Quants are using Machine Learning in Value Investing

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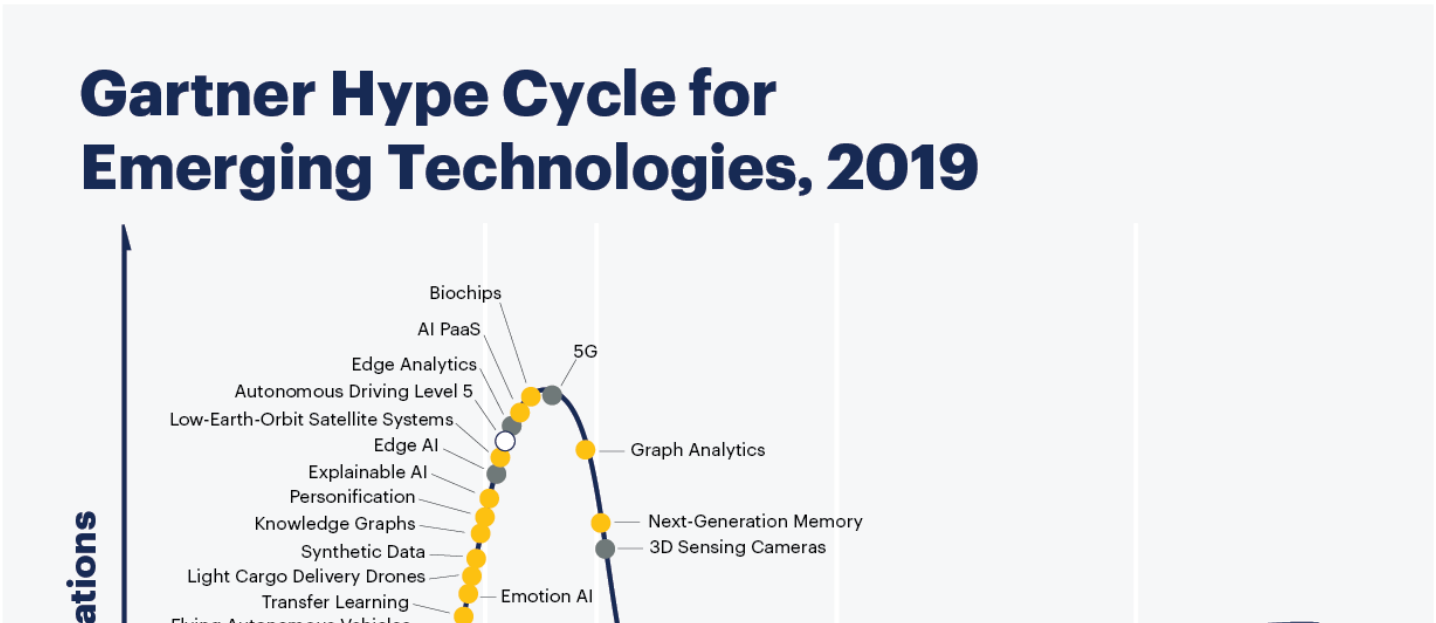
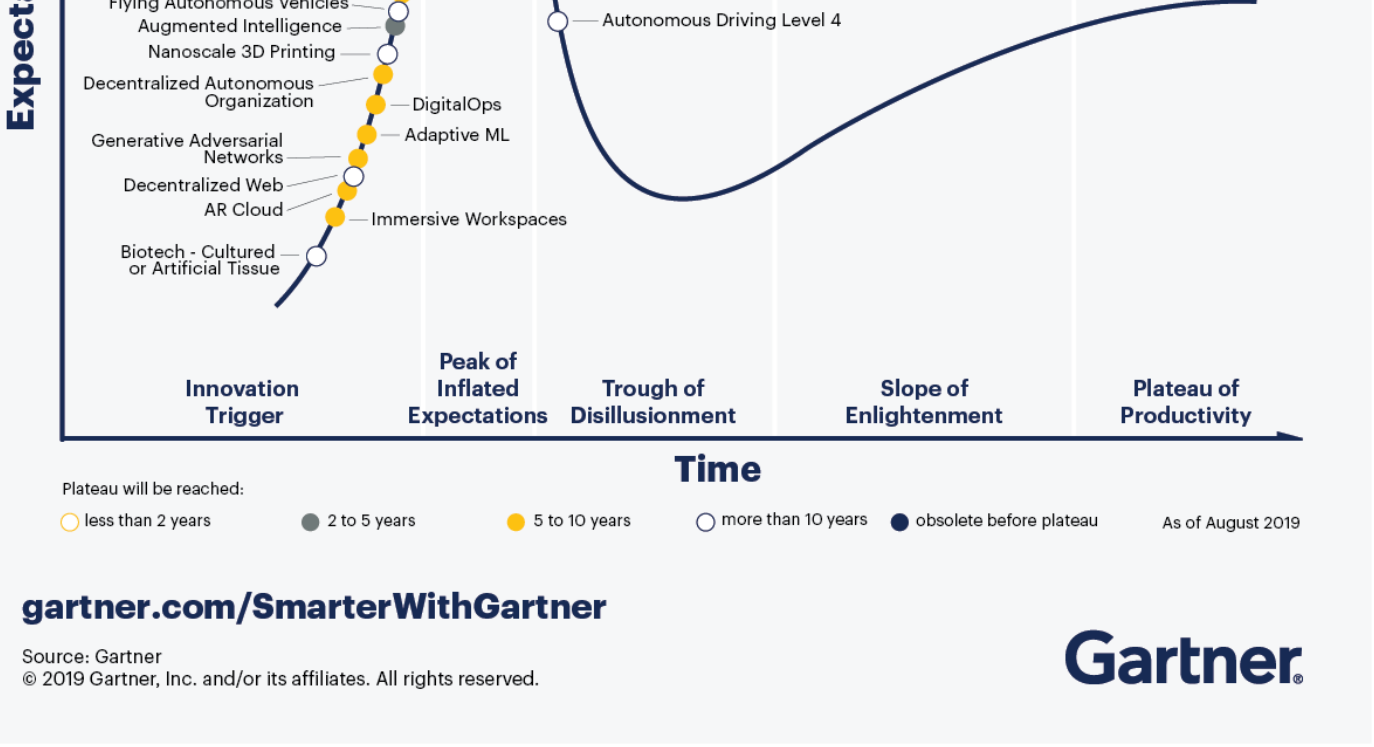
In last few years Machine Learning and Artificial intelligence has dominated the Gartner Hype Cycle, 2019 is no exception.

AI and ML has been creating opportunities in almost every sector including Quantitative Finance. It is well known fact that ML is not new to hedge funds, I remember reading articles on Renaissance Technologies using AI/ML back in the days when these approaches were not ubiquitous. These days even retail quant investors are using AI/ML techniques for value investing.





AI and ML are the computer science concepts with roots in mathematics and statistics. Although these terms caught popularity recently, they have been prevalent in academia from decades. For example, using neural networks to predict financial markets has been an active research area since the late 1980's [1].

There are many reasons for AI/ML techniques to gain steam lately, some of them could be summarized as follows

- Drop is computing cost.
- Easy availability of computing resources, such as one click cloud computing serves from Google, Amazon, Microsoft etc.
- Freely available ML libraries such as Scipy, Numpy, Scikit-learn,Theano, Tensorflow etc.
- Availability of data to facilitate training and testing of ML

algorithms.

With the ease of use of AI and ML approaches, retail quantitative investing has seen a surge. Communities like Quantopian, QuantNet, QuantStart etc. are seeing increased discussions and mention of Machine learning approaches for investing.

One such example is a report published by Acadian asset. In this interesting article they demonstrate application of AI and ML in quant investing [2]. The report proposed a new ML based stock-selection signal, and compared it to a well know stock selecting signal proposed by Joseph Piotroski his 2002 paper, Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers [3].

In his paper Piotroski created a composite performance indicator called F-Score, a commonly used as a stock selection signal. This indicator was constructed using nine metrics reported in a financial statement of every public company. To normalize these variables on the same scale, Piotroski convert all of them to binary values, 1 is positive and 0 if negative. F-Score was calculate by taking sum of all these binary values. These metrics are shown in the picture below. F-Score was on a scale between 0 to 9. A value of 1 means a winner stock and 0 means a loser.

CATEGORY	CHARACTERISTIC	ASSIGNED VALUE IF POSITIVE/NEGATIVE
Profitability	RETURN ON ASSETS	1 / 0
	CASHFLOW FROM OPERATIONS	1 / 0
	Δ LEVERAGE	1 / 0
	ACCRUALS (ROA - CFO)	0 / 1

Leverage, Liquidity, Source of Funds	Δ LEVERAGE	0 / 1
	Δ CURRENT RATIO	1 / 0
	NET EQUITY ISSUANCE (PAST YEAR)	0 / 1
Operating Efficiency	Δ OPERATING PROFIT MARGIN	1 / 0
	Δ ASSET TURNOVER	1 / 0
	Composite F-Score:	Sum of binary values

Source: acadian-asset.com

In the case study Arcadian Asset chose nine characteristics proposed by Piotroski as the features for modeling. But instead of converting these features to binary values and taking summation approach, they used a popular ML approach, called Random Forest. Random forest is a tree based ensemble ML approach which can be used for classification and creating scorecards. The scorecard created by Arcadian using this approach is called ML F-Score.

When this analysis was performed on the broad universe of developed market stocks from 2013–2018, ML-based version of F-Score displays greater efficacy in predicting stocks' 1-month-ahead returns, as evidenced by a higher slope coefficient in the graph below.

Source: acadian-asset.com

I found this application of ML simplistic, yet powerful. It doesn't involve using neural networks or other advanced AI/ML approaches to demonstrate the significant contributions of these approaches in retail investing. This case study really shows that Al and ML techniques can have profound impact on making sound decision when it comes to value investing, with even simplistic methods.

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References:

1. SWALES, G.S. and YOON, Y.: Applying artificial neural networks to investment analysis. Financial Analysts Journal, 1992,48(5)

2. https://www.acadian-asset.com/viewpoints/machine-learning-in-quant-investing-revolution-or-evolution

3. Joseph R. Piotroski, Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers, January 2002.

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Artificial Intelligence