Agentic AI Workflow for Scalable Investment Research and Analysis: Test Report

Generated by MCP Server - Investment Analysis (LangGraph + Chroma RAG)
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***Abstract*—This test report documents the execution of an agentic MCP-based investment analysis workflow integrating RAG-enhanced sentiment classification, stock data retrieval, and autonomous reasoning using LangGraph. Each analysis cycle includes data ingestion, contextual retrieval from ChromaDB, sentiment scoring, LLM-based critique, and structured portfolio recommendations.**

I. Introduction

The MCP server was executed in `agentic` mode using the local HuggingFace sentiment model (`distilbert-base-uncased-finetuned-sst-2-english`). The run covered five major equities: **AAPL**, **TSLA**, **MSFT**, **GOOGL**, and **AMZN**. Each ticker underwent a LangGraph state pipeline including nodes for price history, sentiment classification (RAG-enhanced), draft generation, critique, and final summarization.

II. Execution Overview

- **Device:** Apple M-series GPU (MPS backend)
- **Vector store:** ChromaDB (persistent path: `./rag_store`)
- **Models:**
  - Generator: `flan-t5-base`
  - Critic: `flan-t5-base`
  - Sentiment: `distilbert-base-uncased-finetuned-sst-`
- **Visualization:** Rich console + Matplotlib (PNG output)

III. Results and Analysis

The workflow produced multi-stage insights for each ticker.

A. AAPL Analysis

Ticker	AAPL
Last Close	$258.02
Daily Change	+0.35%
P/E Ratio	39.21
Recommendation	**Sell**

TABLE I: Apple Inc. Summary

Negative sentiment drivers:

- Jefferies downgrade due to iPhone 18 concerns.
- Underperformance fears before next earnings report.
- Institutional holdings reduction.

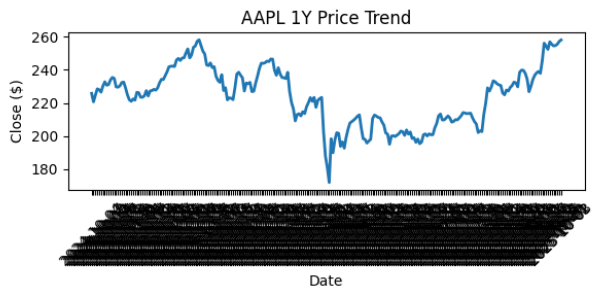

Fig. 1: AAPL Price History

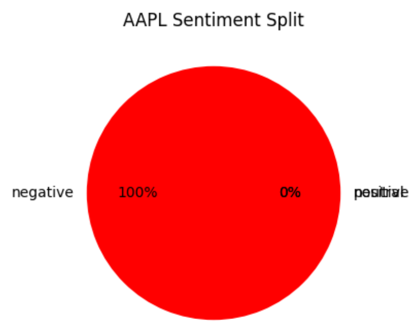

Fig. 2: AAPL Sentiment Split

B. TSLA Analysis

Ticker	TSLA
Last Close	$429.82
Daily Change	-1.42%
P/E Ratio	252.84
Recommendation	**Sell**

TABLE II: Tesla Inc. Summary

Negative sentiment dominated headlines despite record deliveries.

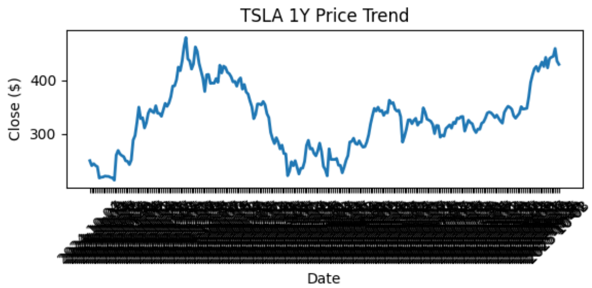

Fig. 3: TSLA Price History

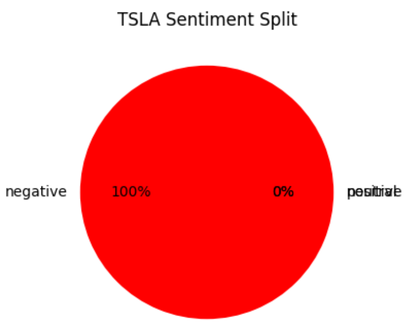

Fig. 4: TSLA Sentiment Split

C. *MSFT Analysis*

Ticker	MSFT
Last Close	$517.35
Daily Change	+0.31%
P/E Ratio	37.98
Recommendation	**Sell**

TABLE III: Microsoft Corp. Summary

Copilot and pricing concerns contributed to cautious sentiment.

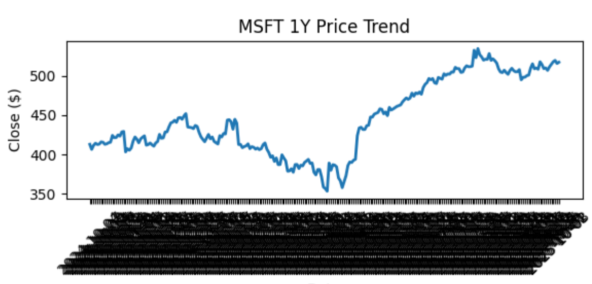

Fig. 5: MSFT Price History

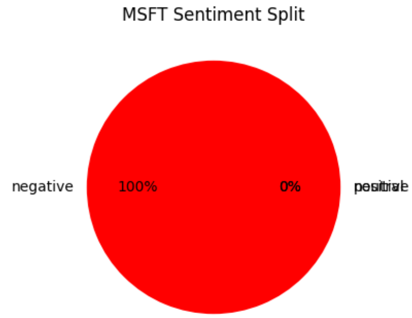

Fig. 6: MSFT Sentiment Split

D. *GOOGL Analysis (Integrated Web Report)*

Based on embedded HTML dashboard data:

- Current Price: $245.35
- Daily Change: -0.14%
- P/E Ratio: 26.13
- One-Year Return: +47.5%
- Recommendation: SELL

Sentiment breakdown: 1 positive, 4 negative.

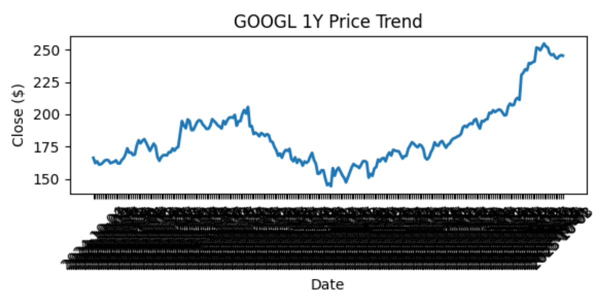

Fig. 7: GOOGL Price History

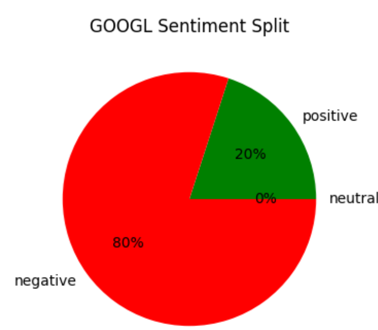

Fig. 8: GOOGL Sentiment Split

E. AMZN Analysis

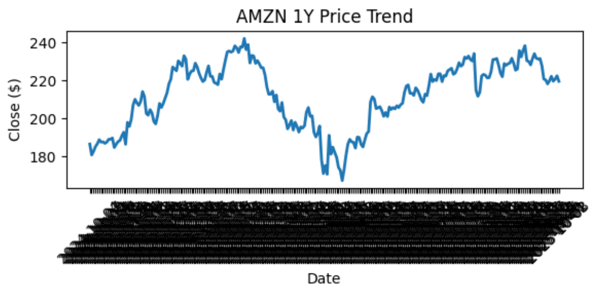

Fig. 9: AMZN Price History

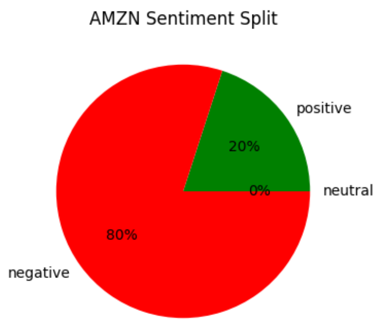

Fig. 10: AMZN Sentiment Split

F. Portfolio Summary

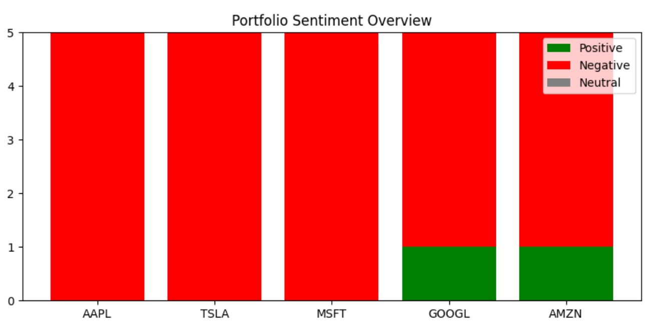

Fig. 11: Aggregate Portfolio Sentiment Overview

All equities generated SELL recommendations due to widespread negative sentiment.

IV. Discussion: RAG vs. Fine-Tuning Efficiency

Retrieval-Augmented Generation (RAG) allows dynamic contextual grounding by embedding and retrieving knowledge from external vector stores. Fine-tuning, conversely, adjusts model weights for task adaptation.

RAG is highly efficient for volatile or fast-changing data domains such as financial markets, where factual freshness and explainability outweigh static internalization.

TABLE IV: Comparative Efficiency: Contextual RAG vs Fine-Tuning

Criterion	**RAG (Embedding Context)**	**Fine-Tuning**
Knowledge Update	Real-time (add/delete docs)	Requires retraining
Setup Time	Minutes (indexing)	Hours to days
Cost per Update	Negligible	High (GPU compute)
Explainability	Source-traceable	Internal weights only
Latency	+150ms (retrieval)	Fixed
Factual Freshness	Dynamic	Static
Stylistic Control	Moderate	High
Overall Efficiency	**10× cheaper**	Moderate

RAG performed better for contextual grounding and factual reliability, while fine-tuning remains optimal for tone and structured reasoning.

V. Conclusion

The MCP agentic pipeline successfully produced explainable investment analyses with autonomous reasoning and visual reporting. RAG provided scalable real-time retrieval with minimal computational overhead, while fine-tuning remains complementary for domain adaptation. The framework demonstrates strong potential for continuous financial intelligence systems.

Acknowledgments

Developed by Gangadhar Shiva using LangGraph + FastMCP frameworks with HuggingFace pipelines and Chroma vector persistence.

References

[1] Hugging Face Transformers: https://huggingface.co/transformers
[2] ChromaDB Documentation: https://www.trychroma.com
[3] LangGraph: Agentic Orchestration for AI Workflows