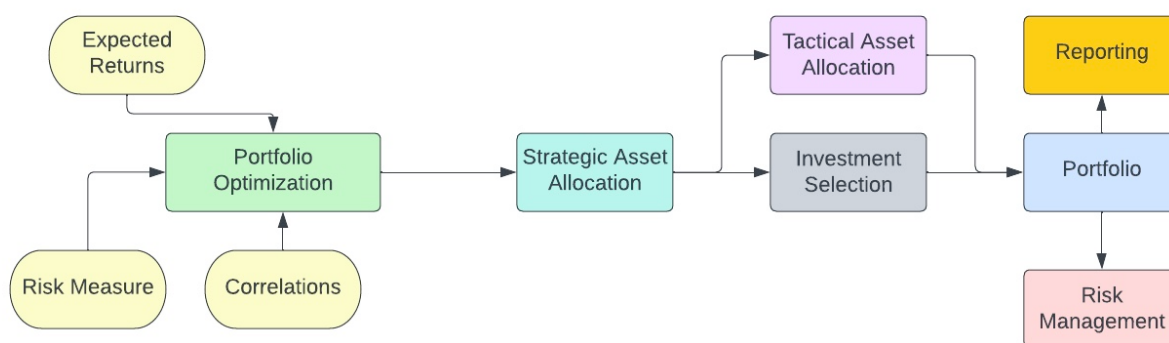


## AI in Financial Services – Removing Barriers

Generative AI and machine learning have incredible potential to disrupt every industry, including financial services; yet adoption continues at a very slow pace. Consider portfolio construction in investment management. Figure 1 below shows a best practice flow diagram for an investment management system.



Portfolio Managers (PMs) and Registered Investment Analysts (RIAs) apply variety of methods to execute this workflow to fully understand their investment behavior in response to market conditions. This requirement is called Know Your Product (KYP).

Current Portfolio construction relies heavily on inputs that carry estimation errors which could result in mismatch between expectations and actual outcomes.

AI and machine learning techniques can be applied to every step of the investment workflow to enable portfolio managers with in-depth knowledge of their investment behavior and greater confidence in their portfolio's performance.

So, why the slow pace of adoption? We often hear that the biggest obstacle is access to big data. however, this barrier has been mostly removed due to proliferation of ETFs representing almost every liquid (and sometime illiquid) asset. This trove of data is now readily available and often for a very low cost if not free. Another barrier cited by the professionals is the lack of financial specific [code] templates and support in getting started.

To address these barriers, we held an event sponsored by the CFA Society Minnesota and in partnership with the CFA Society Cleveland, covering applications of AI and data science in investment management. We demonstrated three practical implementations of AI and Machine Learning (ML) specific to investment management including: 1. Portfolio construction with ML methods; 2. Manager's due diligence with hierarchical clustering; and 3. Earnings analysis and sentiment scoring with ChatGPT/LLMs. More detailed articles below. You can find the video recording of the event [here](#).

*Tuesday, October 24, 2023 | 3-7 pm*

## **PRACTICAL APPLICATIONS OF AI AND MACHINE LEARNING IN INVESTMENT MANAGEMENT**



**CORDELL TANNY, CFA**



**LUCAS BUNTING, CFA**



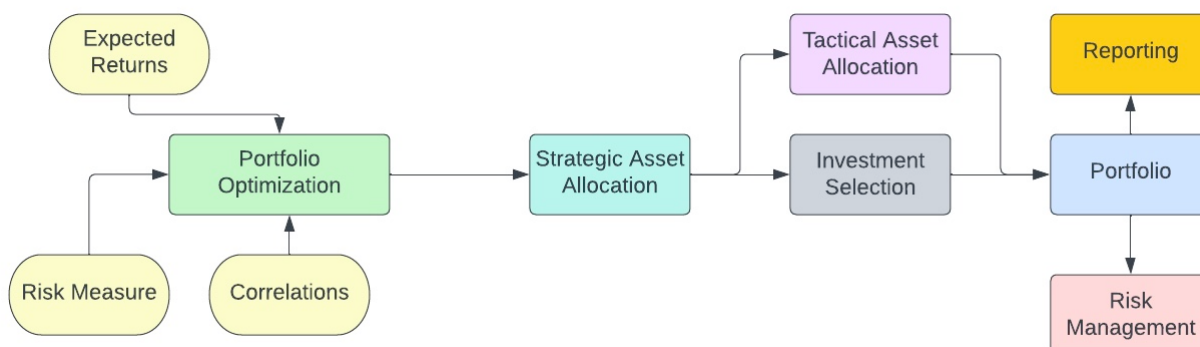
**MEHRZAD MAHDAVI, PHD**  
*Moderator*

*Presented in  
partnership with*



The CFA Society of Minnesota in partnership with the CFA Society of Cleveland and the Digital HUB held an on-line and in-person event in Minneapolis, MN. The event focused on practical applications of AI and ML in the investment management. The Digital HUB provided subject matter experts demonstrating tools and code wrapped with a training package to get you started in building your own products and services.

Subject matter experts presented practical tool sets, at the code level; use cases; and data science upskilling options for the financial professionals. Through several use cases, the presenters applied AI/ML and other quantitative methods to each step of the investment management process displayed below.



Three major use cases, within the investment management workflow, above, were demonstrated including:

1. **Portfolio construction** with Machine Learning methods to improve portfolio behavior in response to changing markets. We demonstrated the new capabilities by including more factor exposures vs the current techniques as applied to the investment management models.
2. **Manager's selection due diligence** with ML methods for hierarchical clustering to improve portfolio diversification and risk management.
3. **Sentiment and earnings analysis** with ChatGPT/LLMs for tactical asset allocation to gain significant leverage in earnings reports analysis and sentiment scoring.

The event was attended by a diverse profile of financial professionals including portfolio managers, CIOs, quantitative analysts and managers as displayed in figure 1.

Following the hands-on presentations, in an interactive panel session, attendees were polled on the some of the key factors for deployment of AI in their organizations. Polling results (by Slido) in response to questions are presented in figures 2-5.

### **Summary:**

The CFA Minnesota Society event, in partnership with the CFA Society of Cleveland and the Digital HUB were well attended both on-line and in person with a wide range of financial professionals including portfolio managers, CIOs, analysts, managers, and academia.

Attendee's feedback was supportive of the agenda and practical hands-on demonstrations.

Overall, attendee's engagement and polling point to some key takeaways:

- There is significant impact of AI in job functions and roles in investment management within the next two years.
- Financial services industry, as other industries, is at the early stages of AI deployment. However, the trend is accelerating.
- Barriers to AI deployment in the investment management workflow have been reduced significantly. Lack of programming and technical capability is no longer the dominant barrier.
- Practical training focused on use cases and "how to get started" seem to be the main concern of financial professionals

Video recording of the event can be accessed [here](#).

Figure 1. Attendee Profile

# Attendees Profile

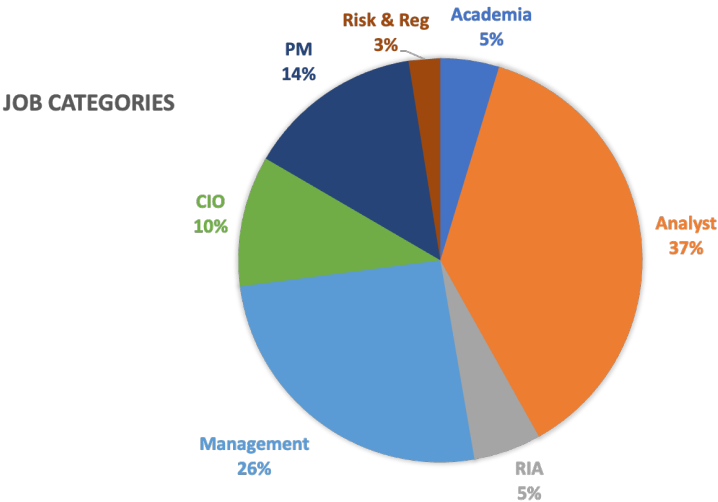


Figure 2:

Q: What is the most important benefit of AI in your business?

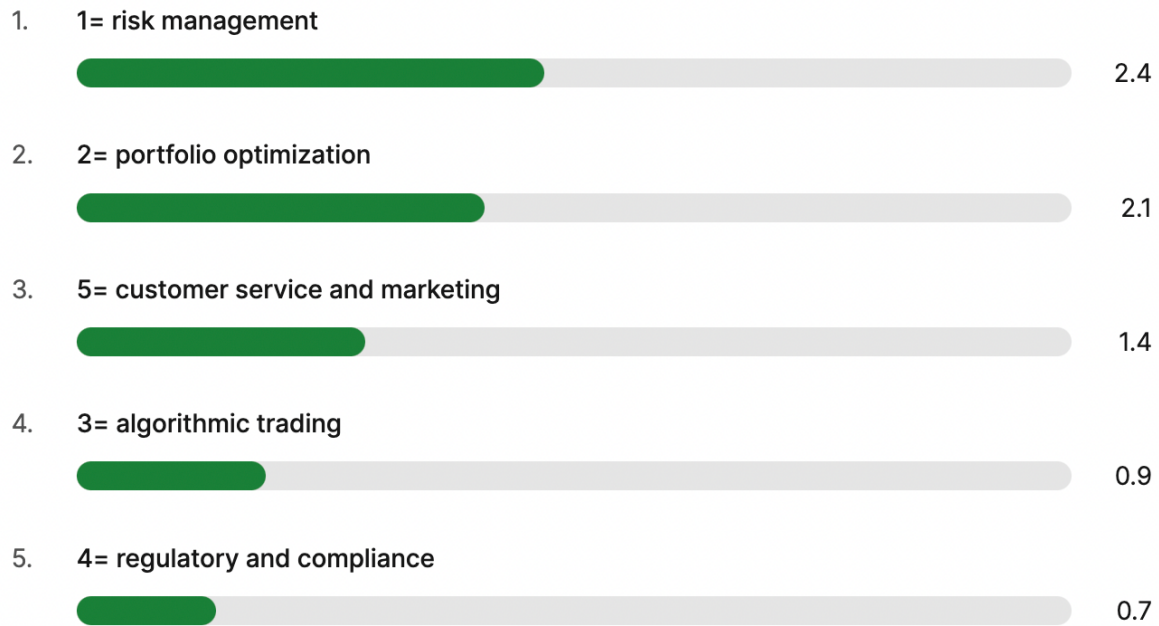


Figure 3:

Q: Where are we in the deployment of AI in financial services?

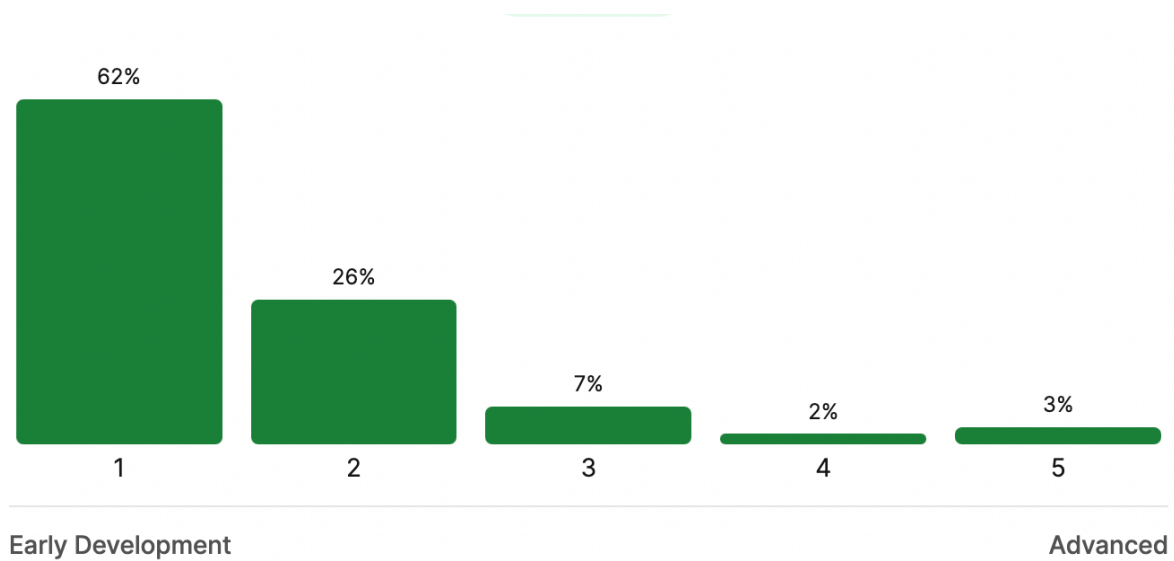


Figure 4:

Q: Do you see yourself using AI in the next two years?

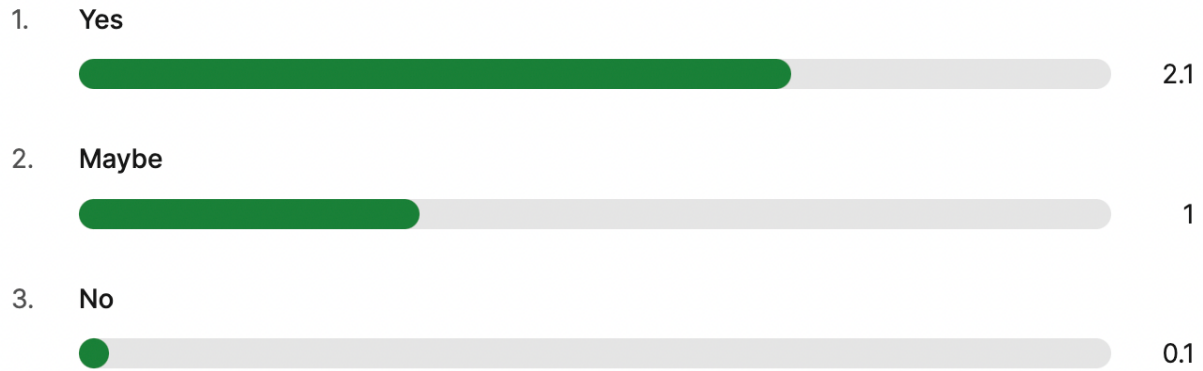
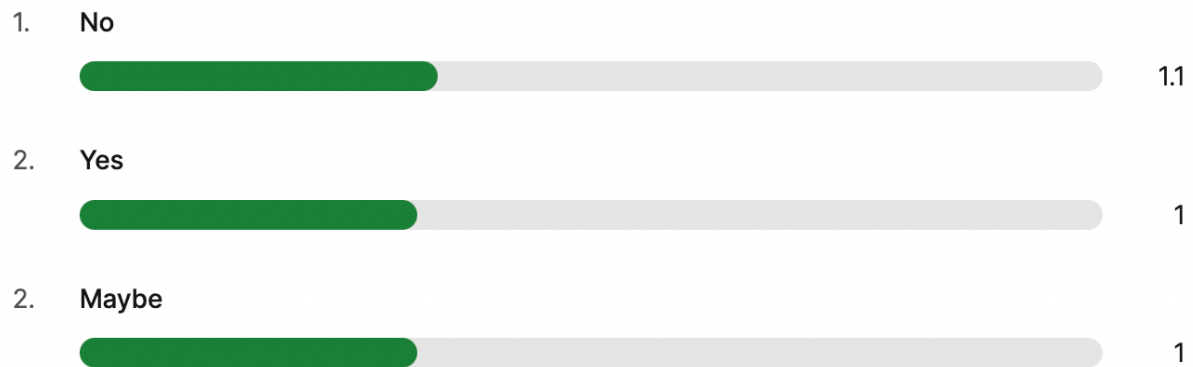


Figure 5:

Q: Do you see technical background (e.g., Python programming) as a barrier to using AI?

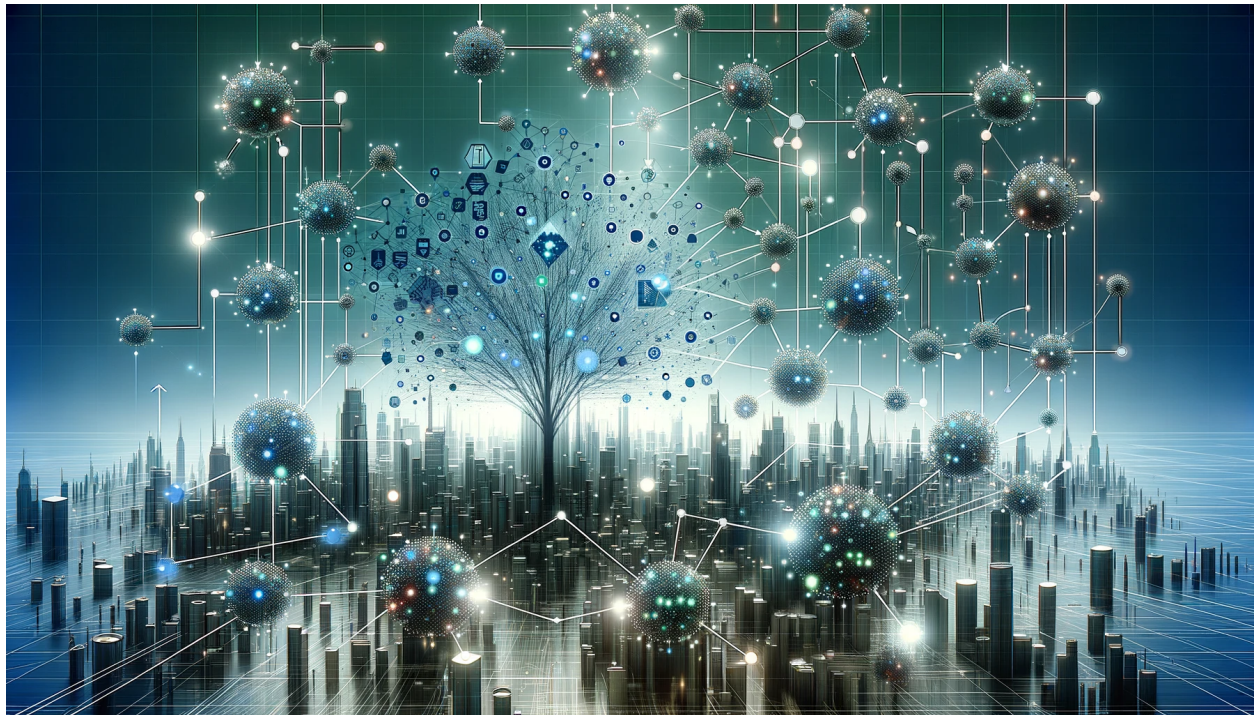




## Using Clustering Algorithms for Investment Due Diligence and Portfolio Construction

Building a solid investment portfolio is no easy task, especially when we dive into the world of portfolio optimization - trying to make decisions that give the best returns while keeping risks low. Traditional methods often lean on historical data to estimate future returns and how different investments behave relative to one another (correlations). But here's the catch: financial markets are not always predictable and relying heavily on past performance can sometimes steer us wrong. Small changes in expected returns or shifts in how assets move in relation to one another can shake our portfolio's stability, exposing it to unexpected risks. We can attempt to improve optimization with sophisticated models, intricately designed to forecast future returns and correlations. However, they seldom align with actual future occurrences. They encapsulate myriad variables and leverage advanced algorithms to mitigate the problems associated with traditional portfolio optimization. However, the eventualities of global economies, policy changes, and unexpected market disruptions invariably usher unanticipated variances, unearthing portfolio vulnerabilities.

This is where hierarchical clustering can step in and be a useful tool. It doesn't just look at past performance but can also group investments together based on a wider range of criteria. This can help build a portfolio that's not only grounded in understanding past behaviors but also resilient against the unpredictable ebbs and flows of the market.



## Large Language Models (LLMs) in Asset Management

Financial earnings reports and sentiment analysis consume a large portion of Analyst's resources during earnings season. Analysts are responsible for knowing all information on their coverage including developments at competitors. The deluge of text data and fee compression, requires fundamental teams to cover more with fewer people. We applied LLMs (GPT 3.5 Turbo) in the context of earnings season to automate earnings reports and sentiment analysis. This techniques provided a leverage of 20 to 1 for resources with high fidelity of results.



- Deluge of unstructured text data, a fraction of which is useful
- Investors should be focusing on the future, not the past
- PMs have a responsibility to know all relevant public information of portfolio holdings and “on-deck” securities
- Analysts are responsible for knowing all information on their coverage, including developments at competitors
- Fee compression necessarily requires fundamental teams to cover more with fewer people.

You cannot read, let alone comprehend, all information available on your security universe.

A practical exploration of the use of GPT 3.5 Turbo in the context of earnings season.

Meant to be a simple example that anyone with a little programming knowledge can easily implement in a short amount of time.



