Blog 04/03/2018 10:00 am EST | **Updated** April 05, 2018

Big data and Artificial Intelligence in Finance

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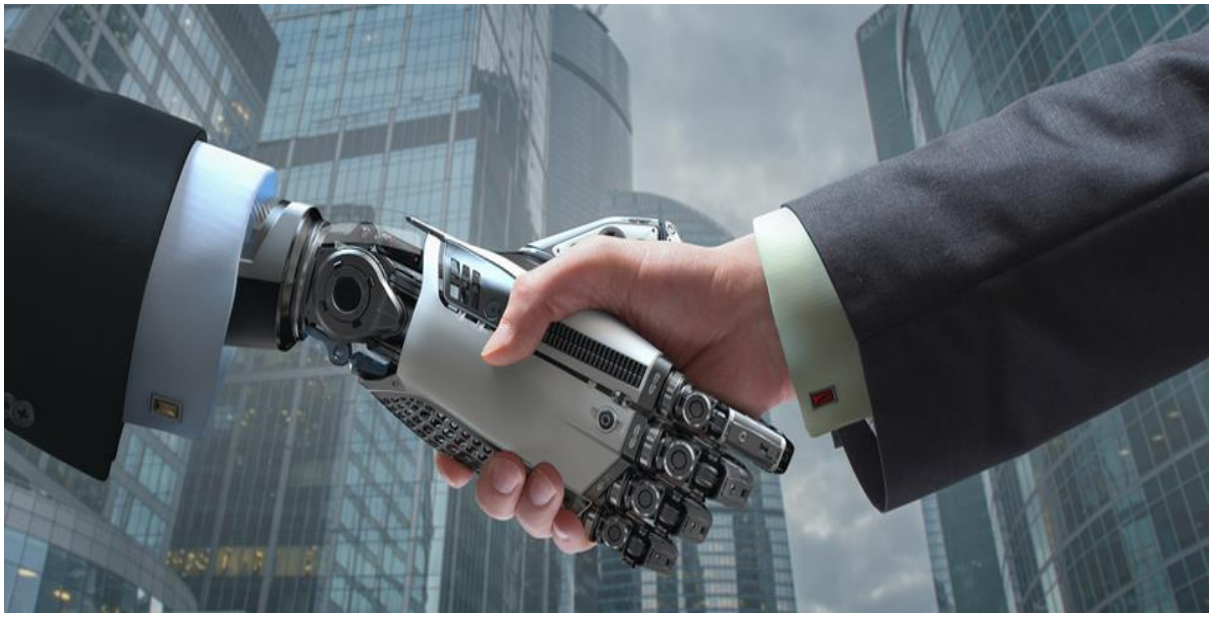


Big Data, Artificial intelligence (AI) and machine learning are being rapidly adopted for a range of applications in the financial services industry. As such, it is important to begin considering the financial stability implications of such uses. Because uses of this technology in finance are in a nascent and rapidly evolving phase, and data on usage are largely unavailable, any analysis must be necessarily preliminary, and developments in this area should be monitored closely.

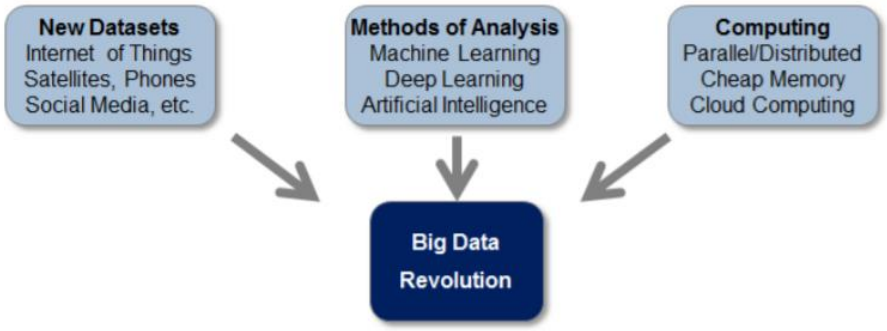
By reading this post, you'll be able understand the importance of big terminologies such as Big Data, Artificial intelligence and Machine learning in Finance industry explaining its integration in the organisation and various application usage of the same.

Let's begin..

In practice, useful data are not readily available and one needs to purchase, organize and analyse alternative datasets (**Alternative data** (in **Finance**) sets are often categorized as **big data**, which means that they may be very large and complex) to extract tradeable signals be it

any field. Analysis of large or unstructured datasets is often done with the use of Machine Learning. Successful application of Machine Learning techniques requires some theoretical knowledge and a lot of practical experience in designing quantitative strategies.

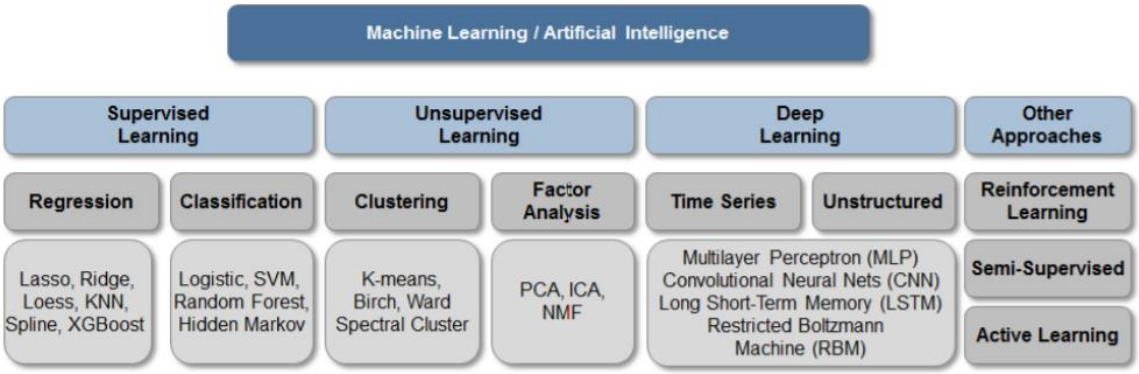
Figure 1: Factors leading to Big Data revolution



In Machine Learning, the computer is given an input (set of variables and datasets) and output that is a consequence of the input variables. The machine then finds or 'learns' a rule that links the input and output. Ultimately the success of this learning task is tested 'out of sample' – its ability to gain useful knowledge of the relationship between variables and predict outcomes in yet unseen situations.

Machine Learning techniques include Supervised Learning (regressions, classifications), Unsupervised Learning (factor analysis, clustering) as well as novel techniques of Deep and Reinforcement Learning that are often used to analyse unstructured data and show promise in identifying data patterns in structured data.

Figure 2: Classification of Machine learning techniques

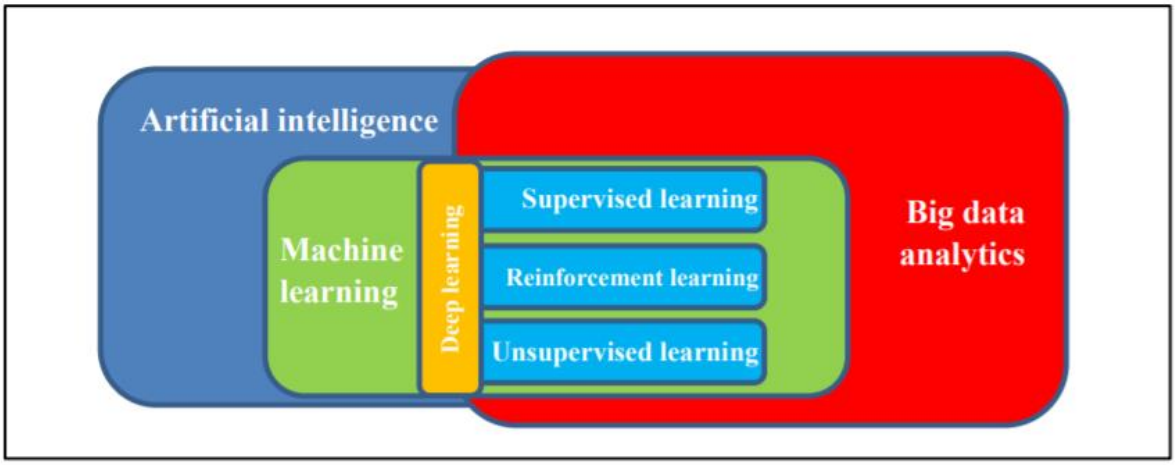


The 'Big Data ecosystem' involves specialized firms that collect, aggregate and sell new datasets, and research teams on both the buy side and sell side that evaluate data. As the Big

Data ecosystem evolves, datasets that have high Sharpe ratio signals (viable as a standalone funds) will disappear. The bulk of Big Data signals will not be viable as stand-alone strategies, but will still be very valuable in the context of a quantitative portfolio in Finance services.

On the other hand, adoption of Artificial Intelligence has been driven by both supply factors, such as technological advances and the availability of financial sector data and infrastructure, and by demand factors, such as profitability needs, competition with other firms, and the demands of financial regulation. Applications of AI and machine learning could result in new and unexpected forms of interconnectedness between financial markets and institutions, for instance based on the use by various institutions of previously unrelated data sources.

Figure 3: A schematic view of AI, Machine learning and Big data analytics



Some of the use cases in AI and Machine learning in financial services are: (i) customer-focused applications; (ii) operations-focused uses; (iii) trading and portfolio management; and (iv) regulatory compliance and supervision.

Customer-Focused applications

AI and machine learning are already being applied in the front office of financial institutions. Large-scale client data are fed into new algorithms to assess credit quality and thus to price loan contracts. Similarly, such data can help assess risks for selling and pricing insurance policies. Finally, client interactions may increasingly be carried out by AI interfaces with so-called 'chatbots,' or virtual assistance programs that interact with users in natural language.

Operations-focused applications

Financial institutions can use AI and machine learning tools for several operational (or back-office) applications. Some of these applications include: (i) capital optimisation by banks; (ii)

model risk management (back-testing and model validation); and (iii) market impact analysis (modelling of trading out of big positions). Similarly, AI and machine learning techniques are also being applied to stress testing. The increased use of stress testing following the financial crisis has posed challenges for banks as they work to analyse large amounts of data for regulatory stress tests.

Trading and portfolio management

AI and machine learning techniques are active areas of research and development for asset managers and trading firms. In addition to significant research and development (R&D), some firms now use machine learning to devise trading and investment strategies. The extent to which AI investment strategies are autonomous or incorporate human oversight varies on a case-bycase basis. In this section, we distinguish between trading execution (primarily sell-side) and portfolio management (buy-side).

Regulatory compliance and supervision

The objective of AI and machine learning applications in this use case is to enhance efficiency and effectiveness of supervision and surveillance. Besides being applied to the monitoring of behaviour and communication of traders for transparency and market conduct, machine learning together with NLP can interpret data inputs such as e-mails, spoken word, instant messaging, documents, and metadata. This in turn begs the issue of the boundaries for the employee surveillance policy. Some regulated institutions are experimenting with cases seeking to enhance their ability to comply with product suitability requirements.

Conclusion

There is always an exponential growth when AI and Big data combines. The use of AI, Big data and machine learning technology is changing the provision of some financial services. While data on the extent of adoption in various markets is quite limited, dialogue with market participants suggests that some segments of the financial system are actively employing those technologies. We have created a working demo of two financial use cases: (i) Stock market prediction and (ii) Portfolio Management. The code for the above two use cases can be found in below github link: https://github.com/neuadsteam7/adsteam7/Class_Presentation

Hope we helped you understand some of the basic usage of Big data, AI and machine learning in Financial services.