Multi-Agent AI System for Financial Decision Making

Project Report

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1. Introduction

In today's fast-paced financial markets, modular AI systems help analyze diverse data sources for actionable insights. This project implements a multi-agent AI framework blending stock prices, news sentiment, and macro indicators to recommend buy/sell/hold actions. The multi-agent structure ensures scalability and transparency in financial decision support.

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2. Problem Statement and Objective

Design and implement a multi-agent system to address business challenges in stock market analysis by integrating heterogeneous data sources and automating intelligence for clear trading recommendations.

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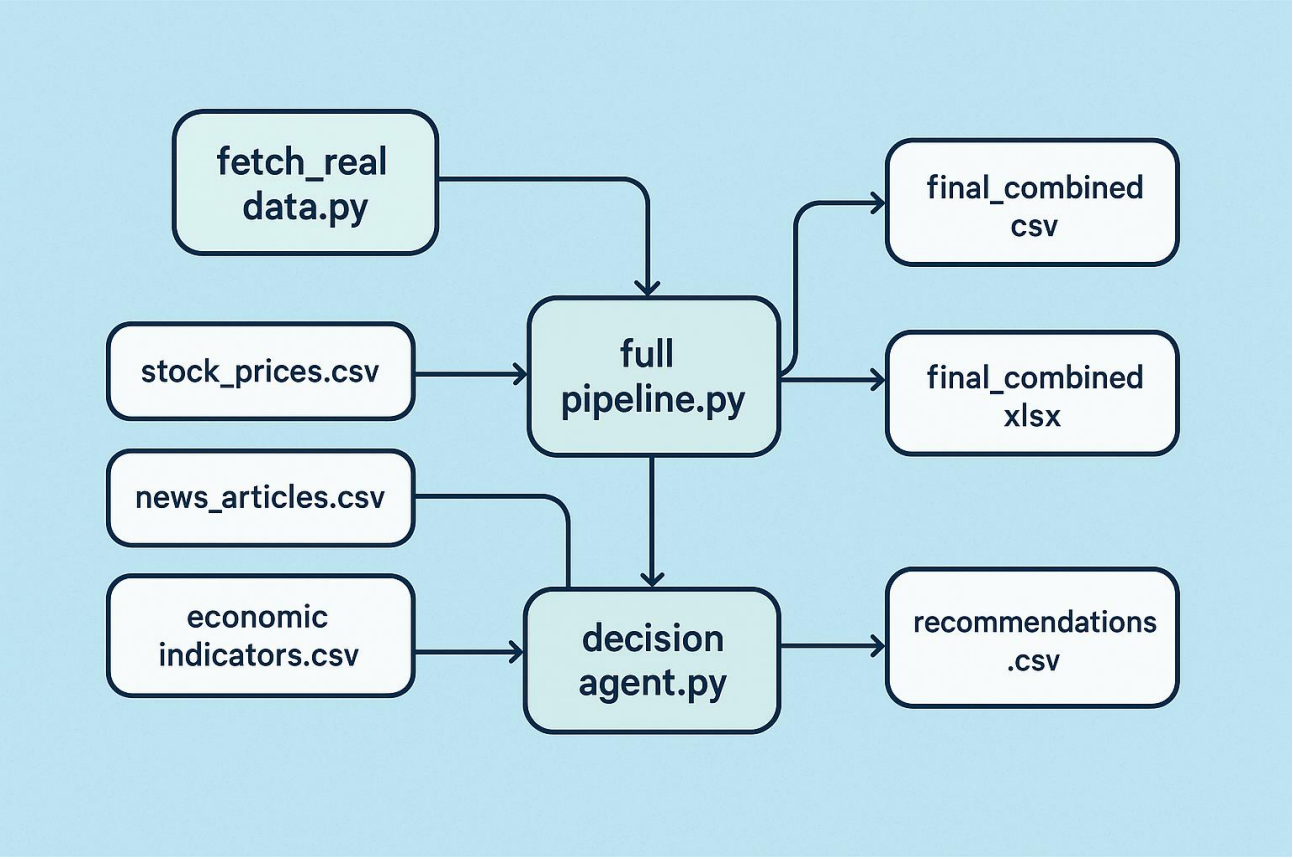
3. System Design and Architecture

- **Data Fetching Agent**: Gathers stock prices, news headlines, macro indicators.
- **Data Merging Agent**: Integrates all sources for analysis.
- **Decision Agent**: Analyzes sentiment/technical trends to assign BUY, SELL, HOLD signals.
- **Orchestration Agent**: Runs all steps in sequence.
- **Reset Agent**: Resets project outputs for clean analysis.

Data Flow Diagram:



4. Implementation Details

4.1 Data Fetching Agent

- Uses Yahoo Finance (Python yfinance) for OHLC stock prices.
- Google News RSS with VaderSentiment for headline sentiment.
- Hardcoded proxies for inflation/GDP.

4.2 Data Merging Agent

- Merges stock prices + news sentiment by date/company.
- Adds macro indicators by date.

4.3 Decision Agent

- Computes 3-day moving average of closing prices.
- Applies rule-based decisions:
  - BUY: Positive sentiment + price > MA3.
  - SELL: Negative sentiment + price < MA3.
  - HOLD: Otherwise.

4.4 Orchestration

- Driver script automates full pipeline from raw data to recommendations.

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5. Data Sources

- *Yahoo Finance API* for stocks
- *Google News RSS* for headlines
- *Manually simulated economic data (demo)*

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6. Results and Examples

Sample Output:

- `stock_prices.csv`—daily OHLC
- `news_articles.csv`—headline + sentiment
- `economic_indicators.csv`—macro proxies
- `final_combined.csv/.xlsx`
- `recommendations.csv` (buy/sell/hold)

Sample Table:

Date	Company	Close	Sentiment	Signal	Reason
2025-08-05	RELIANCE.NS	2200.5	Positive	BUY	Positive sentiment + price > MA3
2025-08-06	TCS.NS	3200.0	Negative	SELL	Negative sentiment + price < MA3

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7. Limitations and Future Enhancements

- Rule-based logic; could add ML models for sharper decisions.
- Economic indicators are static; fetching real data would be better.
- Sentiment analysis based only on headlines—expand to full articles/NLP.

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8. Conclusion

A functioning multi-agent AI pipeline for financial decisions is demonstrated, capable of future expansion and modular upgrades, underscoring the power of agent-based automation for actionable insights.

Achievements:

- Developed a working multi-agent system that integrates stock prices, news sentiment, and economic indicators.
- Implemented agents that fetch data, merge datasets, and generate clear buy/sell/hold recommendations.
- Automated the entire pipeline for seamless execution.
- Produced explainable and actionable trading signals based on simple rules.

Future possibilities:

- Incorporate advanced machine learning models for improved decision accuracy.
- Use real-time and dynamic economic data for timely insights.
- Enhance sentiment analysis by applying deeper natural language processing.
- Expand the system to cover more financial instruments and real-time monitoring.
- Improve user interfaces and provide better visualization of results.

This project provides a solid foundation for a financial decision support system with room for practical improvements and extensions.
