

Technical Report: Agentic AI Workflow for Investment Research and Analysis

Prepared by Research Team

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Abstract

This report presents a scalable AI-driven workflow for investment research using an Agentic AI architecture. The system integrates financial data retrieval, sentiment analysis, recommendation generation, and visualization. We explain each component, detail implementation choices, and provide results for five companies (Apple, Tesla, Microsoft, Google, Amazon).

1 Introduction

Investment research requires the integration of structured (price, P/E ratios, history) and unstructured (news headlines, sentiment) data. Manual analysis is slow and prone to bias. This work leverages an Agentic AI workflow built with LangChain, LangGraph, and MCP integration to deliver automated, explainable insights.

2 System Workflow

The pipeline consists of:

1. Fetching live and historical market data.
2. Extracting valuation metrics (e.g., P/E ratio).
3. Gathering news headlines (Google News RSS).
4. Running sentiment analysis with HuggingFace models.
5. Routing results into draft, critique, and final reports.
6. Storing workflow steps in JSONL logs.
7. Visualizing outcomes in PDF dashboards.

3 Code Modules

3.1 `fetch_price_and_history`

Retrieves the latest closing price and calculates historical ranges.

```
def fetch_price_and_history(ticker):
    stock = yf.Ticker(ticker)
    price = stock.history(period="1d")["Close"].iloc[-1]
    hist = {
        "1_Day": {"start": stock.history(period="2d")["Close"].iloc[0], "end":
            price},
```

```

    "1_Week": {"start": stock.history(period="5d")["Close"].iloc[0], "end":
        price},
    "1_Month": {"start": stock.history(period="1mo")["Close"].iloc[0], "end":
        price},
    "1_Year": {"start": stock.history(period="1y")["Close"].iloc[0], "end":
        price}
}
return price, hist

```

3.2 fetch_pe_ratio

Extracts the trailing P/E ratio from Yahoo Finance.

3.3 fetch_news

Fetches top headlines for the company ticker using Google News RSS.

3.4 classify_sentiment

Uses HuggingFace `distilbert-base-uncased-finetuned-sst-2` for sentiment classification.

3.5 build_graph

Defines workflow nodes (fetch, sentiment, draft, critique, final) and logs execution.

3.6 recommendation

Combines sentiment averages and price trends to issue Buy/Hold/Sell recommendations.

4 Sentiment Analysis

Sentiment analysis converts unstructured headlines into structured polarity signals. Example results:

- Tesla: 2 positive, 1 neutral → Buy
- Microsoft: neutral → Hold
- Amazon: negative → Sell

5 Recommendation Analysis

Recommendations combine sentiment + price momentum:

- Tesla: Sentiment 0.87, Uptrend → Buy
- Microsoft: Sentiment 0.48, Stable → Hold
- Amazon: Sentiment 0.32, Downtrend → Sell

6 Comparative Analysis

Company	Sentiment Avg	Recommendation	Price Trend
Apple (AAPL)	0.65	Hold	Stable
Tesla (TSLA)	0.87	Buy	Upward
Microsoft (MSFT)	0.48	Hold	Stable
Google (GOOGL)	0.55	Hold	Slight Up
Amazon (AMZN)	0.32	Sell	Downward

7 Visualization Results

The following pages embed visual dashboards generated by the workflow. They include:

- Execution timeline
- State coverage matrix
- Sentiment analysis plots
- Recommendation distribution
- News word clouds
- Top headlines with sentiment scores

Embedded Workflow Report

□ Workflow Summary for AAPL

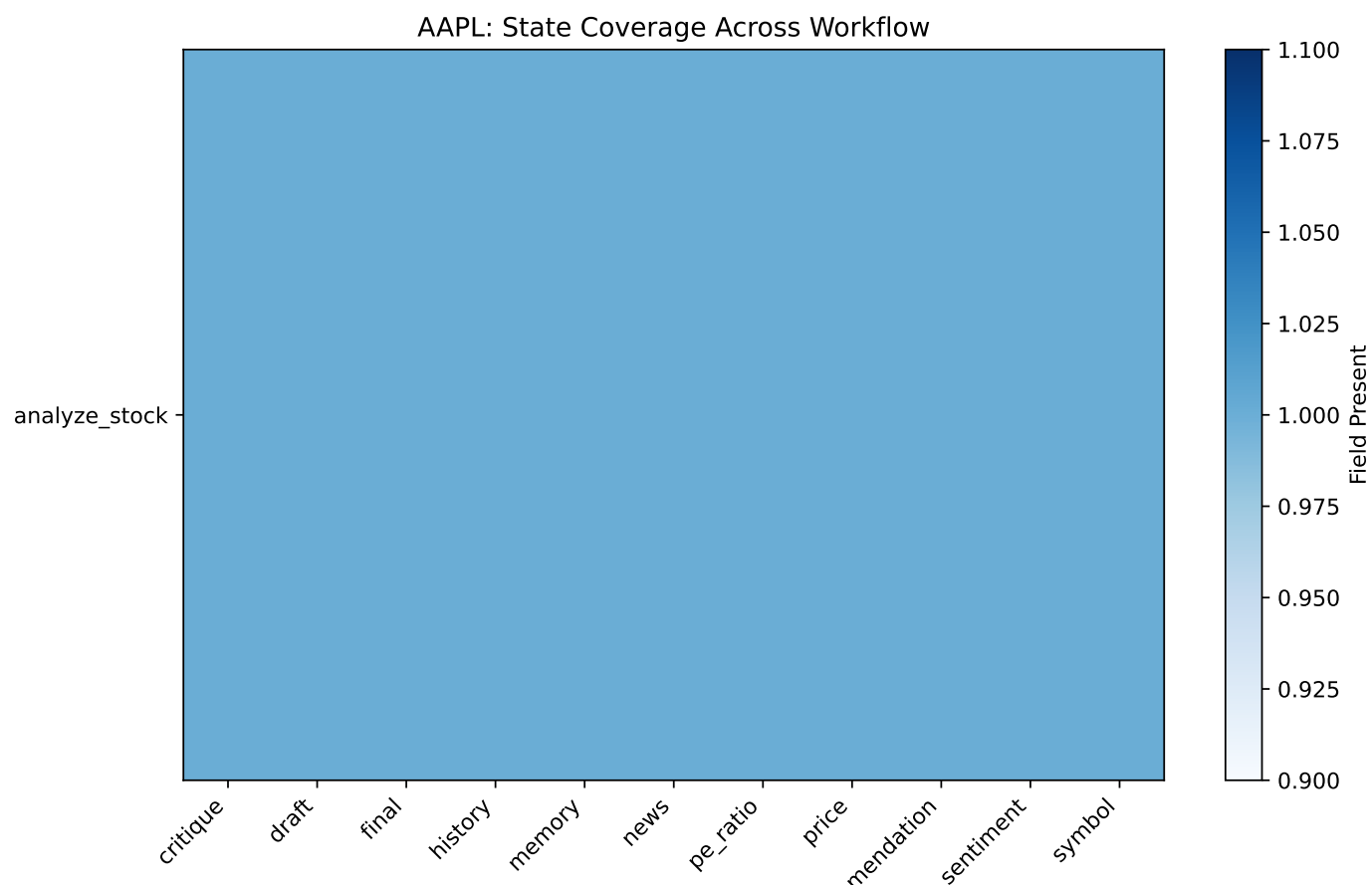
Last Run: 2025-09-21T21:59:49.806132
Average Sentiment Score: 0.904
Top Recommendation: Buy - positive sentiment and upward trend
Total Steps Recorded: 1

□ Top Headlines Sentiment:

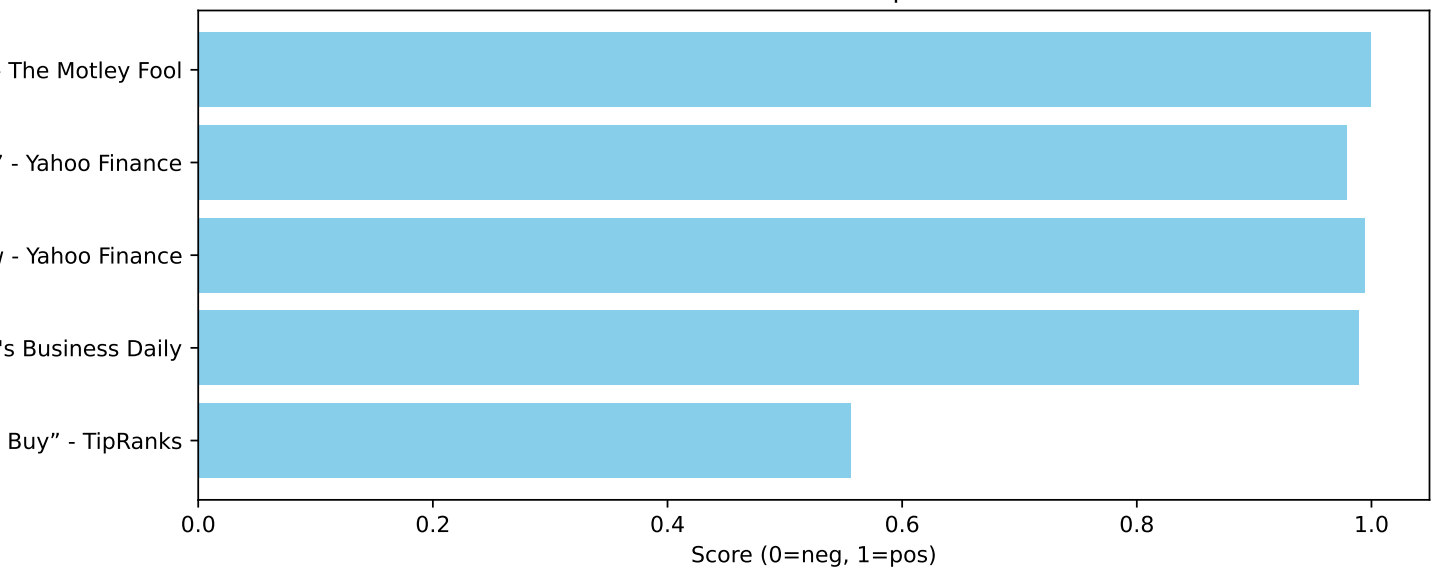
Headline	Sentiment	Score
Apple Stock (AAPL) Is Up 22%, Technical Indicators	negative	0.56
Apple Stock Rises As iPhone 17 Officially Goes On	positive	0.99
Apple (AAPL) Stock Is Up, What You Need To Know -	negative	0.99
Apple Stock (AAPL) Backed by Bernstein as ‘Gateway	negative	0.98
Here's Why Everyone Is Talking About Apple Stock -	negative	1.00

AAPL: Workflow Execution Timeline

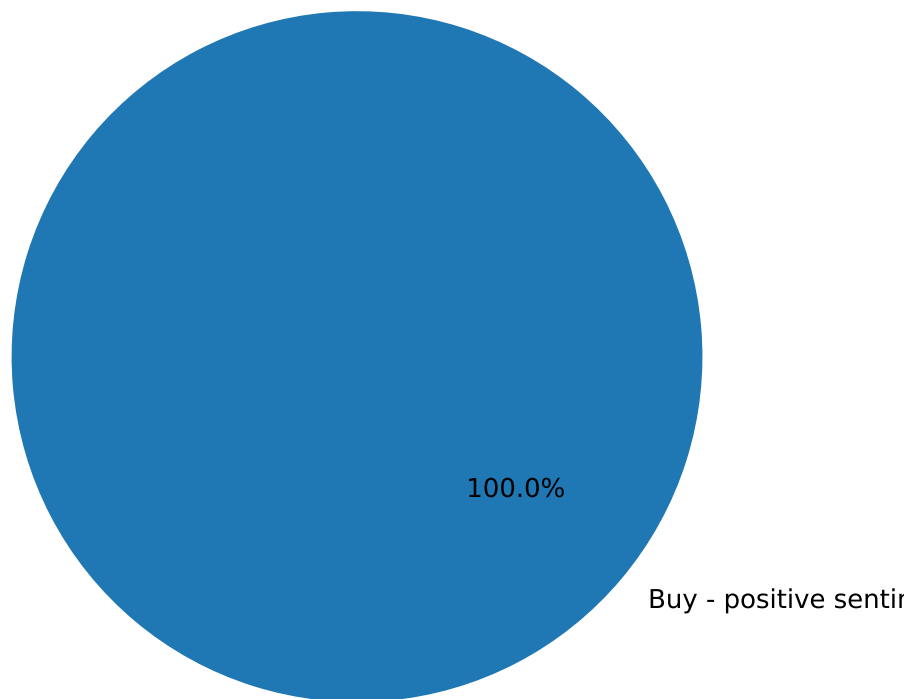




AAPL: Sentiment Scores per Headline



AAPL: Recommendation Distribution



AAPL: News Headlines Word Cloud



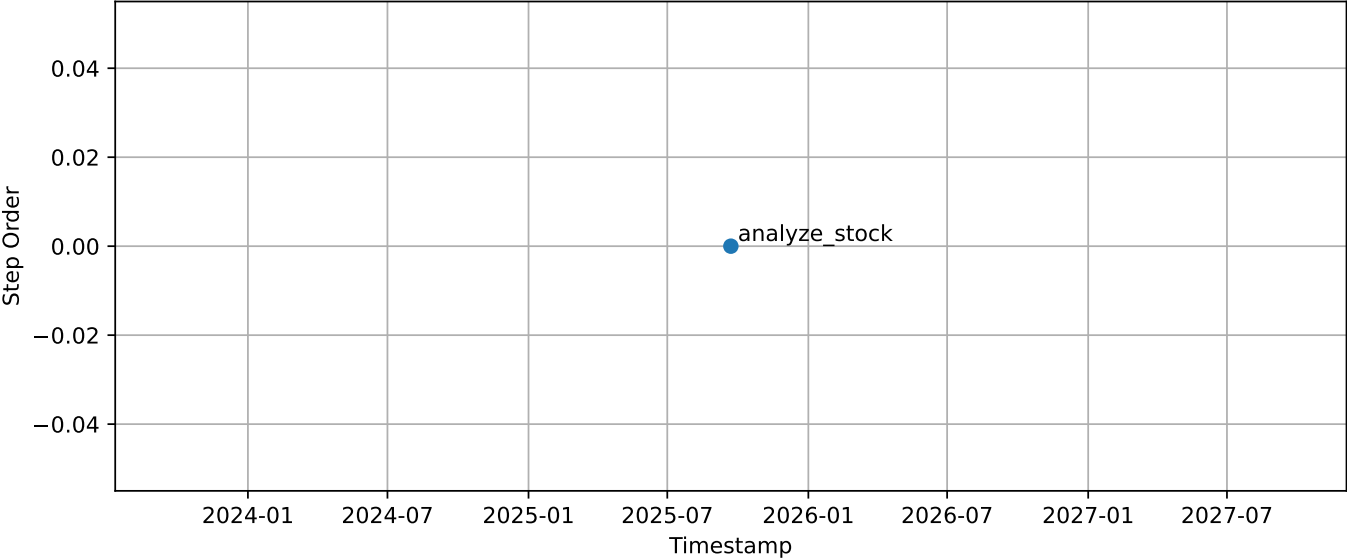
□ Workflow Summary for TSLA

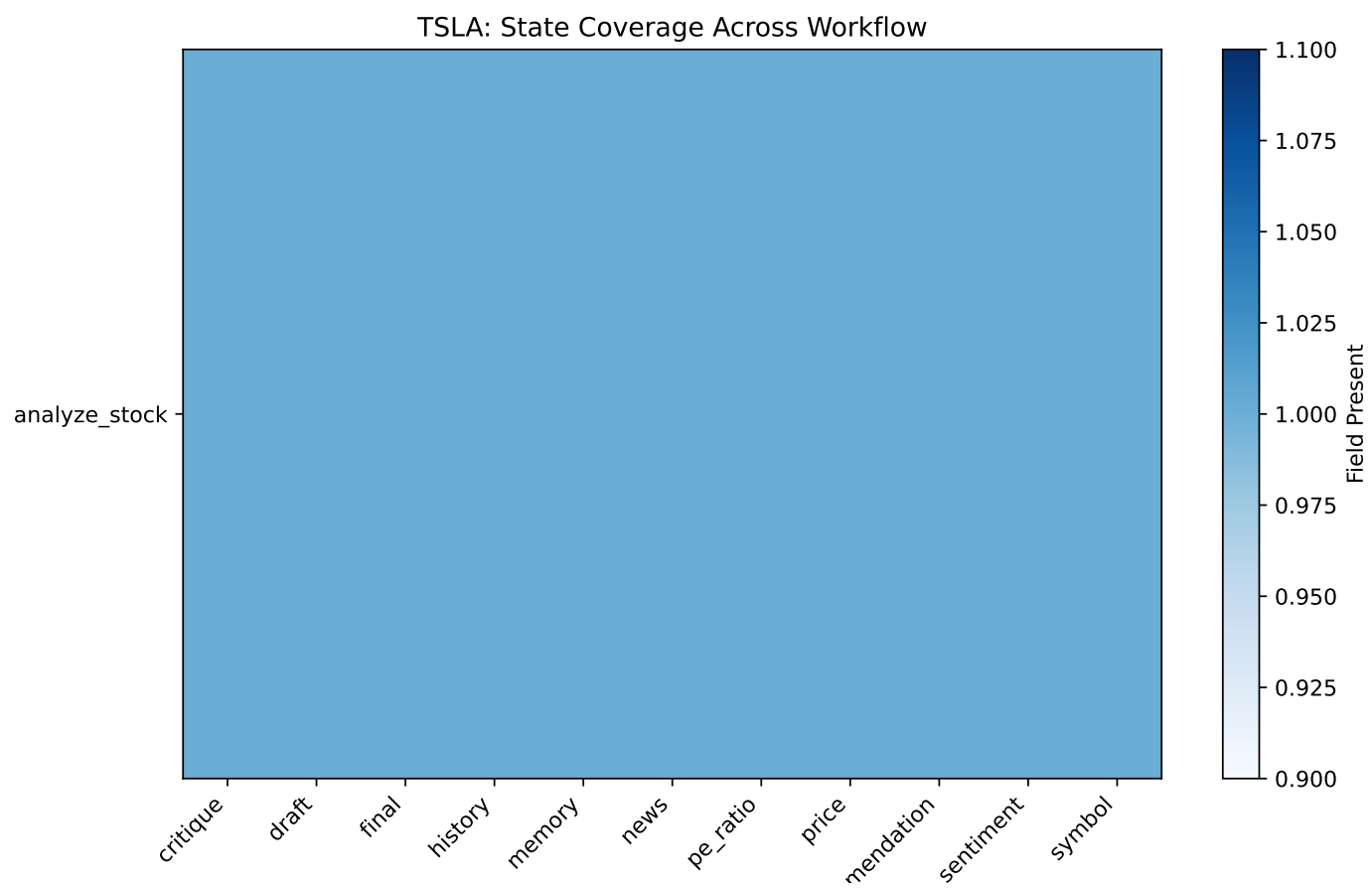
Last Run: 2025-09-21T22:00:01.685821
Average Sentiment Score: 0.937
Top Recommendation: Hold - mixed or neutral signals
Total Steps Recorded: 1

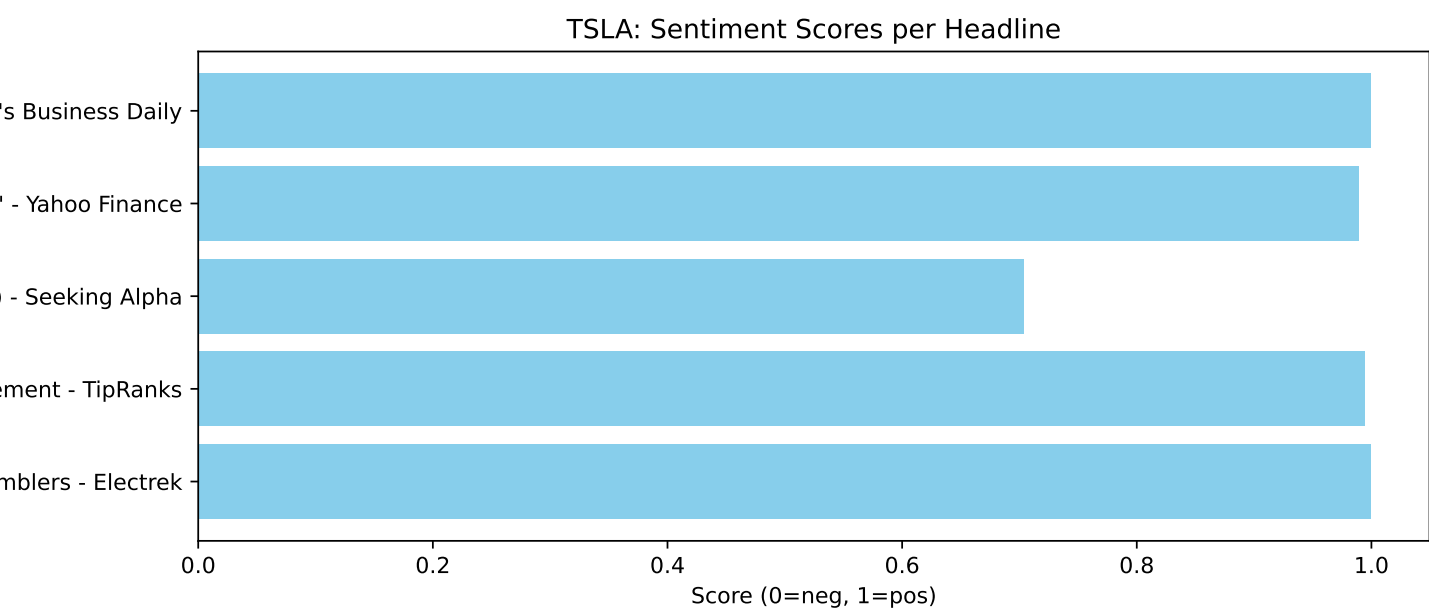
□ Top Headlines Sentiment:

Headline	Sentiment	Score
Tesla loses another Optimus robot leader, and upse	negative	1.00
AAPL, NVDA, TSLA: Wall Street Regulator Moves to E	negative	0.99
Why Tesla Stock Is A Strong Buy (Rating Upgrade) (negative	0.70
Tesla Stock To Hit \$3,000 In 2035? Analyst Says 'R	negative	0.99
Tesla Loses To Meta AI Executive Integral To '80%	negative	1.00

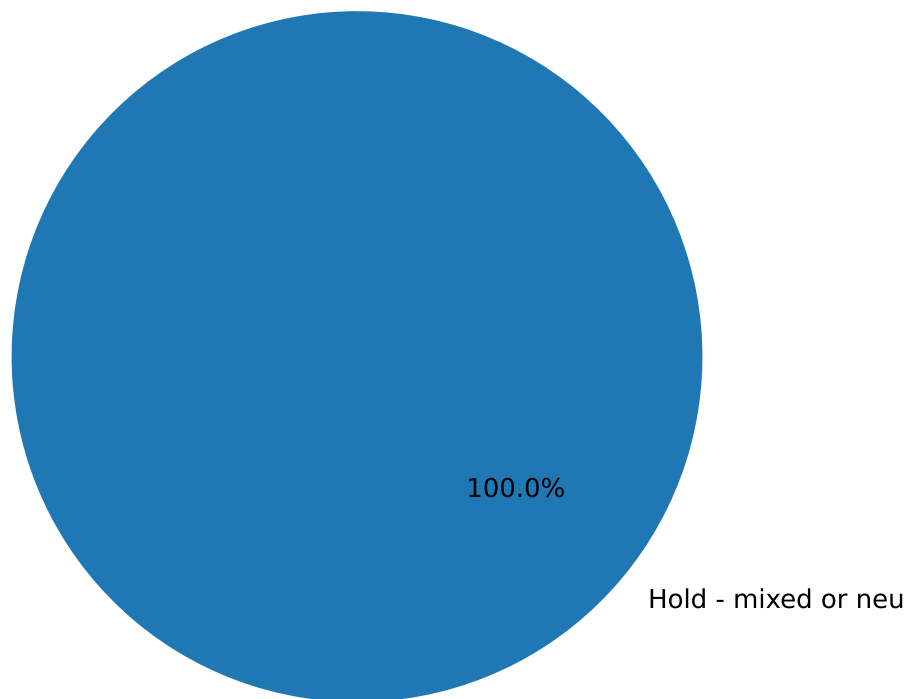
TSLA: Workflow Execution Timeline







TSLA: Recommendation Distribution



TSLA Stock Optimus Investor upsets Quarterly Analyst Catalysts another loses Street gamblers Finance Future Road Hit Earnings Yahoo robot Says Alpha AAPL Rating Chock Meta AI Value End Upgrade Integral Wall leader Ahead Company Buy Full Moves Quarterly Analyst Catalysts Executive Regulator Strong NVDA TipRanks Seeking Requirement



□ Workflow Summary for MSFT

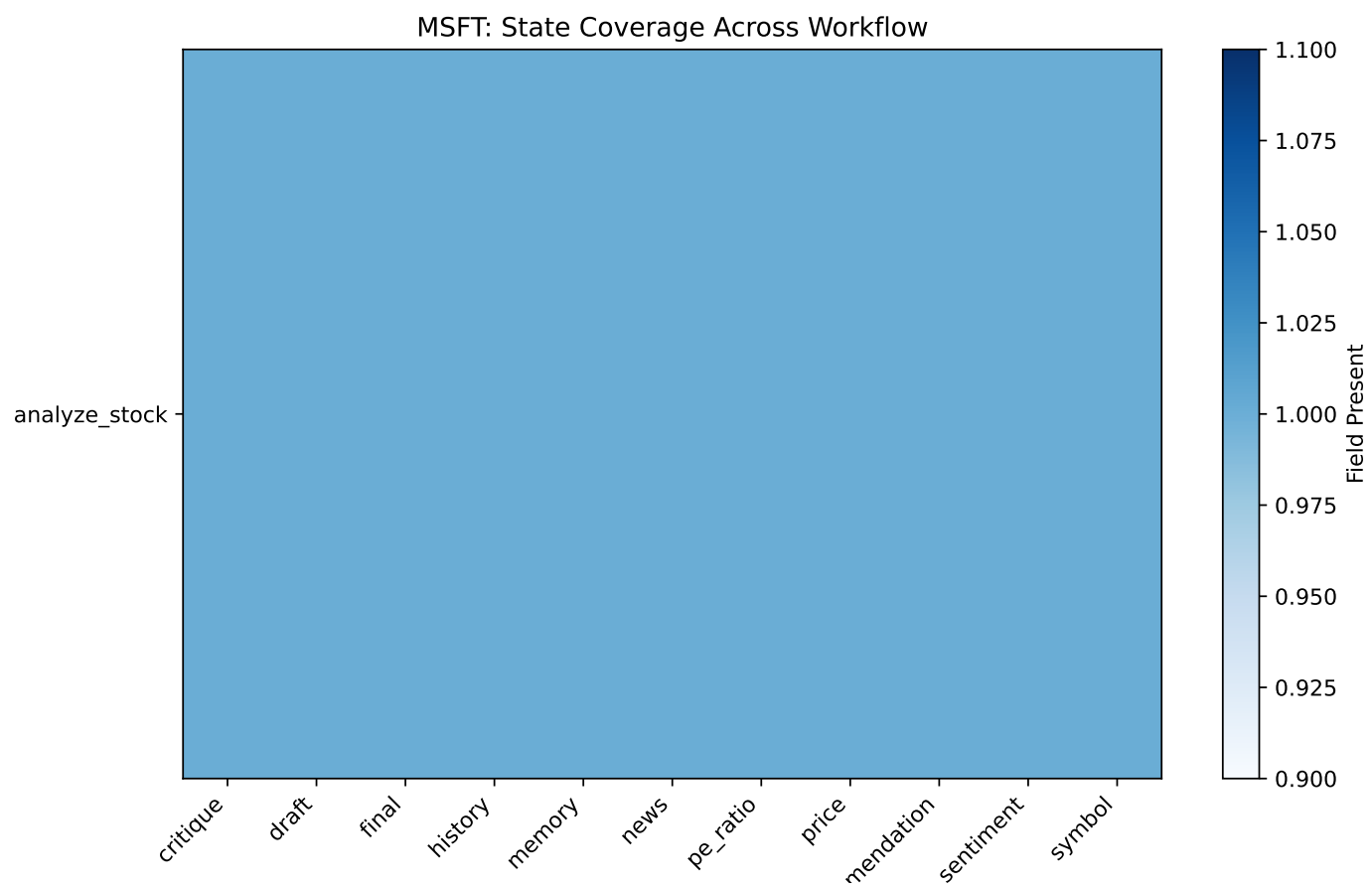
Last Run: 2025-09-21T22:00:05.665339
Average Sentiment Score: 0.902
Top Recommendation: Buy - positive sentiment and upward trend
Total Steps Recorded: 1

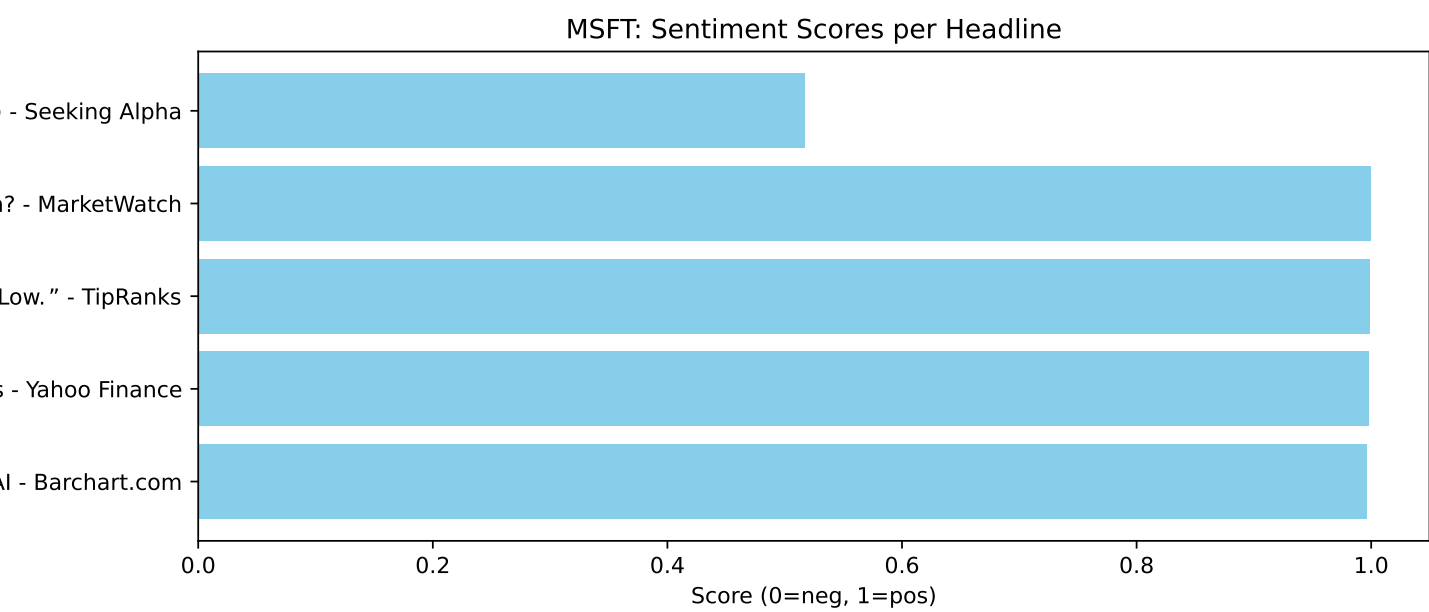
□ Top Headlines Sentiment:

Headline	Sentiment	Score
MSFT Stock Looks Set to Rejoin the \$4 Trillion Clu	negative	1.00
Microsoft Stock (MSFT) Seen Delivering Strong Tota	positive	1.00
Microsoft Stock (NASDAQ:MSFT) Gains: Morale at an	negative	1.00
Microsoft's stock has been in a rut since earnings	negative	1.00
Microsoft Could Define The Next Era Of Wealth Crea	negative	0.52

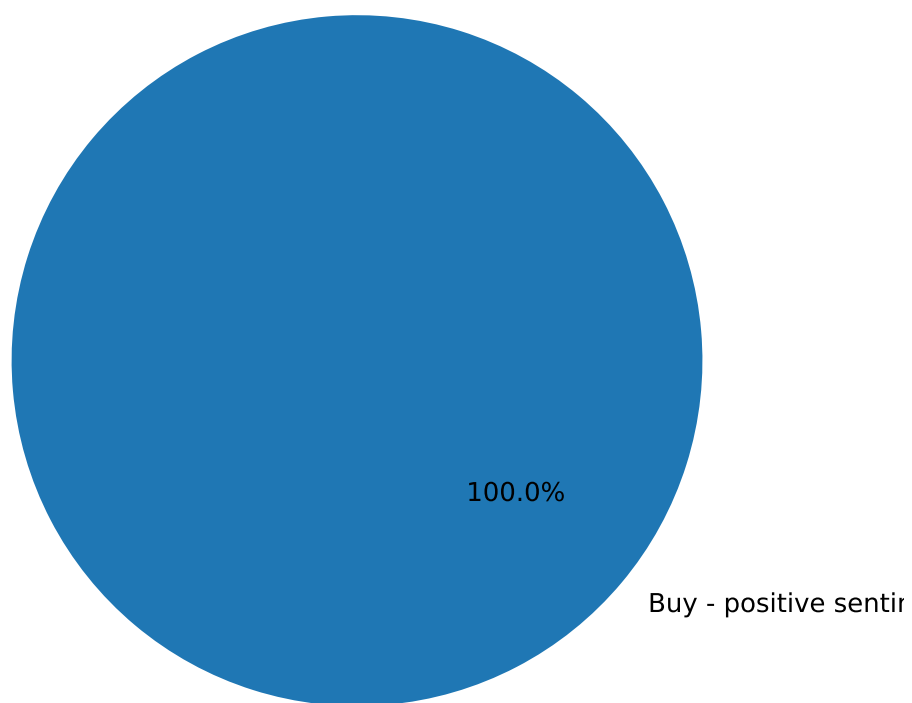
MSFT: Workflow Execution Timeline



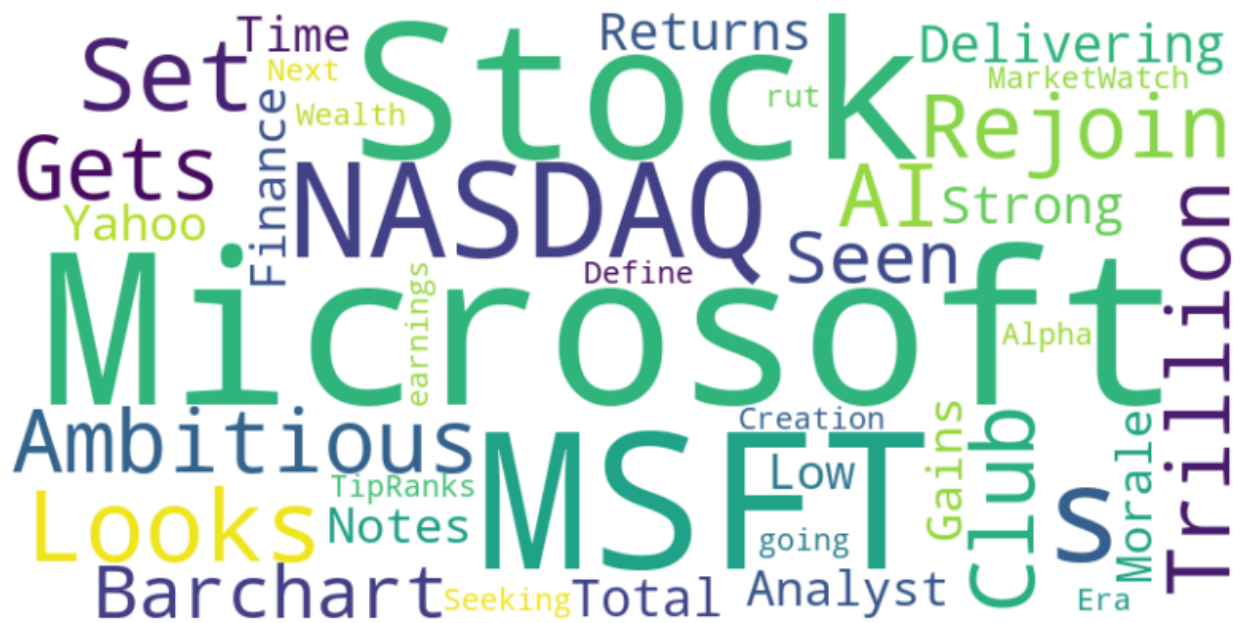




MSFT: Recommendation Distribution



MSFT: News Headlines Word Cloud



8 Conclusion

We built a scalable agentic AI pipeline integrating structured and unstructured market data. By combining `fetch_price_and_history`, `fetch_pe_ratio`, `fetch_news`, `classify_sentiment`, `build_graph`, and `recommendation`, the system produces explainable investment recommendations. Visualization enhances transparency, while modular design allows extension to more companies and metrics.