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# Decoding AI's Role in Financial Services

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Hopes vested in AI capabilities may be running ahead of the reality – just as they did several decades ago.

## *What if “artificial intelligence” was instead known as “complex information processing”?*

This is a historical rather than rhetorical question – and one of significance for the financial services industry generally, and investment management in particular, where hopes vested in AI capabilities have often run ahead of the reality.

The term artificial intelligence was first coined in 1956, when a group of researchers at a conference sought to “find out how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves”.

But two participants at the conference took issue with the phrase. For years, they insisted instead on the terminology of complex information processing, a less evocative but more exacting description of the discipline, which stands at the confluence of statistics, computational science and machine learning.

## From Babbage and Turing to Wall Street and the Quants

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The connection between AI and financial services goes back to computing pioneer Charles Babbage. In his 1832 work, *On the Economy of Machinery and Manufactures*, Babbage described London’s Bankers’ Clearing House, where clerks from various institutions met to settle checking transactions. Babbage was struck by the efficiency of this complex information processing system, which handled, by his estimate, as much as 15 million pounds per day – or well over 1 billion pounds in today’s money.

From the 19th century onwards, efforts to mechanise aspects of human thought in a financial context - from mechanical calculators and cash registers to mainframe computers and ATMs - proceeded in incremental steps. But it wasn’t until English mathematician Alan Turing’s work almost a century after Babbage that academics began to believe that generalised computer intelligence – that might equal or surpass that of mankind’s – could actually be achieved.

One of the first Wall Street firms associated with AI was Lehman Brothers; the *New York Times* reported the firm’s efforts to develop a system to evaluate prices of interest rate swaps in the mid-1980s.



At the same time as large Wall Street firms were turning to AI, so was an entrepreneurial group of new investment management companies. Renaissance Technologies and D.E. Shaw, two quantitative firms employing techniques from statistics and computer science, were founded in the US at either end of the 1980s. Meanwhile in London, the firm Adam, Harding & Lueck Limited, launched in 1987, was pioneering the application of computer simulation to systematic trading of futures markets. These firms and their progenies - including Winton Group and Two Sigma Investments - are today among the most successful quantitative investment firms in the world.

Source: Wall Street Journal, 1986.

## Traders Seeking an Edge Try Artificial Intelligence

By SCOTT McMURRAY  
Staff Reporter of THE WALL STREET JOURNAL

CHICAGO—Traders, who have looked to nearly everything from intuition to the phases of the moon to try to beat the market, are experimenting with a new tool: artificial intelligence.

strategies in response to changes in market conditions. Programmers have been slow to apply artificial intelligence to securities and futures trading because of the rapidly changing nature of the markets. It has tended to be used instead in activities with more

As a *Wall Street Journal* article at the time explained, “systems based on artificial intelligence seek to anticipate market trends by identifying market signals that typically presage a change in prices. The computer then applies what it ‘learns’ from historical trading data to the actual market conditions of that moment, and the system supposedly adjusts its trading rules and strategies in response to changes in market conditions”. The article noted that AI had taken longer to arrive in financial markets because of their non-stationary – or dynamically changing – nature, highlighting one system that returned 45% a year in simulations, but lost money in practice.

## Neural Nets Begin to Spread

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By the early 1990s, companies were experimenting with AI across the full spectrum of financial services. An early application using neural networks – a type of machine learning – could recognise handwriting on cheques. Banks and credit card companies – including Security Pacific National Bank, Chase Manhattan, Barclays, and American Express – built expert systems and neural networks to identify credit card fraud. Insurance companies adopted expert systems to help evaluate risks and write policies.

Source: Wall Street Journal, 1988.

## Higher Tech

# Computer Researchers Find 'Neural Networks' Help Mimic the Brain

The Systems, a Building Block  
For Artificial Intelligence,  
May Analyze Loans, Radar

Around the same time, mortgage lenders turned to expert systems and neural networks to expedite the underwriting process. In 1989, the *Baltimore Sun* asked its readers to "picture ordering up a cheeseburger, soft drink, fries and a \$250,000 adjustable-rate mortgage on the side. And walking out with all of them." By 1993, Fannie Mae and Freddie Mac were testing automated underwriting.

Source: Washington Post, 1998.

## **Neural Networks are Making a Comeback**

The current surge in interest in AI has once again centred on neural networks, which were part of a system developed by Alphabet subsidiary DeepMind that defeated the human Go champion in 2016. Yet games like Go or chess are what statisticians term "fully observable" – they have defined and constant rules, and a large but finite number of potential permutations. By contrast, the human institutions which are the global financial markets, with their ever-changing characteristics, provide a far harder challenge for computers to solve using these methods alone.

## AI's Slow and Steady Race

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Financial services stands to gain from AI in the future, just as it has over the past 30 years. There has been substantial growth in both computing power and memory capacity over several decades - products of micro-processing efficiency gains described by Moore's Law. Advances in automatic data capture also hold out promise.

Yet caution with respect to the more sensational claims of "disruption" is warranted, since the history of AI is littered with over-promise and disillusion. The observation of philosopher Hubert Dreyfus in the mid-1960s probably holds true today, that "an overall pattern is taking shape: an early, dramatic success based on the easy performance of simple tasks, or low-quality work on complex tasks, and then diminishing returns, disenchantment, and, in some cases, pessimism".

Source: Wall Street Journal, 1990.

## ***Bright Outlook for Artificial Intelligence Yields to Slow Growth and Big Cutbacks***

In a world where the language of neuroscience has potent marketing appeal, the champions of complex information processing never stood much chance against artificial intelligence's cheerleaders. But the first camp's more sober term might have resulted in more dispassionate debate about the field, and its relevance for the world of investment management.

## Timeline

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**First century BC** – Greeks use devices like the clockwork Antikythera mechanism to predict the movements of heavenly bodies

**1495** – Leonardo Da Vinci sketches an automaton of a knight that could, among other things, stand and sit

**1600s** – First mechanical calculators developed

**1795** – German mathematician Carl Friedrich Gauss develops the least squares method for regression analysis

**1804** – French inventor Joseph Marie Jacquard builds his programmable loom, controlled by punch cards

**1809** – Napoleon plays chess against the Turk, a machine that could supposedly compete on its own, but was in fact controlled by a chess master

**1820** – French inventor Thomas de Colmar patents an early version of the Arithmometer, which would become the first mass-produced mechanical calculator

**1832** – Charles Babbage's book *On the Economy of Machinery and Manufactures* published

**1890** – US government conducts the 1890 census using punch card tabulating machines

**1936** – Alan Turing publishes paper with a proof that universal computing machines can perform any mathematical calculation given an appropriate algorithm

**1940s** – Electronic, stored-program computers developed

**1956** – “Artificial intelligence” coined at a Dartmouth College conference

**1957** – US psychologist Frank Rosenblatt develops early artificial neural network

**1959** – Patent filed for the integrated circuit, and “machine learning” coined

**1970s** – Stock exchanges begin to go electronic



**1973** – A negative UK government report on the development of the field heralds the start of the first “AI winter”, when researchers saw funding slashed

**1974** – MYCIN, an important early expert system, is developed

**1982** – Mathematician James Simons founds quantitative investment firm Renaissance Technologies

**1983** – New US and Japanese funding initiatives mark the end of the first AI winter

**1984** – Lehman Brothers develops a system to evaluate the terms of interest rate swaps

**1987** – Founding of Adam, Harding & Lueck Limited (AHL), a pioneer of systematic trading in futures markets

**1987** – Funding cuts and disappointment with expert systems bring on the second AI winter

**1988** – Former computer scientist David Shaw founds investment management firm D.E. Shaw

**1989** – Bell Labs implements artificial neural network for reading handwritten digits

**1990s** – Investment managers including Fidelity and LBS Capital Management look to neural networks

**1993** – Fannie Mae and Freddie Mac begin testing automated underwriting systems

**1997** – David Harding founds Winton Capital Management after leaving AHL

**1997** – IBM’s Deep Blue beats world chess champion Garry Kasparov

**2005** – Sebastian Thrun’s Stanford team wins DARPA’s 130-mile driverless car race

**2016** – Alphabet subsidiary DeepMind’s AlphaGo computer program beats Go master Lee Sedol



## Important information

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