AI-Powered Trade Scanner for Financial Markets

Group Members: Alankriti Dubey, Nidhi Parab, Grace Evangelene Avula Lael

1. Introduction

In today's digital age, financial markets produce an overwhelming volume of unstructured data, including news articles, tweets, and analyst commentary. Traders often struggle with data deluge, delayed decision-making, and subjective interpretations. This project presents an AI-powered trade scanner designed to streamline data analysis through natural language processing (NLP), automate sentiment assessment, and deliver real-time, actionable trading signals.

Objectives of the system include:

- Automating sentiment analysis of financial text data using NLP.
- Extracting stock mentions and identifying trending financial topics.
- Merging sentiment scores with market data to generate actionable trade signals.
- Delivering insights via periodic email reports for proactive decision-making.

2. Methodology

2.1 System Architecture

The trade scanner pipeline is composed of the following key stages:

- ➢ **Data Collection:** Retrieves news using NewsAPI, tweets via Twitter API, and historical price data through yfinance.
- ➢ **Text Preprocessing:** Cleans text by removing noise such as URLs, emojis, and punctuation, then applies tokenization and stopword filtering using NLTK.
- ➢ **Sentiment Analysis:** Implements VADER for short-form content and validates results using TextBlob. Sentiments are categorized from "Very Positive" to "Very Negative".
- ➢ **Stock Mention Extraction:** Uses regular expressions and a ticker list to identify company mentions.
- ➢ **Trending Topic Detection:** Evaluates term frequency to detect commonly discussed financial themes.
- ➢ **Insight Generation:** Combines sentiment trends with market performance and volatility to generate trade signals like "Buy" or "Caution".
- ➢ **Reporting:** Compiles insights into a concise report and dispatches it through automated emails.

2.2 Key Technologies

- ➢ **Languages and Libraries:** Python with NLTK, pandas, yfinance, tweepy.
- ➢ **APIs Used:** NewsAPI, Twitter API.
- ➢ **Sentiment Tools:** VADER (for social sentiment), TextBlob (for validation).

3. Results

3.1 Sample Output

The system generates a digest including:

- ➢ Top Financial Topics: Frequent keywords such as "inflation" and "earnings".
- ➢ Popular Stocks: Frequently mentioned tickers with sentiment summaries.
- ➢ Example Insight:
  - ○ AAPL: Sentiment score of +0.35 paired with a 3% price decline.
  - ○ Signal: "Potential buying opportunity if underlying fundamentals remain strong."

```
1. META ($574.98)
-------------------------------
   Market Sentiment: Very Positive (0.86)
   Recent Performance: Strong Downtrend (-8.20%)
   Mention Count: 3
   Volatility: 0.0209

   SIGNALS:
   * BULLISH (medium): Positive sentiment (0.86) despite recent price decline (-8.20%).
Potential buying opportunity if fundamentals support it.
   * VOLATILITY (high): High volatility (0.0209) with strong sentiment (0.86). Consider
adjusting position sizes or using options strategies.
```

3.2 System Performance

- ➢ Handles analysis of hundreds of financial documents within minutes.
- ➢ Sentiment classification accuracy confirmed through manual cross-checks.
- ➢ Provides early warnings for volatile scenarios, improving risk awareness.

4. Discussion

4.1 Challenges Encountered

- ➢ Social Media Noise: Addressed using rigorous text preprocessing.
- ➢ API Limitations: Managed through rate-limit handling and retry logic.
- ➢ Ambiguity in Text: Reduced by using complementary sentiment tools.

4.2 Future Directions

➢ Incorporate FinBERT for domain-specific sentiment interpretation.
➢ Add real-time alerts via Telegram for immediate decision-making.
➢ Support multilingual analysis to cover international markets.

5. Conclusion

The AI-powered trade scanner successfully transforms vast volumes of unstructured data into meaningful trading insights. By leveraging NLP and machine learning, it enhances the speed, objectivity, and scalability of trading strategies. Continued improvements will further refine its predictive power and market coverage.

Key Benefits:

• Reduces manual workload and emotional bias.
• Delivers near-instantaneous market sentiment insights.
• Equips traders with data-driven decision support tools.

References:

o NewsAPI Documentation
o NLTK Library
o VADER Sentiment Analysis Paper