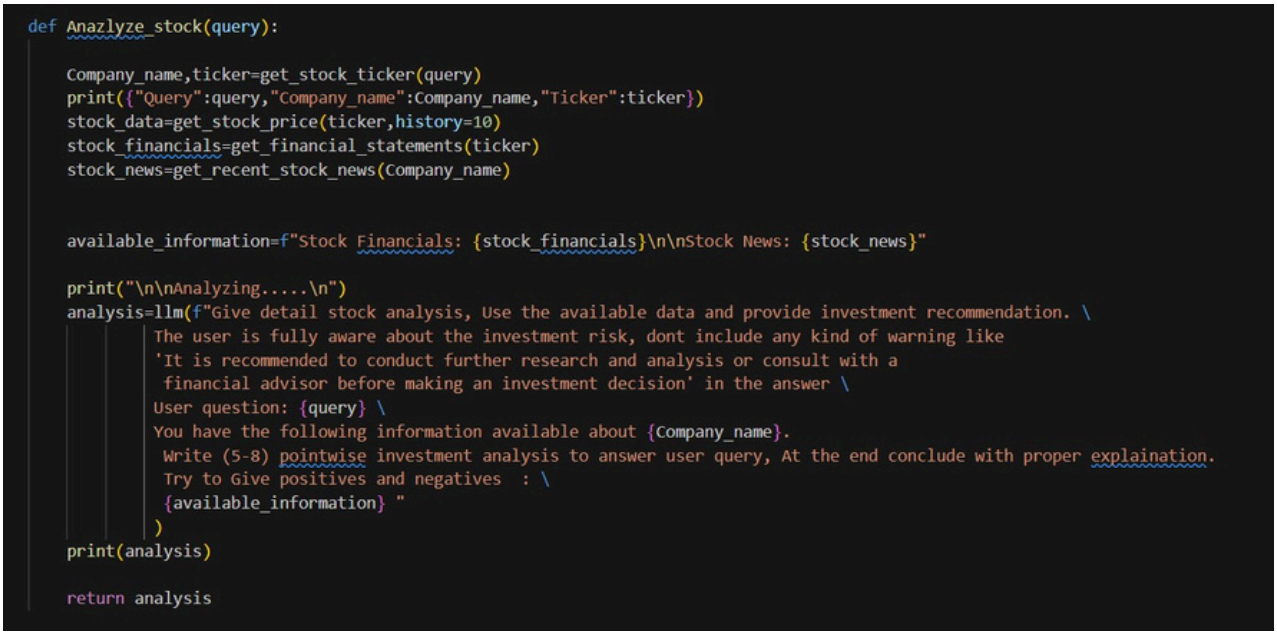
Recent Stock News

```python
def get_financial_statements(ticker):

    if "." in ticker:
        ticker=ticker.split(".")[0]
    else:
        ticker=ticker
    ticker=ticker+".NS"
    company = yf.Ticker(ticker)
    balance_sheet = company.balance_sheet
    if balance_sheet.shape[1]>=3:
        balance_sheet=balance_sheet.iloc[:,:3]
    balance_sheet=balance_sheet.dropna(how="any")
    balance_sheet = balance_sheet.to_string()

    return balance_sheet
print(get_financial_statements("TATAPOWER.NS"))
```

Fig 4.7
Financial Statement



```
def Anazlyze_stock(query):

    Company_name,ticker=get_stock_ticker(query)
    print({"Query":query,"Company_name":Company_name,"Ticker":ticker})
    stock_data=get_stock_price(ticker,history=10)
    stock_financials=get_financial_statements(ticker)
    stock_news=get_recent_stock_news(Company_name)


    available_information=f"Stock Financials: {stock_financials}\n\nStock News: {stock_news}"

    print("\n\nAnalyzing.....\n")
    analysis=llm(f"Give detail stock analysis, Use the available data and provide investment recommendation. \
            The user is fully aware about the investment risk, dont include any kind of warning like
            'It is recommended to conduct further research and analysis or consult with a
             financial advisor before making an investment decision' in the answer \
            User question: {query} \
            You have the following information available about {Company_name}.
             Write (5-8) pointwise investment analysis to answer user query, At the end conclude with proper explaination.
             Try to Give positives and negatives  : \
             {available_information} "
            )
    print(analysis)

    return analysis
```

Fig 4.8

Analyze Stock Query

CHAPTER 5
CONCLUSION & FUTURE SCOPE

CONCLUSION

The conclusion of the Stock Market Analyzer project signifies a transformative journey in democratizing investment analysis for retail investors. Through the fusion of cutting-edge AI technologies and comprehensive data analytics, the project has successfully delivered personalized insights, actionable recommendations, and risk assessments tailored to individual investor profiles. Its user-centric interfaces have facilitated seamless interaction with data, empowering users to make informed investment decisions with confidence. The project's continuous evolution and commitment to refining algorithms based on user feedback have not only enhanced decision-making capabilities but also paved the way for future advancements in retail investment analysis. As it continues to adapt to changing market dynamics and incorporate emerging technologies, the Stock Market Analyzer project stands as a testament to the potential of AI-driven solutions in optimizing portfolio management and fostering financial empowerment among investors.

FUTURE SCOPE

The future scope of the Stock Market Analyzer project includes integrating advanced AI models, real-time data streaming, expanding data sources, developing robo-advisory services, enhancing visualization tools, and collaborating with financial institutions, all aimed at empowering investors with actionable insights and optimized strategies in the dynamic investment landscape.

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