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FEATURE

Making the investment decision process more naturally intelligent

How AI technologies are improving man-machine communication with natural language processing

Patrick Henry and Dilip Krishna

As the investment management industry increasingly adopts AI solutions, new technologies—including natural language processing—are helping investment analysts with their most "human" responsibilities, including making investment decisions.

Key takeaways

- Natural language processing and natural language generation (NLP/G) can summarize and normalize structured and unstructured data from varied sources to aid analysts to efficiently evaluate investment ideas in the pretrade phase. Analysts can save time spent on collecting data, instead focusing on analyzing data with a higher potential for insights.

- The technology can explain in human language the rationale behind AI engine–supported investment decisions. These insights can be used for client communications and regulatory purposes, and improving AI decision algorithms to generate alpha.

- Firms can generate on-demand performance attribution reports and periodic investor reviews using NLP/G engines. The benefits can include improved timing, accuracy, and cost of producing reports that tell the story of investment portfolios' performance and strategy.

- NLP/G implementation involves a refresh of talent strategies, including positioning technology as an enabler rather than a threat. Long-term success will likely depend on four aspects: hiring and grooming the right talent, creating cross-functional "superteams," recalibrating performance management, and instilling a technology-oriented mindset.[1]

- In line with investment management respondents, 86% of financial services adopters predicted that AI will be very or critically important to their business success in the next two years.[2] NLP/G platforms could be good candidates to start, with more than half of investment managers surveyed planning to implement these technologies in 2021.[3]

Human and machine languages converge

People communicate using a variety of somewhat subjective tools—words, tone, facial expressions, posture—while machines communicate with clearly defined labels and quantities. The incompatibility has challenged those aiming to effectively integrate the two realms to enhance decision-making processes. Fortunately, a branch of artificial intelligence has recently reached a sufficient level of sophistication to potentially close the gap.

The emerging capability in NLP and NLG creates an opportunity to enhance the process that is the lifeblood of all active investment managers: the investment decision process.[4] These technologies have many applications across industries and functions, of course, but this article will explore how investment firms are beginning to use NLP/G in idea development, at the investment decision point, and in portfolio report creation.

RELEVANT NLP/G CAPABILITIES

Basically, NLP technologies enable machines to translate unstructured data, such as voice and video, into structured data with labels and quantities that machines can readily process.[5] Completing the loop, NLG can create conversations and written reports from structured data that look and feel like human-created responses and prose.
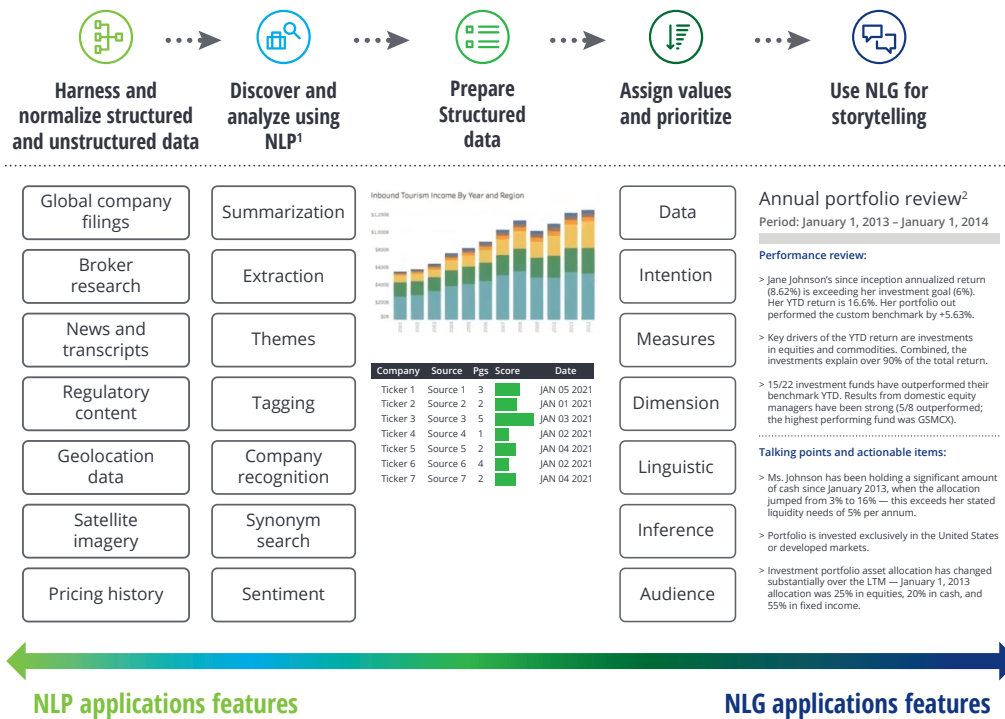
Now, consider the investment decision process. NLP can decipher, connect, and merge disparate data sources into a common platform; it can also normalize data to enable comparisons and connections in the data—a critical step that securities analysts traditionally perform. The NLP advantage: It can vastly expand the volume of information that can be considered. The sources can be from regulatory filings, analyst reports, e-commerce activity, speeches, video, geolocation data, and satellite imagery. Basically, any information that can be linked to an industry, company, or economic activity has potential to be source data for the investment process—and NLP can process more of it than any group of humans. This technology can harness unstructured data and convert it to structured data that can then be used for further analysis or read by other machines. NLP can also normalize and merge structured datasets.

And then, NLG platforms can turn machine-readable or structured data into human-understandable stories; it can even customize stories for specific audience and linguistic requirements.

FIGURE 1

NLP platforms convert unstructured information into structured data; NLG turns this data into stories

| Harness and normalize structured and unstructured data | Discover and analyze using NLP[1] | Prepare Structured data | Assign values and prioritize | Use NLG for storytelling |

NLP applications features

NLG applications features

Note: [1]AlphaSense, [2]Narrative Science

Sources: Discussions with NLP and NLG solution vendors; subject-matter specialist discussions; Deloitte Center for Financial Services analysis.

Figure 1 illustrates the refinement path of investment data using NLP/G. NLP's primary function is to convert unstructured data into structured data that can be utilized by analysts or read by other programs, such as AI decision engines. NLP performs this function by recognizing patterns in the data relative to known patterns or data elements such as dates, ticker symbols, numerical values, dictionaries, and report title codes. A subsequent stage of processing in NLP creates new data elements based on the patterns that are discovered. This stage is where tagging and scoring of patterns in the data occurs. These two types of data allow a system to generate easily comprehensible tables and charts.[6]

Assume you have the audio and video data from the last decade of quarterly earnings calls of a particular industry's leading firms. NLP can find patterns in the word choice, tone, and facial expressions; then it can create themes and scores based on the relationships among the data elements for each company. At this stage, analysts can readily work with the information or feed it into an AI investment decision engine, to be

considered with other datasets, to arrive at buy/sell/hold ratings for securities. The final step in the refinement path is to add NLG features such as linguistics and intentions to the data, enabling the machines to complete a loop by creating what appears to be human-created prose that is completely data-driven and unbiased.
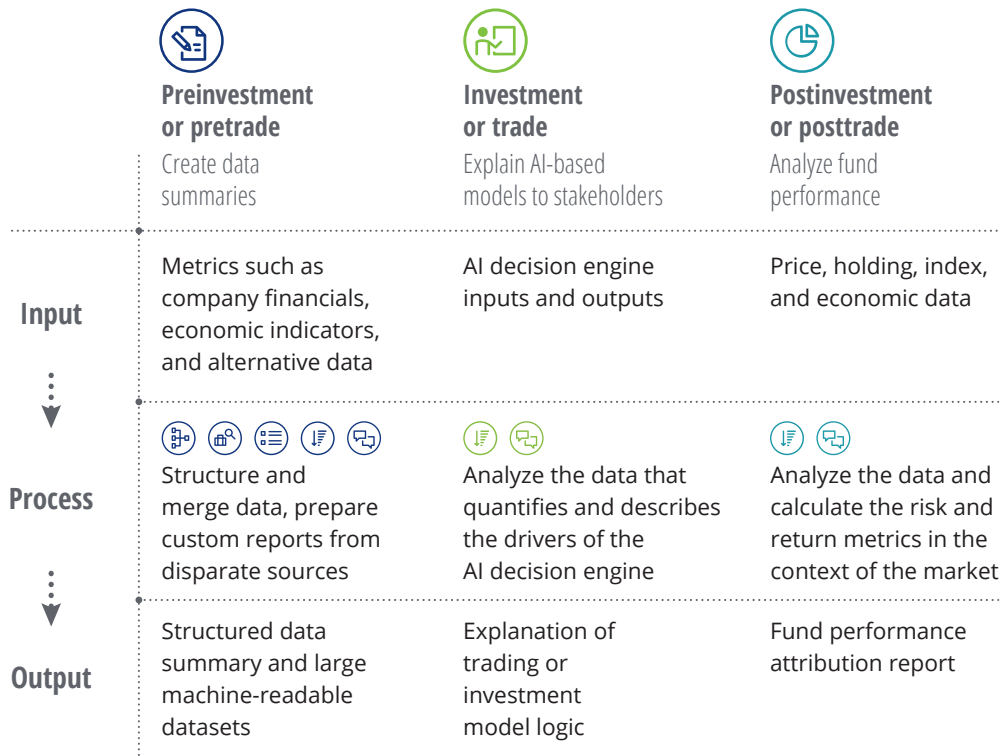
NLP and NLG platforms map into three areas of investment decision-making in varied ways

With this basic understanding of what NLP/G does, let's dive deeper into how this technology can apply to the investment decision process. Firms may utilize NLP and NLG differently depending on the stage in the process: NLP/G can support information gathering and curating pretrade, AI decision engine oversight for AI-supported trading, and portfolio and performance reporting posttrade (figure 2).

FIGURE 2

NLP/G applications across the investment decision process

	Preinvestment or pretrade — Create data summaries	Investment or trade — Explain AI-based models to stakeholders	Postinvestment or posttrade — Analyze fund performance
Input	Metrics such as company financials, economic indicators, and alternative data	AI decision engine inputs and outputs	Price, holding, index, and economic data
Process	Structure and merge data, prepare custom reports from disparate sources	Analyze the data that quantifies and describes the drivers of the AI decision engine	Analyze the data and calculate the risk and return metrics in the context of the market
Output	Structured data summary and large machine-readable datasets	Explanation of trading or investment model logic	Fund performance attribution report

Sources: Discussions with NLP and NLG solution vendors, subject-matter specialist discussions, Deloitte Center for Financial Services analysis.

PRETRADE PHASE

The goal in the pretrade phase is to surface and evaluate investment ideas. Analysts, without the aid of AI, spend significant time identifying, searching, sorting, and organizing relevant information. A survey of 450 research analysts found that they spend roughly two-thirds of their time, on average, collecting and understanding data before knowing whether the information is material.[7] NLP/G can do much of that work for them by digesting and merging structured and unstructured datasets, seeking themes and patterns in the data, and assigning scores to the discovered relationships. Research analysts recognize the technology's potential to generate new opportunities: 45% of surveyed research analysts expect their roles to be substantially different in five to 10 years.[8]

Indeed, many expect technology to reshape the pretrade workstream. AlphaSense, Sentieo, Yseop, and other maturing service providers in the pretrade phase offer Software-as-a-Service solutions for the investment analyst function; they have NLP/G technology at their core and have recently been enhancing their applications to support remote collaboration among analyst teams. Users can feed various file formats and set the parameters for a standard report, based on the data in the files—for example, figure 3 is an automated output from Yseop, synthesizing the past 10 annual financial statements for 15 public firms in the same industry. Analysts can feed quarterly data, customize the data fields, and specify the analysis to perform, and templates can be saved and enhanced over time.

FIGURE 3

Sample machine summary of industry financial performance

Total revenue from Business Activities grew to €45.97B from €27.29B over the last nine years, starting with a sharp increase to €36.31B from €27.29B between 2010 and 2013. It remained mostly stable between 2013 and 2016 and rose overall to €45.97B during the last three years.

Total revenue increased overall by 68.47% mainly driven by:

- a 155.73% increase of Red Inc
- a 75.58% increase of Blue Inc
- a 90.19% increase of Green Inc

Regarding the profitability metrics, Blue, Red and Green are the ones with the highest **EBITDA** in 2019.

Worth mentioning, Red had the largest increase. **EBITDA** strongly increased to €351.9M in 2016 from -€3.3B in 2010 (becoming positive). It reached €4.9B in 2019.

Blue recorded 70% growth in **EBITDA** since 2010, despite a 20% increase in **operational expenses** which was more than compensated by the increase in **revenue**.

Net income rose overall to €12.84B from €8.80B during the last nine years. Starting with a drop to €7.21B between 2010 and 2012, **Net income** increased to €10.06B between 2012 and 2014. After a decrease between 2014 and 2016, it grew to €13.01B from €9.11B between 2016 and 2017 and dropped again to €10.30B in 2018. Over the last year, **Net income** climbed to €12.84B.

Over the last nine years, **Net income** rose by 45.9% mainly due to:

- a 190.17% increase of Blue Inc
- a 291.78% increase of Red Inc
- a 200.39% increase of Green Inc

Yellow Inc, Orange Inc, Grey & Co are the ones with the lowest net income in 2019, with €90.2M, €11.3M and -€75.1M, respectively.

Note: Company names and figures have been changed to protect firm identities and performance details

Source: Yseop.

Implementation of these technologies has the potential to significantly reduce the time analysts spend collecting and understanding data without even knowing whether the information is valuable.[9] Analysts would still spend their time analyzing, but the shift would be to working with data that has higher potential for insight. To use the mining analogy, NLP/G performs a refining step that concentrates the ore before analysts spend time on evaluation.

INVESTMENT DECISION POINT PHASE

The objective in this phase is to arrive at a buy, sell, or hold decision. NLP and NLG do not perform these tasks—a portfolio manager does it either directly or with the aid of an AI decision engine—but NLP/G can help in this phase by writing the story of an AI-supported decision. Proprietary technologies subject data to a series of shocks or stress tests to explain the drivers of an AI decision engine, including investment engines, and NLP/G can process the combined input and decision data to produce a standard unbiased report explaining the decision, including potential contrary factors. Portfolio managers can use this story to review and approve or reject the trade; firms can also use the story to report to portfolio managers, clients, or regulators on the drivers or the *why* of the trade. Portfolio managers can use this information to manage and update AI decision algorithms. For clients and regulators, the firm can use the technology to demonstrate understanding and control of the trading algorithms: They can tell the *why* of every trade, objectively. In this phase, NLP/G acts as a support technology to the decision, as opposed to the AI component that directly performs the investment decision.

POSTINVESTMENT PHASE

NLP/G technology is most mature in the postinvestment phase, with applications already in use at some large investment management firms. Because portfolio and index performance are naturally structured data, NLP/G engines can readily use these inputs to generate performance attribution reports and periodic investor reviews. Many see this technology altering the performance analyst role, with 19% of performance analysts—highest among all investment professional roles—expecting that their current roles will not exist in five to 10 years.[10] NLP/G is expected to improve the timing, accuracy, and cost of producing reports based on investment portfolios' performance and strategy. These outputs' programmatic nature combined with NLG's ability allows for the creation of client on-demand reporting. Figure 4 shows a machine-generated portfolio narrative that was written with NLP/G technology and made available to investors shortly after period close.

FIGURE 4

Screenshot of portfolio commentary report

Source: Narrative Science; Deloitte Consulting LLP.

Positioning to adopt NLP and NLG platforms

To convert the possible benefits of NLP/G adoption into reality, investment managers may benefit from reexamining their strategic vision and talent approach. There is a long adoption curve ahead, and firms may help drive initial adoption by balancing short- and long-term objectives. Leading practices suggest that implementation and execution are best supported with a refresh of talent strategies, including positioning technology as an enabler rather than a threat.

Senior leadership buy-in is often key for adoption. Both the chief investment officer and portfolio managers should be onboard to help with challenges and integrate the technology and investment teams. Once the objectives of NLP/G adoption are truly shared, an organization can pursue them in a coordinated fashion.[11] Close collaboration between technology, investment, data science, and strategy teams can help drive NLP and NLG adoption.

Four areas in talent management will likely contribute to long-term NLP/G success:

Recruitment and training. Appoint experienced data science professionals in key roles. Early AI leaders have made it a point to recruit people with skills such as mathematics and advanced physics.[12] Train new analysts in coding and AI applications.

Organizing in teams. Start with small teams, focusing on using AI to automate routine, repetitive tasks. Have a mix of capabilities within teams to drive innovation. Work toward creating "superteams" that have a mix of analyst, technology, and investment strategist skill sets.[13]

Performance management. Realign incentives from span of analyst control to innovation using technology. Manage redeployment of investment professionals based on skill sets and experience. Align processes and performance management to adjust for AI's inclusion on the team.

Culture. Shift the mindset to technology as a business partner for the investment team, training not as a service. Inculcate a culture of regular training and upskilling for all members of the investment team.

A leading investment firm followed many of these principles in their path to NLP/G adoption. Leaders within the firm sprinkled data scientists across the investment groups, added coding and analytics to the requirements for new junior-level portfolio managers and analysts, and offered existing investment staffers training in those skills, to free up the investment team's time. For hiring, the firm began approaching not only schools' finance majors but physics departments and other areas where someone might have expertise in coding and analytics. The firm also created training camps for anyone else who's interested. In all, the firm has trained 75 investment staffers—analysts, portfolio managers, and traders—on coding and analytics.[14] Talent and technology strategy go hand in hand; to be successful over the longer term, talent develops the organizational capability to drive the strategy.

Path forward for investment managers

Investment managers are at a juncture where the adoption of NLP/G platforms today may create a competitive advantage for years to come. In a recent Deloitte survey, 86% of financial services adopters predicted that AI will be very or critically important to their business success in the next two years, in line with investment management respondents.[15] NLP/G platforms could be good candidates for a place to start, with more than half of investment management firms surveyed planning to implement these technologies in 2021.[16]

NLP and NLG support the three phases of the investment decision process in very different ways, and the decisions to deploy this technology in any of the phases are independent. Firms using NLP/G may identify investment opportunities sooner and improve operational efficiency. The time saved by analysts gathering data in the pretrade stage can be used to broaden the coverage universe or conduct a deeper analysis of already-covered companies. These improvements may enable analysts to identify the strongest investment ideas and potentially increase alpha. In the investment phase, the NLG engines can help firms communicate the rationale behind AI-supported decisions rather than treating them as black boxes. This capability can help firms continuously improve the existing decision-making algorithms and develop new ones. Finally, in the posttrade phase, NLP/G engines can generate portfolio commentaries from performance data on demand in seconds, instead of requiring days of manual effort each time.

The technology's greatest benefit comes from being able to process large amounts of data quickly. There are no difficult prerequisites for implementation of NLP/G in the pre- and post-trade phases of the investment process. Many firms will likely start their AI journey with NLP/G technologies in these phases. For the investment decision point, NLP/G is likely best used to explain an AI decision engine's output. This implementation often comes in conjunction with developing an AI decision support capability.

As investment management firms set out to digitally transform their operations, leaders will likely increasingly look to AI technologies. It should be encouraging that NLP/G has the potential to play a key role in reimagining the heart of active management—the investment decision process.

Endnotes

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