

Machine Learning: On the Ground Floor, Ready to Rise

While much of the talk about machine-learning technology in capital markets is overblown, there's no question that these tools are set to become increasingly prevalent over the coming years. Anthony Malakian takes stock of where the industry stands based on actual implementations.

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Desmond Lun spent much of his academic career focused on computational biology. In 2006, after earning his PhD in electrical engineering and computer science from MIT, he became interested in understanding how applying techniques for analyzing Big Data problems in biology could predict financial market outcomes.

Lun began trading, trying out ideas from his own work in computational biology and developing new methods geared toward finance. It took six years to develop the core of the platform that would eventually power his hedge fund, [Taaffeite Capital Management](#), an Australia-based outfit that Lun, who also teaches plant biology and computer science at Rutgers University, co-founded with Howard Siow.

Pronounced “tah-fight,” the hedge fund is named after a precious gemstone discovered in 1945 by Richard Taaffe. Taaffeite the investment manager was launched in 2014, built on a core [artificial intelligence \(AI\)](#) platform that uses Bayesian networks and deep learning. While that might sound complex, Lun insists that these are “very, very general techniques.” What matters, he says, comes down to “how you apply them and how you make them work for a specific problem that really determines if it works or not.”

Taaffeite sucks in large amounts of widely available data—such as historical prices and exchange-traded instrument volumes—and feeds it into its learning algorithms. What makes Taaffeite’s strategy proprietary is the way that the algorithms learn, based on specific biological computations. They learn from

structured datasets and make a very specific prediction, on which the program decides how to act and how to place trades. “And there’s no human intervention,” Lun explains.

He says it’s important that the system can eke out a small edge at a time. He likens it to using loaded dice at a craps table, knowing the grift is on while the others at the table are none the wiser.

Huge Gains

Take, for example, [Brexit](#). While some got clobbered by last year’s British referendum vote to leave the European Union, Taaffeite’s lower-leveraged fund returned 20 percent last June and about 30 percent for its higher-leveraged funds. On June 24, 2016, the day after the Brexit vote, the hedge fund made about two-thirds of those June gains in a single day, Lun says.



“Our system doesn’t know anything about external events—it’s reacting on historical prices and volumes. What it was seeing, though, was prices starting to move in an anomalous way. If you looked at European equities compared to equities in other markets, they were being bid up in the run-up to that referendum on the expectation that it would go the other way, and obviously it did not, and we made very large gains out of that,” he says.

“I think what the system was picking up on was a very, very good asymmetric bet where if Brexit had not happened, we probably would have made small losses or no losses at all,” he continues. “But as it happened, we came out with a very, very large, winning bet. That was responsible for about two-thirds of our gains, but even if you take that day out, we still would have had a very, very good month, and it’s really because of all the uncertainty around that decision—it created a lot of opportunities for anomalous pricing to occur.”

From Hype to Leap

There’s a lot of hype surrounding the machine-learning space. Vendors throw around the term like they throw around the term “industry leader” when describing their organization or technology/services.

Artificial intelligence—which combines everything from machine learning to robotics, deep learning, natural-language processing and virtual reality—is the most intriguing technological development facing the industry today.

Blockchain's hype is already withering on the vine, in many ways. But AI implementations—and spending—are tangible.

According to consultancy [Preqin](#), 40 percent of hedge funds launched in 2016 were considered systematic and favored computer models and algorithms over human analysts—though that doesn't necessarily mean that machines are making all the investment decisions, as is the case with Taaffeite. According to estimates from consultancy [Opimas](#), financial firms will spend over \$1.5 billion this year on AI-related technologies—including machine learning—with that figure projected to rise by 75 percent to \$2.8 billion in 2021. And the MIT Technology Review website stated that machine learning, specifically, has created a "tremendous resurgence" in overall AI endeavors, across all disciplines and sectors, and predicted that financial data was the next frontier to be conquered.

Though considered a new innovation—especially in the capital markets—machine learning has been around since the 1950s. The techniques being used aren't necessarily creating this rapid advancement in the industry; it has more to do with a combination of outside effects, says Michael Kollo, deputy global head of research at [AXA Rosenberg](#). First, there's the issue of Big Data—there is a ton of inexpensive data available that can be analyzed and broken down. And alternative datasets are becoming increasingly valuable for trading houses.

Additionally, the ability to cheaply store that information has also vastly improved, in large part thanks to the advancement of public [cloud](#) providers like Amazon, Google, Microsoft and IBM. But perhaps most importantly, computing power has increased exponentially over the last decade, so gaining insights from these machines no longer takes months of computational analysis. "One thing that's not going away is that whether we call it machine learning, AI, deep learning, or whatever else, processing power is only going one way. The allure of finding patterns because you can examine every permutation of every possible pattern within your dataset is only going to get greater," Kollo says.

A Snapshot

Other firms taking a lead on machine learning include Chicago-based high-frequency trading (HFT) firm [Hull Investments](#), which uses machine-learning algorithms to power its market-timing strategy, adjusting the equity exposure

depending on return forecasts, where the strategy is anywhere from 150 percent long to 50 percent short. “I think the biggest thing is we’ve had so many different techniques—everything from neural networks to random forests—that the biggest benefit recently has been in the combination of models, or an ensemble of models,” Blair Hull, founder of Hull Investments, told sibling publication *Waters* in an earlier interview. “So you don’t just have one model—you have multiple models that you use. That’s the biggest advancement that’s come in recent years.”

But it’s not just specialist shops that are at the forefront of innovation in this space. Buy-side behemoth [BlackRock](#) is using machine-learning techniques to better calculate the cost of liquidating fund positions in the case of redemptions, according to Stefano Pasquali, who heads the firm’s liquidity research unit, who spoke at a conference hosted by *IDM* sibling publication *Risk*, in July.

BlackRock is currently in the process of feeding internal trade data into its market liquidity model. Depending on the insights gained, it will tweak the system from there. “Liquidity is multi-dimensional, and is impacted by so many features. It is highly non-linear. So this is a typical use-case for neural networks,” Pasquali said, adding that BlackRock will also use machine learning to assess the probability of large net-flows out of its funds.

Meanwhile, London-based hedge fund group [Man GLG](#) appointed William Ferreira to the newly created role of head of machine learning, where he will be responsible for developing the firm’s machine-learning capabilities, providing its portfolio managers with tools and techniques through which to support their analysis and decision-making processes.

“We believe that machine-learning techniques present an opportunity for discretionary investment managers, providing them with analytical tools to complement, and further enhance, their decision-making processes,” said Man GLG chief executive Teun Johnston in a statement. “We are continually seeking to develop our offering for our clients and, as the amount of data available continues to expand, these techniques can supplement existing rigorous quantitative and qualitative analysis.”

[State Street](#) uses machine-learning techniques to ingest, digest, and tag research reports in its Quantextual platform—a research aggregation

tool aimed at helping portfolio managers and chief information officers to get a better handle on the many research reports populating the market.

“[W]e’re trying to use the machine learning part of that application to help with some of the content tagging, so that you can more quickly zero in on what would be most relevant for you,” said JR Lowry, global head of information and advisory solutions at State Street, as well as EMEA head of State Street Global Exchange, in a previous interview. And much like how Amazon or Netflix draw your attention to products you might like, in time Quantextual will also make suggestions “based on your express interest and usage of tool.”



Another firm to recognize this potentially beneficial use of machine learning is [Saxo Bank](#), which has been working with machine-learning techniques for several years now. In a previous interview with *Waters*, Saxo CEO [Kim Fournais](#) said the bank recently started working on a component that will help it to better personalize users’ trading and investment experiences using machine learning. “It will understand your behavior,

your interests, what kind of news you are interested in, what kind of instruments you have traded, and what kind of risk profile you have,” he said.

Other firms have found more mundane but still important uses for machine learning: [UBS](#) is deploying Arago’s Hiro AI platform to support its UBS Global Production Services unit, with the aim of automating processes across the entire IT stack. “The implementation of Hiro is a key step towards a new kind of process automation based on artificial intelligence,” said UBS chief technology officer Stephan Murer in a statement. “After a short trial phase we became convinced of the benefits that Arago’s problem-solving artificial intelligence delivers to its clients.”

It’s not just trading and investment firms who are pouring money into machine learning. Vendors are equally keen to build the next-generation platforms and tools to serve firms hungry for a taste of what AI can do for them.

[IBM](#), one of the leaders in AI advancement with solutions already in place in the healthcare and security sectors, is now taking aim at finance's Regtech space, launching its Watson Financial Services Solutions unit in June, which addresses everything from anti-money laundering/know-your-customer (AML/KYC) needs to fraud monitoring and surveillance.

Meanwhile, [Misys](#) has unveiled a new platform, dubbed FusionCapital Detect, which uses machine-learning algos to tackle validation errors in the trading workflow.

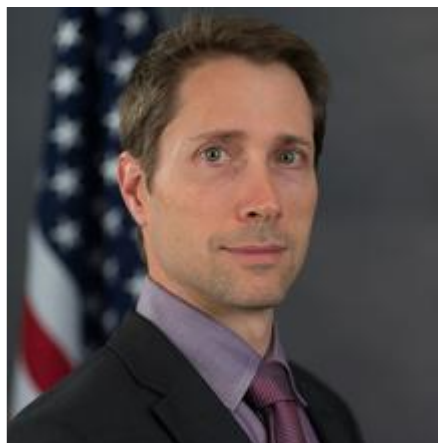
Peter Farley, senior strategist for capital markets at Misys, told *Waters* that the solution aims to limit transaction errors, cut down on labor costs and reduce reputational risk. "We ran a beta test with a big regional bank, looking at areas where mistakes can cost more, such as structured products and derivatives," he said. "We found that the cost of these errors in the validation process is around 20 percent of the transactions."

Exchanges and other marketplaces are also taking advantage of machine-learning to provide better and compliant service for clients. [Trumid](#), a dark pool for corporate bonds, uses machine learning to power its Likelihood-to-Trade (LTS) score, a proprietary machine-learning model that incorporates real-time information entered by users, and analyzes the past performance of similar bonds to provide a view into possible trading opportunities. Trumid asks its users to "follow" either subsets of bonds or individual bonds. That list can be thousands of bonds long, depending on the user. LTS' machine-learning model—which serves as a dynamic list-sorting tool—then takes that user "follow list" list and creates a list of bonds that have the highest probability to trade at that moment, reducing the time taken to find trades, and increasing the likelihood of execution.

Meanwhile, in July, [Nasdaq](#) acquired London-based Regtech firm Sybenetix, which uses machine learning to predict people's behavior in order to flag suspicious activities, citing "growing market demand" for machine-learning platforms on the buy side. "We see a lot of different buy-side firms across the board realizing that strong compliance is a key competitive advantage and a differentiator," said Valerie Bannert-Thurner, senior vice president and head of risk and surveillance technology solutions at Nasdaq, after the acquisition.

A major endorsement of machine learning in the financial markets comes from [the US Securities and Exchange Commission](#)

([SEC](#)), which began using machine learning to augment its risk assessment processes in 2008. The regulator has moved on to modeling and using it to measure the probability of words within and across documents to find unique topics and insights, and to create alerts. Both topic modeling and text analysis are now used widely in the agency to point to possible anomalous transactions, noted [Scott](#)



[Bauguess](#), SEC acting director for the division of economic and risk analysis, and acting chief economist, during his keynote speech at the CyberRisk North America event in June.

“The underlying science is remarkable, and this data-driven approach makes it easier to apply to SEC procedures,” Bauguess said. “Regulators can use artificial intelligence and machine learning to understand behavior, and we have been integrating them into the risk programs of the SEC.”

Enough Fiction

At its core, machine learning is both understandably defined and complex. It's easy to understand its basic premise—a computer/algorithm learns without being explicitly programmed to execute on a specific function. What's not so clear, however, is how those algos develop their own functions. This creates misconceptions and unrealistic expectations.

Take [Google](#), for example. Its Google Brain deep-learning research unit taught two neural networks—named Alice and Bob—how to encrypt and send messages to one another that a third neural network, Eve, could not understand. Then there is [Facebook](#)'s chatbot neural networks that created a language to more efficiently communicate with one another. There were rampant (false) reports that the engineers had to kill the project for fear of a computer takeover.

In finance, machine learning is still on the ground floor compared to what Google and Facebook are working on, and they're still just scratching the surface of the technology's potential. Rest assured, however, that sooner or later machine learning will be used for almost everything—in small parts and large—from the front office to the back office.

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