MAFS 5440 Project 2 Optional Topic: Large Language Models for Financial Analysis

Discover how cutting-edge AI agent technology is revolutionizing investment management through multi-agent systems that simulate legendary investors' strategies.

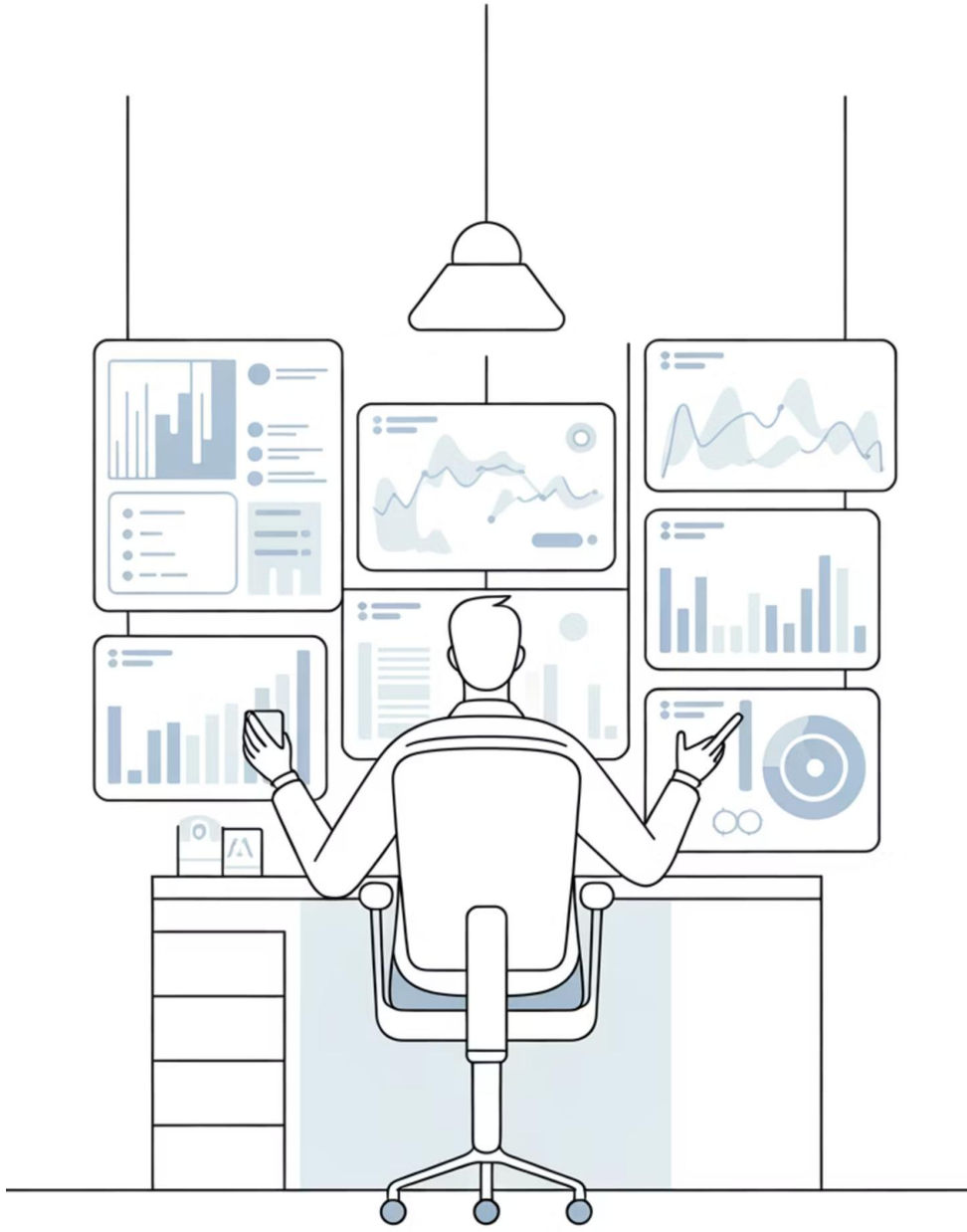
Understanding LLMs in Finance

What Are LLMs?

Large Language Models utilize transformer architectures trained on massive datasets, enabling them to recognize, translate, predict, and generate text and other content with remarkable accuracy.

Financial Applications

In finance, LLMs automate complex analysis tasks by processing vast amounts of heterogeneous data—news articles, research reports, financial statements, earnings calls, and real-time market data—to extract valuable insights and identify patterns difficult for human analysts to detect at scale.



The AI Hedge Fund Project

We recommend exploring this repo https://github.com/virattt/ai-hedge-fund, a highly acclaimed open-source project with over 42,000 GitHub stars that demonstrates the practical application of LLMs in investment management.

42K

GitHub Stars

Highly acclaimed open-source project

12

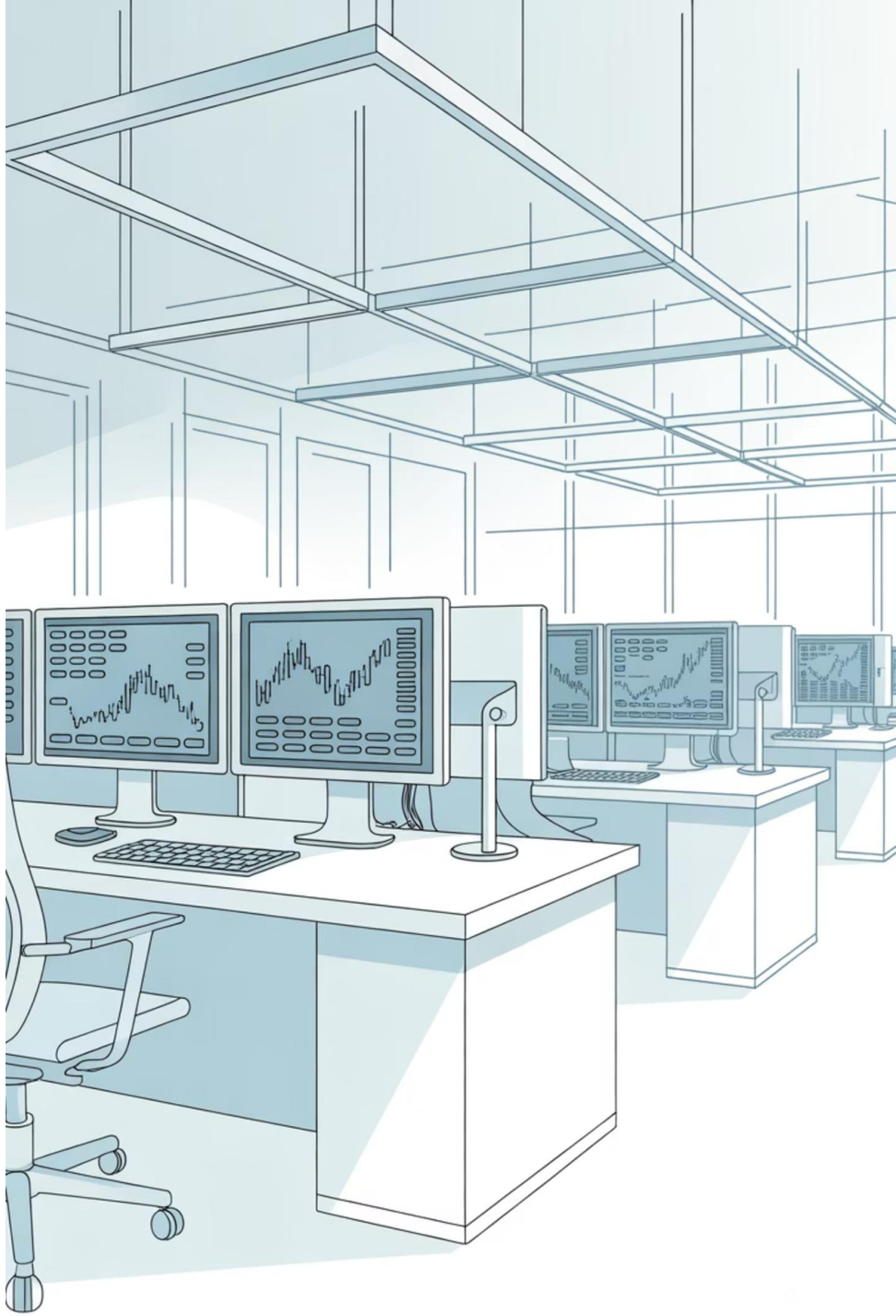
Investor Agents

Specialized AI agents with distinct philosophies

4

Analytical Agents

Valuation, Sentiment, Fundamentals, Technicals



Multi-Agent Architecture

The system implements a sophisticated multi-agent architecture where different AI agents simulate the investment philosophies and decision-making processes of renowned investors, working together to make informed trading decisions.

Investor Agents

12 specialized agents embodying distinct investment philosophies

Analytical Agents

4 agents analyzing valuation, sentiment, fundamentals, and technicals

Portfolio Manager

Orchestrates final trading decisions based on agent inputs

Risk Manager

Evaluates portfolio vulnerabilities and risk exposure

Value Investing Agents

Ben Graham

Focuses on margin of safety principles, seeking stocks trading below intrinsic value with significant downside protection.

Charlie Munger

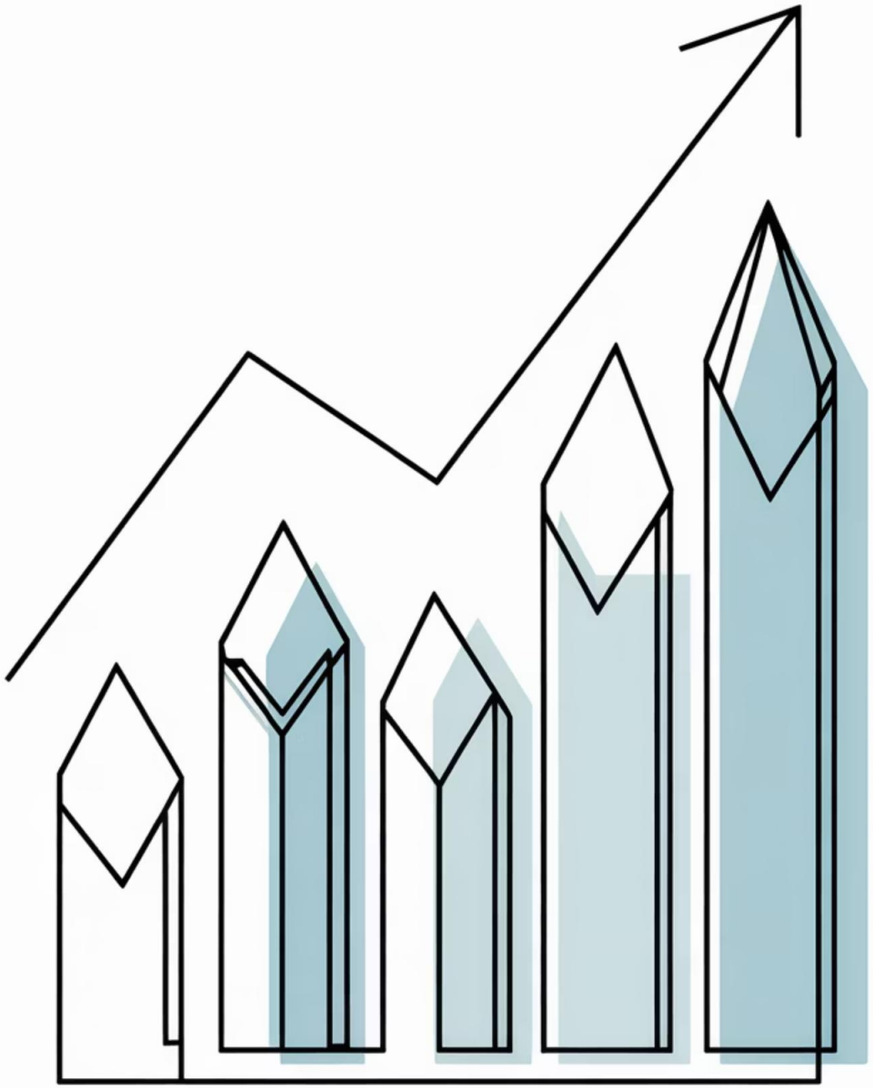
Emphasizes wonderful businesses at fair prices, prioritizing quality companies with sustainable competitive advantages.

Michael Burry

Contrarian deep value approach, identifying overlooked opportunities through intensive research and analysis.

Mohnish Pabrai

Seeks low-risk doubles with asymmetric risk-reward profiles and high probability of success.



Growth & Strategic Investors

Growth Investing Agents

Cathie Wood: Innovation and disruption focus, targeting transformative technologies

Phil Fisher: Growth through research, emphasizing quality management and products

Peter Lynch: Ten-baggers in everyday businesses, finding growth in familiar companies

Strategic Investors

Bill Ackman: Activist investing approach with concentrated positions

Stanley Druckenmiller: Macro and asymmetric opportunities with flexible strategies

Rakesh Jhunjhunwala: Indian market specialist with long-term perspective

Project Direction 1: Implement a New Investment Agent

Develop and integrate a new AI agent based on your favorite investor or a unique investment philosophy.
For this direction, we expect you to codify the investment strategy you have the deepest understanding and quantify it with back-testing.

01

Research Investment Principles

Study your chosen investor's philosophy—Ray Dalio's principles-based approach, George Soros's reflexivity theory, or David Tepper's distressed debt strategies.

02

Implement Decision Logic

Code the agent's decision-making using appropriate prompting strategies that capture the investor's unique approach.

03

Integrate into Framework

Connect your new agent with the existing multi-agent system for collaborative decision-making.

04

Backtest and Evaluate

Test performance across different market conditions and compare with existing agents to understand philosophical differences.

Starting Point: a Streamlit App

Leverage the existing Streamlit-based user interface to enhance visualization of agent decisions, compare strategies, and analyze portfolio performance metrics. This project involves both understanding existing code and developing new features: https://github.com/fuxiaoyi/ai-hedge-fund-plus.

Data Integration

Expand connections to new data sources for compre--hensive financial metrics and agent-specific outputs.

Visualization Enhancement

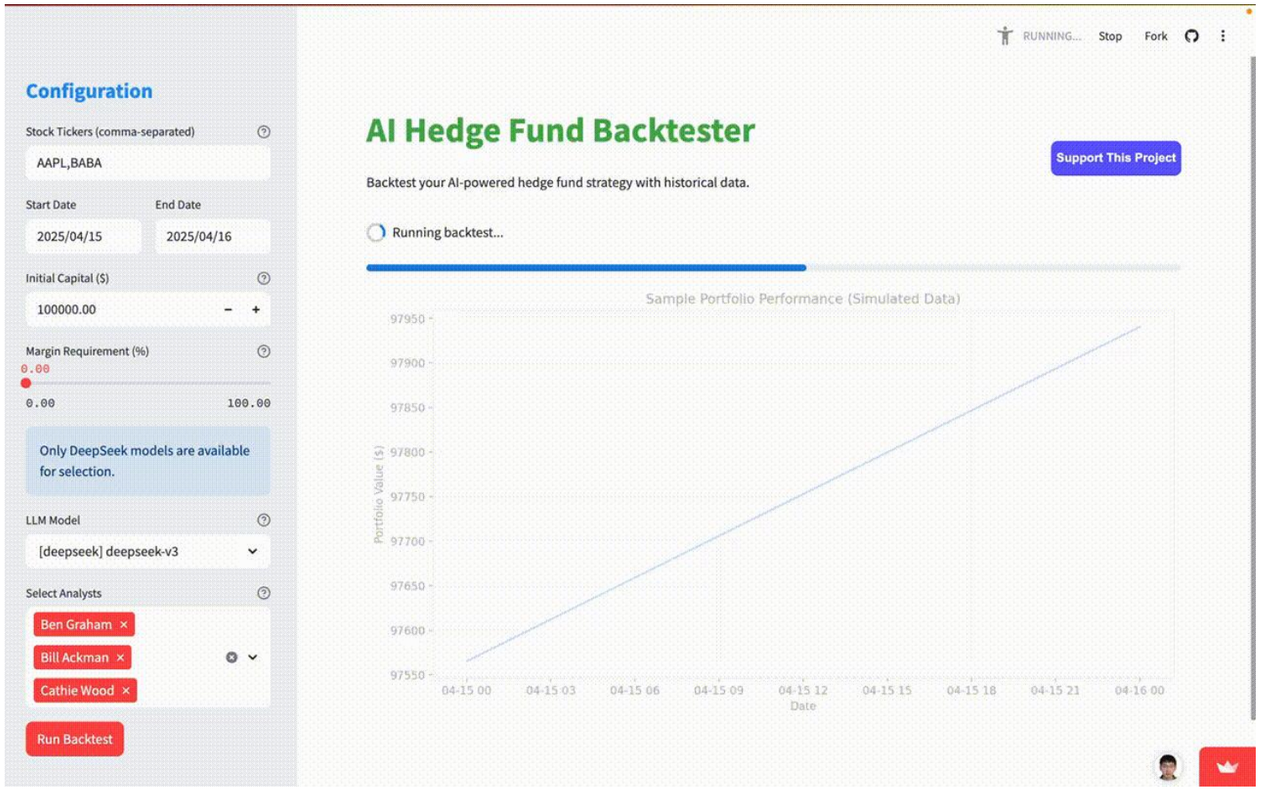
Design and implement intuitive charts and graphs to display complex financial data and agent performance clearly.

Interactive Features

Add dynamic filters, sliders, and controls for real-time comparison of investment strategies and scenario analysis.

Insight Generation

Develop features that highlight key insights and actionable recommendations from the visualized data, aiding decision-making.



Project Direction 2: Novel Financial Applications

Extend the AI hedge fund framework to create innovative applications in financial investments.
Your creativity is encouraged.

Sector-Specific Analysis

Develop specialized agents for specific sectors like biotech, renewable energy, or cryptocurrency with domain-specific knowledge.

Risk Management Systems

Create advanced risk assessment agents that identify portfolio vulnerabilities and suggest hedging strategies.

ESG Integration

Implement environmental, social, and governance factors into investment decision-making processes.

Alternative Data Integration

Incorporate satellite data, social media sentiment, or patent filings into investment analysis.

Market Regime Detection

Develop agents that identify changing market conditions and adapt strategies accordingly.

Previous Student Projects

We list two successful implementations by previous students who have created noval LLMs based financial analysis applications (using the AI hedge fund framework is OPTIONAL).

Financial News Analysis

An application that generates various reports on S&P 500 stocks. The system collects news data from a free API, indexes it using LlamaIndex, and uses OpenAI's backend to produce insights.

View Project Demo →

Fundamental Analysis

Integrates LlamaIndex, and GPT-4 to process vast amounts of financial data, to provide in-depth, accessible insights into company performance, market trends, and meeting minutes.

View Project Demo →

Your application is expected to demonstrate both technical sophistication and practical relevance to financial markets.

Submission Requirements

Written Report

Include demonstration of your demo application and necessary analysis

Source Materials

Provide zip folder with main logic codes and essential files

Exclude Large Files

Do not include large data files such as checkpoint weights

Additional Resources

•TradingAgents: Multi-Agents LLM Financial Trading Framework (Paper) https://arxiv.org/pdf/2412.20138

•TradingAgents Framework -https://github.com/TauricResearch/TradingAgents

• Financial Agent - GitHub Repository https://github.com/virattt/financial-agent

• Financial Analyst App - GPT-4, Streamlit, and Llama-Index Tutorial https://youtu.be/c_LAIkkhKts?si=zbyANC91SymDJuV3

• LlamaIndex starter tutorial https://gpt-index.readthedocs.io/en/latest/getting_started/starter_example.html

• HKUST Azure OpenAI API service https://itso.hkust.edu.hk/services/it-infrastructure/azure-openai-api-service

• Other API services: https://api.bianxie.ai, AI/ML API:https://aimlapi.com

• FinGPT-ForecasterHuggingface Space Demo https://huggingface.co/spaces/FinGPT/FinGPT-Forecaster

• Huggingface Generation with LLMs tutorial https://huggingface.co/docs/transformers/ llm_tutorial