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Demystifying AI for IR

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The public's fascination with artificial intelligence has risen dramatically in recent years, sparked by advances emerging from Big Tech.

Terms such as 'machine learning' and 'data science,' largely absent from general conversation just five years ago, now feature prominently in your news feed and fill your inbox. While interesting and thought provoking, the flood of information can also be confusing and distracting, leading to far more questions than answers.

In this paper we aim to demystify the current state of Artificial Intelligence (AI) as it relates to investor relations and give guidance on the trends that could have an impact to your role today and those that will have an impact tomorrow.

We'll start with some AI basics and explore two specific topics: sentiment analysis powered by natural language processing (NLP), and the impact of AI in the reshaping of asset management.
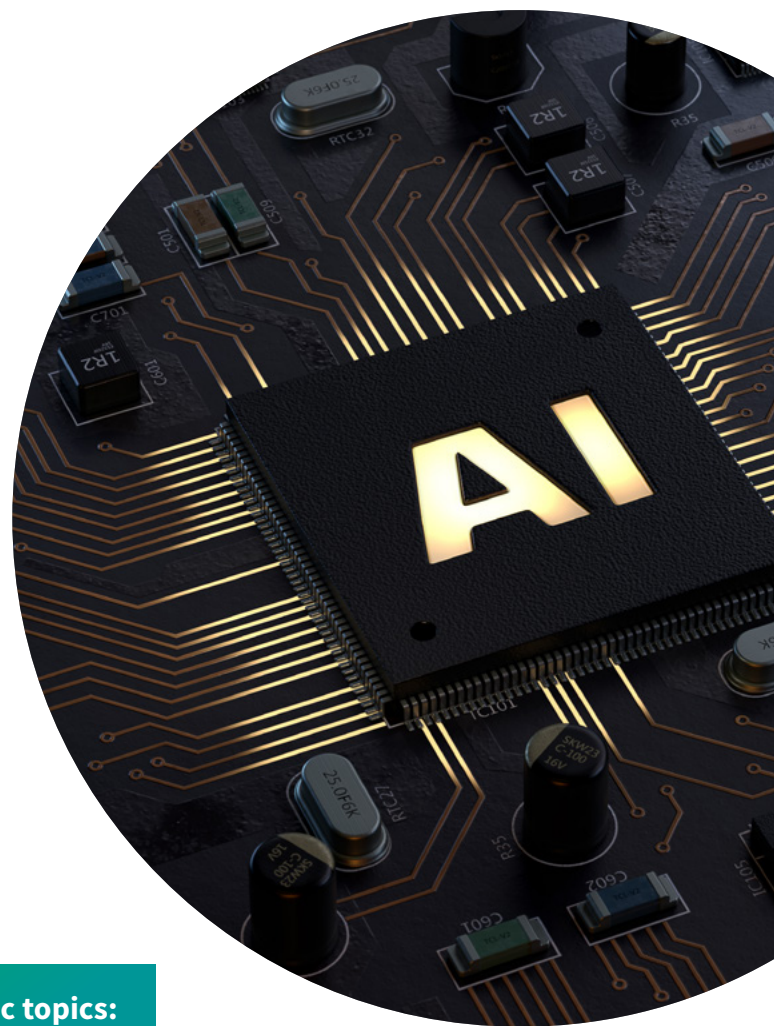
History of AI

The nature of human intelligence and the exploration of whether machines can replicate it has been a topic of conversation and debate for centuries.

The earliest mentions can be found in Greek mythology with the **introduction of the world's first robot**[1], and it has occupied space in the realms of art, philosophy, literature and science ever since.

The most recent, and arguably most substantive, push towards progress can be traced back to the **Dartmouth Summer Research Project**[2] on Artificial Intelligence held in Hanover, New Hampshire in the summer of 1956. Those eight weeks started a modern movement to fund research in artificial intelligence, mobilize a globally distributed group of scientists to advance the field, and spark the curiosity of private enterprise to explore the commercial applications of the technology.

The decades that followed had several false starts with respect to meaningful progress in AI, but the latest reboot driven by advances in cloud computing, the rise of big data, and the power of parallel computing has resulted in true breakthroughs that are having meaningful impact across many aspects of everyday life.

[1] Adrienne Mayor, "The Greek myth of Talos, the first robot," ed.ted.com/lessons/the-greek-myth-of-talos-the-first-robot-adrienne-mayor, retrieved 6 March 2020.

[2] Wikipedia, "Dartmouth workshop ," en.wikipedia.org/wiki/Dartmouth_workshop, retrieved 6 March 2020.
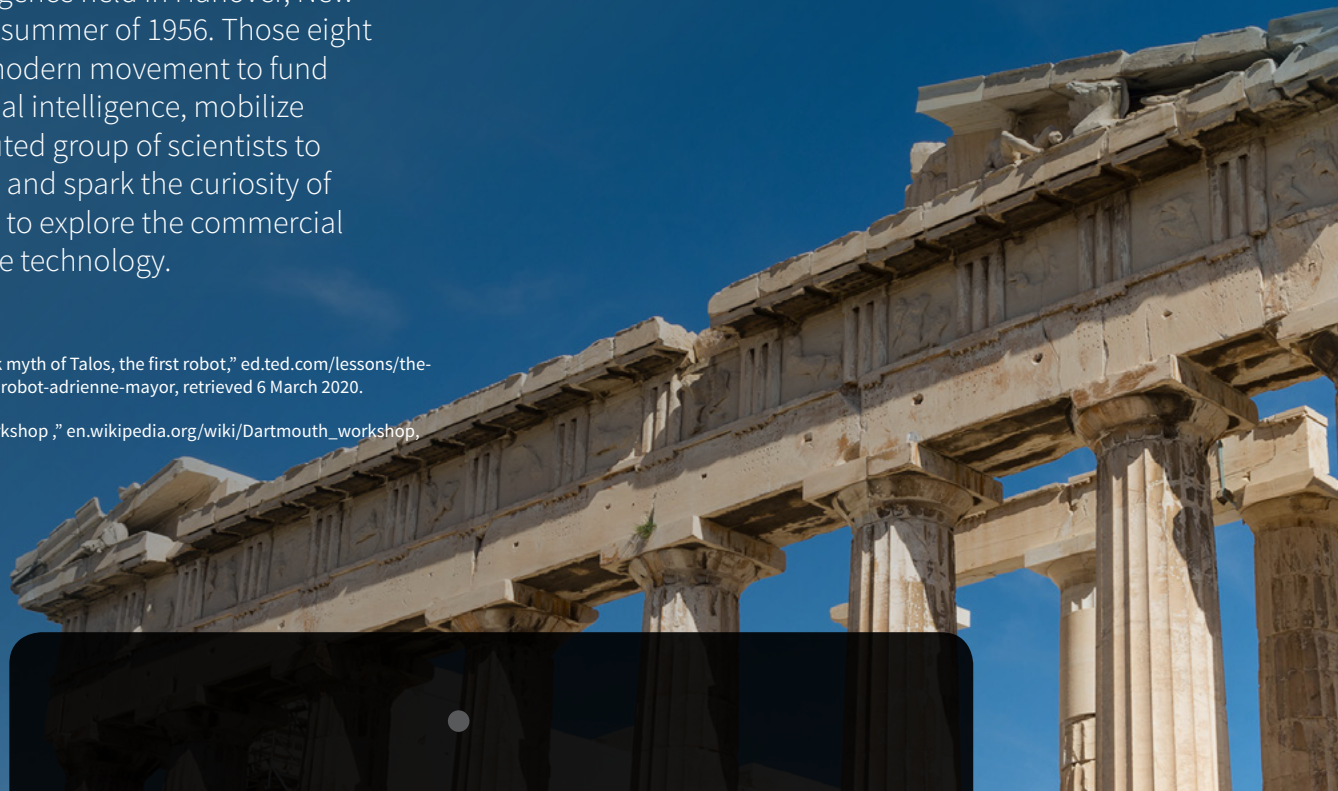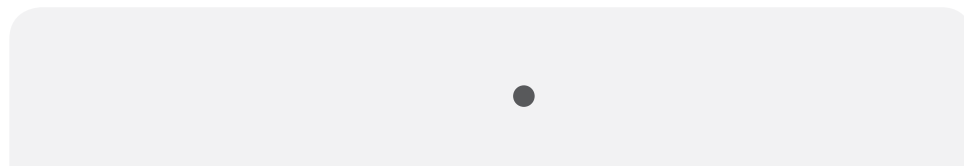
History of AI and key points of impact to asset management and investor relations

AI General	Year	AI Asset Management

Definitions

The language of artificial intelligence has grown and evolved along with the technology. To best understand the impact of this collection of technologies known as AI, it will be helpful to define the key terms in use today and how they relate to the role and function of investor relations.

Artificial Intelligence (AI)

The definition of artificial intelligence has been somewhat of a moving target.

The AI community often references computer scientist Lawrence Gordon Tessler when he quipped that artificial intelligence is **"whatever hasn't been done yet."**

For example, the AI community does not view techniques such as optical character recognition (OCR), which has made scanning old documents and converting them to machine-readable text, as AI. It is just something computers do, but not real machine intelligence.

> The debate will rage on, but for our purposes let us define AI as using computers to perform tasks that, at present, require human interaction and our associated intelligence to do well.

Machine Learning

Stated simply, machine learning is highly sophisticated pattern recognition.

It is a collection of methods that direct computers to use statistics and other mathematical techniques to find relationships inherent within data sets. Humans can aid the process with supervised learning that is simply providing the computers with training data that is actual ground truth.

The quarterly 13F SEC filing is one such example of ground truth. Every quarter we learn which stocks institutions have bought and sold. Machine learning can pair the 13Fs with an array of company specific, sector and macro data sets to discover patterns that can form the basis for predictive models. These models can enhance the existing process of stock surveillance that many IR teams already rely upon by providing a new level of intelligence.

Machines do not always need the help of humans, however, to build sophisticated models. Techniques classified as "unsupervised" can ingest enormous amounts of structured and unstructured data and discover relationships that may not be obvious or easily discoverable by humans. Unsupervised machine learning does not rely on data training sets or human generated ground truth.

In recent years, the Internet of Things (IoT) expanded to measure more of the inner workings of global commerce, creating the perfect feedstock to power these unsupervised machine learning experiments. Asset managers have begun to take advantage of these new data sets and machine learning to enlist computers to help them with investment thesis discovery.

Previously undiscovered correlations arise from these methods, but you still need humans to vet the relationships to test whether they are making sense and are in fact predictive in a consistent fashion.

Deep Learning

Artificial intelligence pioneers reasoned that one of the best ways to create thinking machines was to emulate the human mind.

Neuroscience teaches us that we learn by creating connections between billions of neurons in our brains. Over time, with experience and repetition, these networks grow stronger and form the basis of our intelligence.

It made sense to use mathematics to approximate this process so machines could also learn, and this led to the creation of artificial neural networks in the 1980s and 1990s. These techniques formed the foundation for many of the models that approximate human vision and language processing, among many other applications.

What made these models truly come alive and start to approach their potential was a series of events in the 2000s that democratized access to affordable computing power, mass storage, but most importantly, access to massive data sets enabled by the rise of the social web.

> The mathematics, the power, and the access to big data fueled a revolution in artificial intelligence that is just beginning to change our world.
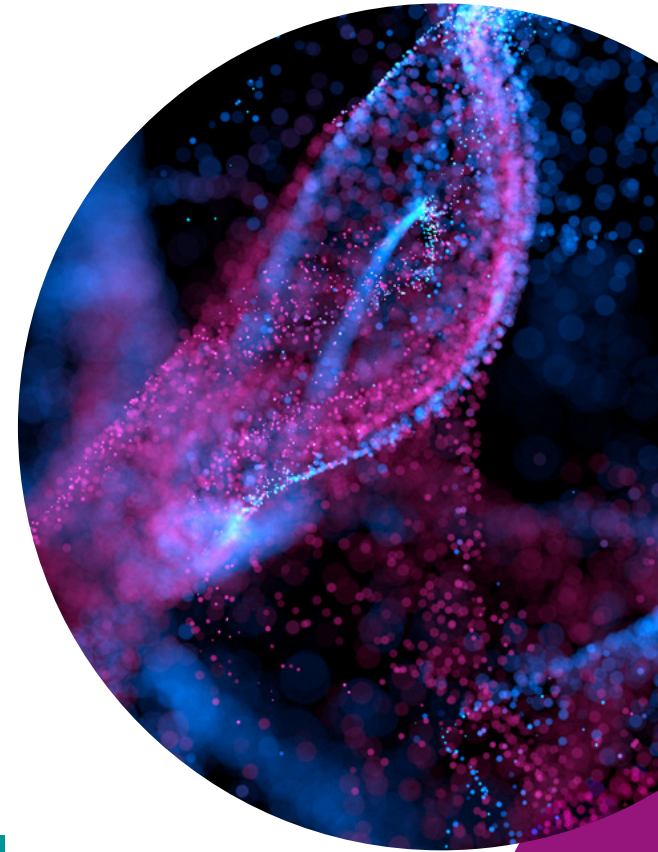
Natural Language Processing (NLP)

Language is an excellent example of something that should be tailor-made for computer applications.

Grammar constructs are rules-based, and with the right dictionary of definitions, machines should be able to deconstruct language in a similar fashion to how we listen and understand spoken and written words.

Early work in NLP relied heavily on the rules-based nature of language, but these methods fell short due to the nuanced nature of language out 'in the wild.' This all changed when researchers used machine learning techniques and the massive body of machine-readable text to allow machines to learn the inherent rules of language from huge training sets as opposed to trying to encode the rules manually.

Deep learning powered the ability of machines to read and understand text in ways we had not expected and with a speed and accuracy previously unknown.

One highly relevant application of NLP is to discern sentiment. For the investor relations professional, this is a well-known use case, being positioned as a means to gauge sentiment of prepared remarks in earnings releases and other public communications.

If an IRO could know how the investor community might react to the language in prepared statements prior to their release, wouldn't that be of tremendous value? The jury is still out on whether this is possible, but the potential is indeed intriguing.

Explainable AI

A general criticism of AI techniques is the perception that the resulting models are in fact 'black boxes' that cannot be easily explained.

This has led to the emerging sub-field of explainable AI. Explainable AI is simply the introduction of AI tools and models that inherently deliver results fully understood by humans; put even more simply, the models tell you how they got their answer. There is a reason pension funds proceed with caution when exploring AI-based quant funds. They cannot accept an answer of 'I don't know' when asking a fund why they chose to make a specific investment.

This is happening less and less as better tools appear to generate improved attribution for many machine learnings models, but there is still a long way to go. While progress is being made, it is still difficult to generate explainable results with a deep learning-based approach and we are still years away from generating fully explainable outputs.

Case Studies

But how does all this apply to the daily challenges of investor relations and, more importantly, the future of the discipline? We will now examine two areas where AI has impacted the capital markets community and, by extension, the investor relations function. One is AI-based sentiment analysis and the other is the rise of the AI-powered investment fund.

Sentiment Analysis

What is Sentiment Analysis?

Sentiment analysis, also known as opinion mining, is one of the most highly researched applications in artificial intelligence. Early versions of sentiment analysis employed simple, rules-based techniques that counted the occurrence of words from a lexicon previously characterized as negative, neutral, or positive. These techniques were straightforward to implement, but difficult to scale as the sentiment mappings for specific words were very generalized and missed the subtlety associated with specific situations.

This all changed with the application of natural language processing techniques powered by the emergence of massive training data sets found on the social web. Models emerged that could read text from various online sources and extract a reasonably accurate assessment of how well a product launch was going, or whether the introduction of a new public policy proposal was received positively by the public. The power lay in the model's ability to ingest public opinion at scale and determine an amalgam of sentiment.

How Sentiment Analysis is employed

It was not long before the aforementioned techniques were being employed by participants in the financial markets to mine news and social media, in real time, for sentiment signals that could provide insight into the performance of a sector or individual organization. A natural progression then led to mining communications coming directly from corporations in the form of earnings releases and the transcripts of the associated earnings conference calls. The hypothesis was that subtleties in the language of the prepared statements and how management responded to questions could serve as leading indicators of market reaction.

This hypothesis underpins several solutions marketed to IROs today. These solution providers attempt to broadly quantify the sentiment of the language in earnings calls; notably, they do not claim to provide insight into share price movements.

As the technology progresses, the possibilities become intriguing. New products could enable investor relations teams to assess the text of prepared statements ahead of time. IROs could get an advanced sense of whether the market would react positively or negatively to messaging and provide recommendations for tuning the language. This does lead to a whole series of thorny questions around regulatory compliance and other legal matters, but it is a veritable certainty that we will see some form of this product in the near future. But will it be effective?

Will Sentiment Analysis be effective for IR?

There is a fair amount of skepticism surrounding the ability of the NLP models to predict market impact from earnings calls. The primary reason is that it is not possible to draw a confident conclusion that one source of information would have such outsized influence on market reaction. There have certainly been instances where management's statements during an earnings call have moved markets, but did the numbers being reported make the market move or was it management's choice of words? It is likely a combination, but extremely difficult to tell what the true driver is. Can a solution attempt to gauge a more generalized sentiment from the investor community? Possibly. As with any AI application, though, the model is only as good as the training data.

Today's Sentiment Models

Today, sentiment models take advantage of a technique referred to as transfer learning where a base model is trained on large-scale data sets to learn the basics of language, but they also tackle more nuanced themes such as negation and sarcasm detection. This base model is then tuned with an application-specific training set to understand the language, content and tone. General, unsupervised training techniques will not get the job done for such a specific application of NLP. This is where the shortcomings of these applications become most clear. Where can a data scientist find a reliable and, more importantly, relevant set of individuals to properly tag the language of a corpus of earnings call transcripts? Analysts on the buy and sell side might be good candidates, but their time is largely spoken for, and without a proper data set to enable the necessary supervised training, the models are unlikely to yield the results necessary to deliver value.

Conclusion

We remain in the early stages of development for AI applications relevant to the IR function. Much more research, trial and error, and willing parties necessary to create proper training sets are required to create the 'killer app' for IR. The potential is strong, however, and we will monitor developments closely and keep the community aware of material changes to the effectiveness of IR-focused sentiment solutions.

AI in Asset Management

Emergence of AI in Asset Management

Over the past 15 years, the asset management industry has seen a slightly different class of funds emerge from both established players and upstart organizations on the bleeding edge of applying data science techniques to existing quantitative methods. These are firms such as Renaissance Technologies, Two Sigma, D. E. Shaw and others that have, in some cases, moved entirely away from the human decision-maker in favor of the machine.

But what does this really mean for investor relations? Roadshows to the cloud? IROs chatting with the robots? The answer, like others that we have examined in this paper, is a moving target, but data – both quantitative and qualitative – can provide some insights that are highly relevant now and give us clues to what the future holds.

Asset Managers utilizing AI as part of their process

To provide context, let us clarify how many asset managers are using AI in their investment process, and how much money is in fact being managed by machines as opposed to humans. A **recent study[1]** by the CFA Institute found that only 10% of portfolio managers had used machine learning techniques in their investment process in the previous 12 months. **Another study[2]** dating back to 2018 by E&Y, focusing more on the hedge fund segment, suggested this number is higher, closer to 30%. Consensus seems to indicate that the majority of funds still use more traditional tools and methods in their investment process.

The bigger takeaway, however, is that the primary use of machine learning is to aid in idea generation. A driver of this trend is the quality of the data and information coming from AI-powered sources. A **recent paper[3]** from Indiana University comparing the effectiveness of 'robo-analysts', which create automated research using AI techniques, to traditional human analysts concluded that 'robo-analysts' can outperform their human counterparts over the long run. Despite the advances and new sources of data and information, very few institutions have gone as far as ceding decision making to the machines.

[1] Larry Cao, "AI Pioneers in Investment Management," www.cfainstitute.org/en/research/industry-research/ai-pioneers-in-investment-management ,30 September 2019

[2] EY, "At the tipping point: Disruption and the pace of change in the alternative asset management industry," www.ey.com/Publication/vwLUAssets/ey-2018-global-alternative-fund-survey/$FILE/ey-2018-global-alternative-fund-survey.pdf, retrieved 6 March 2020.

[3] Braiden Coleman, Kenneth J. Merkley and Joseph Pacelli, "Man versus Machine: A Comparison of Robo-Analyst and Traditional Research Analyst Investment Recommendations," papers.ssrn.com/sol3/papers.cfm?abstract_id=3514879, February 2020.

## Asset Managers who are truly AI-powered

But there certainly are players, such as those mentioned earlier, that employ computer scientists, PhD mathematicians and statisticians over the more traditional MBA/CFA portfolio manager. Looking at a select universe of funds that would qualify as truly AI powered, IHS Markit estimates that those account for 1% to 2% of total investable assets and this number has remained largely within this range for the past five years. Furthermore, an examination of these funds' equity assets under

management show that many are well under $100B in equity assets under management, still large, but far from the largest institutions investing orders of magnitude more. Please note that this discussion centers around AI-driven asset management. This is separate and distinct from algorithmic trading, which is prevalent across trading desks, is systematic and can and often does have a material impact on daily market fluctuations.

Prevalence of AI-powered funds

There are varied reasons why these funds are not more prevalent. Perhaps there is a limited universe of institutional investors that are attracted to these types of funds. Explainability of investment decisions most certainly plays a role in limiting the investor universe. Another possibility is that these techniques may have difficulty operating at scale and have experienced performance erosion as more assets are deployed.

Additionally, the potential resistance from the asset management community to embrace a set of technologies that could eventually eliminate the need for human portfolio managers may be a factor. The answer is likely a combination of factors, but the fact remains that, on a relative basis, funds truly powered by AI are both smaller than the average fund in terms of EAUM and there are far fewer than the more traditionally managed fund. This will likely change over time, but we have not seen any empirical evidence that the growth curve has begun to change. For the time being, this class of funds will likely remain in the distinct minority.
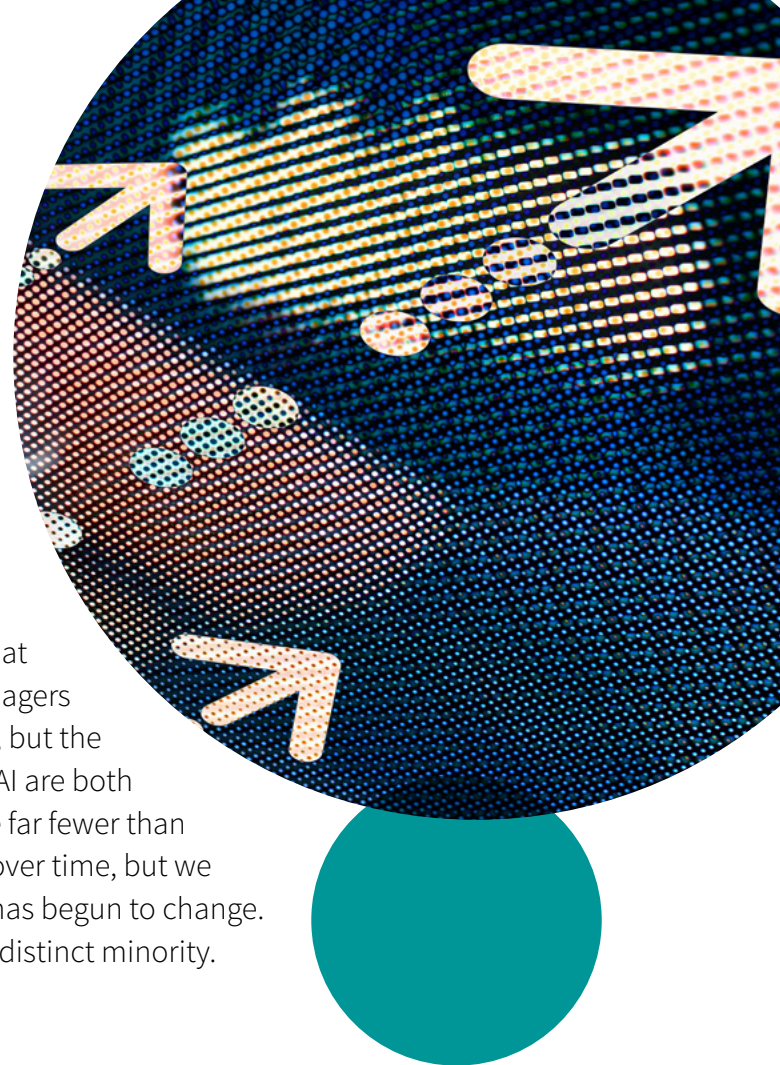
Anatomy of an AI Fund

Another question we must answer is what do the portfolios of these funds look like? AI-powered funds typically take more of a 'factor-exposure' strategy that naturally leads to portfolios resembling a basket-of-stocks approach. This is far from surprising given that the very nature of the equity asset class lends itself very well to using the breadth of the equities universe to let the machines work their quantitative magic to maximize returns and minimize risk. This is precisely where these techniques shine. Take, for example, Renaissance Technologies, which is one of the largest and well-known institutions employing advanced mathematics and artificial intelligence.

According to recent filings, they have close to 4,000 stocks in their portfolio spread across approximately $120B in equity assets under management. Other firms such as Two Sigma also demonstrate this breadth of holdings approach. By comparison, an analysis of 1,300 hedge funds with at least $50M in equity assets under management during the same timeframe showed the average number of equity securities in their portfolios was 118. The takeaway here is that the AI quant funds will generally not have highly concentrated positions in your stock. There are, of course, exceptions to this. Both Bristol Myers Squibb and Chipotle have Renaissance as a top-10 shareholder. These situations do appear to be isolated, though, and evidence does not point to material growth in highly concentrated positions from this class of fund.

The Future of AI and Asset Management

Artificial intelligence is here to stay and its impact on asset management has already begun, but it is still in its infancy. The robots are not taking over just yet, but IROs do need to remain mindful that active managers are already ingesting more and more AI-powered data inputs in their investment process. This is an opportunity to engage with the investor community in new ways, to partner with them to source and evaluate relevant and unbiased data to be better informed about their organization. As the march towards our AI future continues, we will see more Two Sigmas and Rentechs emerge, and the challenges around how to engage with them will become more relevant. However, it also suggests a future where markets may be far more efficient, and those organizations that are well run, creating measurable value in sustainable and responsible ways, will be the ones rewarded from pools of capital less influenced by bias and irrationality. This is a positive development for IR, but also far from certain. For now, what is certain is that all of this is still years away.

Key Takeaways

i.   We expect artificial intelligence to be a hot topic of conversation for investors and investor relations officers for years to come and to be increasingly relevant to issuers, investors, and other market participants.

ii.   AI-based sentiment analysis and other potential 'killer apps' designed for IR are still in the early stage of development.

iii. While some market participants are currently exaggerating the influence that sentiment analysis has on markets, we do expect the power of these tools to improve over time.

iv.   Machine learning is part of the process for many asset managers today, but decisions are still mainly being made by humans, and pure data science players represent a relatively small portion of the market at present.

v.   As AI grows in significance, IROs should remain apprised of where the technologies are and most importantly ensure that they know where they are heading.

The world of investor relations is evolving. At IHS Markit, we connect you to the intelligence, technology and expertise you need to keep pace and embrace the future.

For more information on how our integrated suite of solutions, advanced technology, data science, predictive analytics, advisory services and thought leadership expertise can help you streamline your IR workflow, visit **our website**.

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