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MINI REVIEW

Top 5 Enablement Engineering Capabilities for Enterprise AI and Machine Learning in North American Banks

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Abstract

Banks in North America are going through two consecutive transformations, first is digital transformation, and second is the transformation towards AI-powered banking. However, each bank can be in different stage of the overall changes while the challenges surfaced in COVID-19 pandemic intensify the second. Applications of these AI technologies in banks or financial institutions of significant size, are referred to as Enterprise AI, which are used in providing technology solutions or solving business problems at the enterprise scale. In this short paper, the author will present five engineering enablement capabilities that accelerate enterprise AI transformation in large banks, or comparable financial institutions.

Key Words: *Enterprise artificial intelligence; Machine learning; North american banks; Financial risk modeling; Robotic process automation; Cloud computing*

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Author and Audience

The author is a banking technologist with some three decades of professional experience from West Europe to North America, and in recent years leading the first wave of transformation towards Omni-channel digital banking, customer onboarding and regulation remediation, Big Data platforms and data driven analytics and reporting, and currently building a team of data scientists and DevOps engineers for research and development of data products and technology pilots using AI, Robotic Process Automation (RPA), Machine Learning on Big Data and Cloud platforms. Target audiences are decision makers in banks who are accountable or leading the enterprise AI transformation.

1. Categorization of Enterprise AI and Machine Learning in Banks

McKinsey estimates that AI technologies could potentially deliver up to $1 trillion of additional value each year [1] in global banking. Enterprise AI for banking in North America refers to the application of Artificial Intelligence (AI) technologies and tools including applicable categories of Machine Learning (ML), for example, anomaly detection for operational risk management like credit card fraud detection, KYC automation and regulatory control, or Anti-money laundering (AML) transaction monitoring in electronic fund transfer payments, and ever demanding regulatory compliance reporting and regulatory remediation. According to latest release from International data corporation (IDC) [2], worldwide revenues from AI market are forecasted to grow 16.4% year over year in 2021 to $327.5 billion and by 2024, the market is expected to cross $553.3 billion.

Artificial Intelligence is enabling rapid innovation [3] with many potential benefits. More general forms of Machine Learning are product recommendation, like picking stocks or investment instruments in capital market or wealth management lines of businesses; more narrowly forms, like chatbots or personal assistants deployed in customer contact centers in large financial firms, who can intelligently interact with customers or simply responding to specific human commands or systemic alerts upon unusual events like large volume transactions. Latter forms of machine learning involve many Natural Language Processing (NLP) components, and technologies of speech recognition or computer vision, like primitive signal and image classification and analysis, or advanced facial or pattern rationalization, regression, and reinforcements.

Fundamental application of AI and Machine Learning, however, are in enterprise data processing and process automation, and in this case, examples are data profiling, data categorization, data quality control and issue management. Without AI and Machine Learning, data processing alone will be a huge cost and operationally inefficient and unsustainable. Many banks have deployed “soft robots”, which are RPA engines powered and optimized by trained models of Machine Learning who are capable of gaining insights and growing mathematically. More sophisticated application of AI and Machine Learning are deployed for legal data governance, such as automatic summation and semantic analysis and dissemination of legal documents and customer interactions with banking agents, be the content int the form of call centner audio, online transactions, or multimedia social media data mining.

2. Financial Risk Modeling

Banks are essentially about risks, financial risks, and for which the mathematically meticulous risk models, which are in general beyond literal interpretation of human analysts in terms of complexity of risk factors and interconnectedness thereof that manifest in profitability margins. Risk management becomes increasingly predicating on Machine Learning, and typically starting from financial product design to price engines for such products and associated services, and drafting and editing of contracts, disclosure and terms and conditions are all building around the qualification and quantification of risks. Financial Risk Modeling, however, are not merely about abstraction of knowing facts, which are complex enough. More complex and challenging are prediction analysis and simulation of future events where hundreds of risk factors are entangling with the fabrics of market fluctuation and profit projection. Forecasting is fundamentally a regression tasks in terms of Machine Learning that may be tackled using regression models such as Linear Regression model, a Regression SVM or Random Forest. After all, banks are not university or researching institutions, banks are for-profit institutions. In banks, financial risk modeling is about engineering capability, without which, neither AI or Machine Learning will have no applicability. This is the first enablement engineering capability.

3. Innovative AI and RPA Products from FinTech or RegTech Start-ups

Banking is changing. Disruptions from the technology giants or smaller financial technology product start-ups are among the most significant changing agents. Rather than continuing with the traditional model of outsourcing, AI and RPA automation complemented with banking process re-engineering and operational model re-design should be given priority. What can be outsourced can be automated. Not everything should be automated, however, customer interaction and product design should always have human touch because banks are serving customers, even institutional customers are run by humans. Workforces in banks and in customer institutions are changing as well, and currently negligible percentage of robotic entities will grow, and many predict the future of co-working environment between human works and banking robots.

Picture it; it can be the future; it can be uncomfortable. When people talk about this, some envision dependable butlers like in movies; in other movies, there are deadly Terminators, depending on who you are talking to. Regardless which camp you are in, you are facing the questions like: Will banks become technology companies who happen to do banking? No, banks are banks; banks are in the business of providing financial services that are rigorously regulated. Same regulations should not be applied to technology giants or start-ups of TechFin or FinTech; otherwise, no innovation can be expected from such technology companies. Some of the technology companies may attempt to provide financial services through credit or deposit alike product offering, and initially can even be profitable. Customer will suffer though, and to restore confidence by managing the risks hence protect the interests of customers, regulations comparable to those applied to banks will eventually be enforced, which will lead to the dwindling of profits hence such offerings are quickly withering away.

So, what is the resolution? The resolution is to build partnership with such FinTech or TechFin technology houses; currently, regulators and governments should act collaboratively to stop technology giants from pretending to be banks with legislative tools. Let banks be banks and let banks change. Partnership as reasoned is the to gain second engineering capability, which are innovative products and tools, to enable banks in enterprise AI transformation. The banks should change from the previously accustomed COTS model, which stands for Commercial Off-the-shelf products. Instead, banks should build partnership with these start-ups, and operate in a sustainable model of benefiting both partners. The engineering capability requires the third one.

4. Computing Fabric on Distributed Cloud

Cloud computing is gaining momentum across the enterprise application landscape in most banks in North America. What's lagging is the architecture and governance to enable and accelerate transformation towards AI-powered banking. Architecture styles take a decade also to mature, let alone governance and operational models, but AI and Machine Learning is crushing upon banks.

This paper is not about strategy, nor about architecture or governance. In a nutshell, Enterprise AI and Machine Learning applications works best with a Micro Core Architecture, analogous to Micro Service Architecture for services. Comparable technology or tools like Kubernetes and Docker will emerge to implement such architectures just as micro chips for distributed computing instead of monolithic Mainframe machines. The prerequisite, however, is a computing fabric, like stars, planets and all objects born and live on the fabric of time and space, and of forces and particles governed by laws of physics. Technologies do not come to the market alone and cannot evolve in isolation. The concept of AI or Machine Learning came to existence decades ago but only become practical recently because prerequisites technologies, like Cloud, only became sufficiently mature not long ago.

Computing fabric for enterprise AI and Machine Learning refers to the platform on which such applications can be cost effectively developed and deployed. The best platform available is based on Cloud technology, where multiple Cloud vendors co-exist to minimize risks for banks and complement each other from the engineering capability perspective, for instance, enablement and compatibility of new AI and RPA products and Machine Learning pipelines and supported algorithms and dependent computing capacities or models, like convolutional neural networks and recurrent neural networks.

5. Virtualized Data Federation

Data Federation and Distributed Cloud are two sides of the same coin, which are data and computing capabilities that makes enterprise AI and Machine Learning possible and practical. Enterprise Data Lake will eventually be migrating towards a federated model rather than centralized storage hence materialize the original promise of democratizing data. Virtualization is to bring the data together through metadata bridges and data virtualization tools, like Dremio and Presto and data query acceleration solutions with Alteryx and Rabacus.

New programming languages will also emerge, with extensive libraries and reusable modules, like Python, which is used not only as a programming language but scripting capabilities to automate the processes of coding, testing, deployment, orchestration, monitoring, and operation. This enablement engineering capability is solving the problems of data for Machine Learning, without which Enterprise AI cannot sustain to provide business value.

Comparable to a reporting layer for reporting tools, a analytics engineering layer should be build on top of the virtualizable data federation and distributed computing fabric. This engineering layer is for tools to plug and play, into a virtualized data platform as well as leveraging the distributed Cloud platform, for AI and Machine Learning. It can be extensive to integrate hundreds of commercial or Open-Source AI or ML products, or as thin as simply supporting R, TensorFlow, Azure ML Studio and ML Services, and recently extending to Sage Maker IDE, and to frameworks including Scikit-Learn, PyTorch and Keras.

This is the fourth enablement engineering capability.

6. New Generation of AIML Software Engineers

The fifth enablement capability refers to new generation of software engineers who are capable of AI, RPA, and Machine Learning. Nothing more to add that will help to elaborate except two points. One, these engineers do not have to be young but veteran software engineers typically do not function well as most do not have the necessary and sufficient qualification through formal education or professional training. Two, these engineers will not be able to become proficient by merely acquiring the training in AI and Machine Learning. In fact, engineers are engineers; statisticians are required and necessary but for a narrow purpose-information technology like AI and Machine Learning application development is by and large a software engineering activity. Such engineers should be capable at least in three levels: first, network or virtual machine, operating system, and data system scripting. Second, these engineers must be proficient in Machine Learning algorithms and AI or RPA coding best practices, frequently proprietary to specific tools selected, where partnership stipulated above is essential. The key capability is to learn quickly and fast to practice. Third, these engineers should not work alone, but paired up with business analysts who are keen and savvy in embracing new technology like AI and Machine Learning. Enterprise AI is a wave of transformation. When banks reach the target state, many fundamental aspects of banking will be in a new reality, where customer expectations are new as well. So are the financial regulations. So are the ethics of computing and banking powered by AI and Machine Learning, RPA, Big Data and more.

7. Conclusion

Enterprise AI accelerates business growth for large banks in North America through predictive analytics for data driven decision making and adoption of banking robotics for operational efficiency improvement. The key is machine learning, however, the trigger of critical transformation hinges on the threshold of workforce changes from human employees to robotic entities, hard or soft, or invisible ones like packaged algorithms. Are the big banks ready for the world of robotics? Probably not. But the viewpoints are shifting from digital transformation dominated by data to AI-powered banking enabled by five engineering capabilities: Financial Risk

Modeling, partnership with Innovative Product Start-ups, Computing Fabric on Distributed Cloud, Virtualized Data Federation, and most importantly, new generation of AIML Software Engineers. These capabilities can only function effectively and coherently once the new enterprise architecture and governance frameworks are implemented into new operational model, which will be the topic of future researches.

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