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Letting the Machines Decide

New Wave of Investment Firms Look to 'Artificial Intelligence' in Trade Decisions

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By SCOTT PATTERSON

Wall Street is notorious for not learning from its mistakes. Maybe machines can do better.

That is the hope of an increasing number of investors who are turning to the science of artificial intelligence to make investment decisions.

With artificial intelligence, programmers don't just set up computers to make decisions in response to certain inputs. They attempt to enable the systems to learn from decisions, and adapt. Most investors trying the approach are using "machine learning," a branch of artificial intelligence in which a computer program analyzes huge chunks of data and makes predictions about the future. It is used by tech companies such as Google Inc. to match Web searches with results and Netflix Inc. to predict which movies users are likely to rent.

One upstart in the AI race on Wall Street is Rebellion Research, a tiny New York hedge fund with about \$7 million in capital that has been using a machine-learning program it developed to invest in stocks. Run by a small team of twentysomething math and

A hedge fund started by four young math wizards is using a branch of artificial intelligence, called "computer learning," to make investment decisions. Rebellion Research's four, 20-something-year-old partners explain how their computer program "thinks" up their strategy.

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computer whizzes, Rebellion has a solid track record, topping the Standard & Poor's 500-stock index by an average of 10% a year, after fees, since its 2007 launch through June, according to people familiar with the fund. Like many hedge funds, its goal is to beat the broader market year after year.

"It's pretty clear that human beings aren't improving," said Spencer Greenberg, 27 years old and the brains behind Rebellion's AI system. "But computers and algorithms are only getting faster and more robust."

Some sophisticated hedge funds such as Renaissance Technologies LLC, based in East Setauket, N.Y., are said to have deployed AI to invest. But for years, these firms were the exception. Some firms that have dabbled in AI are skeptical it is anywhere close to working.



Rebellion is part of a new wave of firms using machine learning to trade. Cerebellum Capital, a San Francisco hedge fund with

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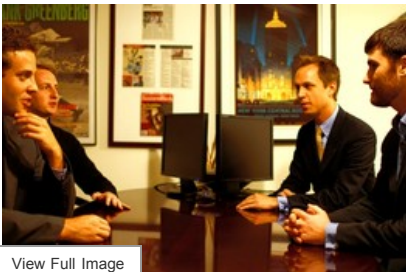
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'Human beings aren't improving,' says Rebellion Research's Spencer Greenberg, foreground. With him, from left, are Jeremy Newton, Jonathan Sturges and Alexander Fleiss, also of Rebellion Research, outside the company's New York offices last month.

contrast, the typical quantitative approach may employ a single strategy or even a combination of strategies at once, but may not move between them or modify them based on what the program determines works best.

"No human could do this," said Michael Kearns, a computer-science professor at the University of Pennsylvania who has used AI to invest at firms such as Lehman Brothers Holdings Inc. "Your head would blow off."

Rebellion has struggled to raise money, in part because investors since the credit crisis are dubious of opaque math-based strategies.



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From left, Rebellion Research's Alexander Fleiss, Jeremy Newton, Jonathan Sturges and Spencer Greenberg on a recent day.

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“ Trading is a zero sum game. Even if the computers are trading against computers money will still be made because everyone's model is different. ”

—Setsuna Seiei

based on shifting dynamics in the market and broader economy. The program isn't wed to any single investing approach. Under certain conditions, the fund will buy cheap stocks, in others it will favor stocks with swiftly rising prices—or both at the same time.

Unlike the high-frequency funds that use artificial intelligence to aid rapid trading, Rebellion tends to hold stocks for long periods—on average four months but in some instances more than two years. It also doesn't short stocks or use leverage, or borrowed money, which can amplify returns but also boost risks.

The program monitors about 30 factors that can affect a stock's performance, such as price-to-earnings ratios or interest rates.

The program regularly crunches more than a decade of historical market data and the latest market action to size up whether to buy or sell a stock. When certain strategies stop working, the program automatically incorporates that information, "learns," and adjusts the portfolio.

For instance, it may detect data indicating stocks with low price-to-earning ratios are likely to

\$10 million in assets, started using machine learning to invest in 2009. A number of high-frequency trading firms, such as RGM Advisors LLC in Austin, Texas, and Getco LLC in Chicago, are using machine learning to help their computer systems trade in and out of stocks efficiently, according to people familiar with the firms.

The programs are effective, advocates say, because they can crunch huge amounts of data in short periods, "learn" what works, and adjust their strategies on the fly. In

The firm has attracted at least one long-time "quant" skeptic: famed value investor Jean-Marie Evillard, who recently invested several hundred thousand dollars of his own money into Rebellion. "My cup of tea is not quantitative investing," he said. "But I think they are serious investors, and I'm impressed by the fact that they don't have a high turnover...and don't use leverage."

Rebellion's Mr. Greenberg is no stranger to the investing world. His father, Glenn Greenberg, is an iconoclastic value investor and manager of Brave Warrior Advisors, who recently split from his partners at Chieftain Capital Management Inc. His grandfather, legendary baseball slugger "Hammerin' Hank" Greenberg, played for the Detroit Tigers in the 1930s and '40s.

Past success doesn't mean Rebellion will continue to beat the market. As with many quant strategies, its system could stop working if market fundamentals change in ways that trip up its computer program, known as "Star."

What makes Star intelligent, says Mr. Greenberg, is its ability to adjust its strategy

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rise and load up on those stocks. Then, if the program later finds that the strategy is likely to lose steam, based on shifts in the factors it tracks, it will dump those stocks and buy stocks it deems more favorable.

Every morning, Star recommends a list of stocks to buy or sell—often it offers no changes at all. A human trader implements the moves. The firm says it never overrules the computer program, which is largely the same system they started with in 2007, with a few nips and tucks. Rebellion typically holds about 60 to 70 stocks at any time.

Mr. Greenberg started designing Star in mid-2005, soon after he graduated from Columbia University with an engineering degree. He was joined by Alexander Fleiss, a high-school friend with a background in finance and math, as well as Jonathan Sturges, who has a master's degree in music composition, and Jeremy Newton, a mathematician who helped design the AI program.

In January 2007, with \$2 million in capital, the program started picking stocks. That spring, it started moving into defensive positions such as utilities. Rebellion gained 17% in 2007, compared with the 6.4% gain by the Dow Jones Industrial Average, according to people familiar with the fund.

It stayed defensive throughout most of 2008, holding gold, oil and utility stocks. Still, it lost money like most investors, sliding 26% but topping the 34% decline by the Dow industrials.

In early 2009, Star started to buy beaten-down stocks such as banks and insurers, which would benefit from a recovery. "He just loaded up on value stocks," said Mr. Fleiss, referring to the AI program. The fund gained 41% in 2009, more than doubling the Dow's 19% gain.

The firm's current portfolio is largely defensive. One of its biggest positions is in gold stocks, according to people familiar with the fund.

The defensive move at first worried Mr. Fleiss, who had grown bullish. But it has proven a smart move so far. "I've learned not to question the AI," he said.

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