# Machine Learning in Capital Markets

## Abstract

In today's dynamic business environment the volume of data generated is rising continuously. Machine learning, a subset of artificial intelligence, can process and analyze massive data through configuration. Similar to humans, machines can also process natural language and learn from experience. Machine learning has wide-ranging applications for the capital markets segment, which is characterized by labor-intensive processes that generate low business value.

## A New Opportunity for Intelligent Services

Machine learning focuses on developing algorithms to enable computers to independently adapt behaviors and make empirical data-driven decisions. Machine learning algorithms require trained data to capture the characteristics and relations between variables. As the research on machine learning advances, the focus will shift to self-learning and automatic recognition of complex patterns. By identifying patterns within the underlying data sets, algorithms enable intelligent decision making, guided by the given rules and conditions.

Machine learning is classified into two major types—Supervised and Unsupervised learning. Supervised learning uses historical datasets to fine tune and predict outcomes, and the user has to model the system by tagging the output and guiding the system with conditions and constraints. In Unsupervised learning, the system detects the clusters from untrained data sets by inferring from classifications and boundary conditions. Additionally, a third concept called Reinforcement learning is also emerging wherein the systems' dynamic actions constantly measure the outcome and correct future behaviors.

Machine learning offers three broad solutions:

1. Robotics Process Automation (RPA) for automation at desktop and business process levels
2. Cognitive Computing for computers and systems that make decisions
3. Deep Learning for identifying patterns

## RPA in Capital Markets

RPA is one of the early stage machine learning applications to benefit business process automation. The exponential growth in computing power and its reducing cost has made RPA viable for deployment in business process services. RPA improves business efficiencies and effectiveness, while reducing manual errors by emulating and automating human actions. It is viewed as a potential replacement for the repetitive tasks performed by the operation teams. The RPA components extensively used for data extraction and preparation include optical character recognition (OCR), intelligent character recognition (ICR), document and image parsers, macros, scripts, and tools for recording and replaying. Depending on the data extracted, the logic and decision-making activities are performed using rule-based engine, BPM tools, or memory management.

RPA enables creation of three different types of bots—Task Bots, Meta Bots, and IQ Bots—depending on the complexities of the processes to be automated. Task Bots perform and enable completion of automated tasks by executing multiple steps using predefined rules and structured data. They are extensively used at the desktop level for completing the tasks that can replace any repetitive human actions performed during the processing lifecycle. Meta Bots are used mainly at the point of integration. APIs are used to perform system level automation and enable interaction with multiple systems to complete the task. Meta Bots enable orchestration of complex processes with dependent sub processes and actions to be performed or completed by multiple systems. IQ Bots are advanced RPA systems that apply machine learning, based on the trained data sets. They are self-learning systems that apply different models using both structured and unstructured datasets.

Applications of RPA include customer servicing, Know Your Customer (KYC) processes, customer profile creation, derivative documentation, regulatory and compliance filings, and automated portfolio rebalancing.

## Cognitive Computing in Capital Markets

Cognitive computing involves computer systems used for decision making by the processing computer, which is tuned to learn and think like humans. The methodology adopted is similar to the way the human mind works as it learns, contextualizes, and performs, based on past experiences and informed judgments. The underlying technology of any cognitive application involves natural language programming, which can understand the language, contextualize, and build relationships and neural networks. The system senses and predicts patterns and utilizes advanced self-learning algorithms to understand and enable complex decision making, computer vision, speech recognition, and data mining. It also offers statistical techniques to manage the data and content, and build runtime.

Cognitive computing enables organizations to build smart applications by employing dynamic learning techniques such as neural networks, which continue to train the model, based on the outcome obtained through iterations and interactions. Knowledge-intensive processes are well suited for replacement and automation using cognitive computing.

Applications of Cognitive Computing include automated fraud detection, smart forensic management, and auto reconciliation.

## Deep Learning in Capital Markets

Deep Learning is an advanced and nascent stream in machine learning and includes a collection of techniques for building multi-layered, non-linear artificial neural networks that can learn features from the input data. It can learn and recognize patterns but cannot solve problems. Deep learning algorithm is used for both supervised and unsupervised models. It is more prevalent in unsupervised learning and tasks, which can abstract or compose the information based on the layers of factors. Deep learning requires large volumes of data to learn and abstract the information; look for complex relationships, and refine the algorithms or models as they compose more data.

Deep learning can be employed in the financial markets to develop automated trading strategies using technical analyses. Deep learning models can be applied to identify patterns using different technical charts of each stock, perform predictions, and make trading decisions, based on the patterns recognized. The other potential applications of deep learning include developing credit rating mechanisms by identifying patterns of internal, external, and economic factors that affect the financial performance of companies. Similarly, deep learning techniques can also be used to provide appropriate automated investment advice to clients by utilizing multiple data from varied sources such as research reports, technical data, financial performance, news, and social media.

## Conclusion

With the widespread adoption of digital technology, one can expect the development of smarter machines and greater commercial applications of machine learning techniques. Most banks consider algorithm-driven automated solutions to mitigate operational risks, improve efficiencies, reduce labor costs, and achieve faster compliance.

Building smarter machines and improving their efficiencies requires significant human effort to develop working models, train them with large volumes of data, and continuously upgrade until the desired objectives are achieved. Increasingly, smarter machines are set to dominate the capital market industry to manage the trading and other labor-intensive, low-value business processes.

## About The Author

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