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8 Mill and Main Place, Suite 150 | Maynard, MA 01754
www.mercatoradvisorygroup.com | phone 1-781-419-1700 | email: info@mercatoradvisorygroup.com

NOW IS THE TIME TO DEVELOP AN AI BUSINESS PLAN BEYOND FRAUD

The white collar robot is around the corner. Machine learning tirelessly executes simple tasks better than humans.

Machine learning (ML) is a powerful analytic tool to deploy today, but it also represents the next phase of business automation and even software development. ML learns by observation and tries to perform a task and will improve its performance over time based on the positive and negative feedback it receives. ML is applied to improve analytic insights such as predictions and fraud detection for payments, but it will ultimately help automate the onboarding, provisioning, and dispute processes and change all business operations as we know them.

by Tim Sloane,
Vice President, Payments Innovation, and
Director, Emerging Technologies Advisory Service



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Introduction

Consumers use machine learning every day. Amazon, Apple, Google, and Microsoft enable us to talk to our computers with speech recognition engines based on machine learning tools. Google and Facebook use machine learning to identify, find, and sort pictures while Amazon, Facebook, LinkedIn, and Netflix utilize machine learning to surface appropriate content for customers. Every major car manufacturer uses machine learning to warn drivers of nearby obstacles, to enable voice interaction with the car, phone, and navigation system, and increasingly to park or drive the car. Machine learning has made robots practical for an ever wider range of tasks. Manufacturing floors will never look the same again; nor will office work. And this is just the tip of the iceberg.

Machine learning will have a greater impact on society than microelectronics, software, or the internet have had, and the impact will happen much faster. The emergence of smartphones, cloud computing, open source, and the recent use of machine learning to design improved ML models indicate that advancements will be delivered and adopted at unprecedented rates.

Machine learning isn't a solution looking for a problem to solve. It can solve a wide range of business problems and already is. These range from processing loan applications or customer onboarding to improving customer service and support. Machine learning tools can take over repetitive tasks and perform them with higher quality at lower cost than humans. However, despite this incredibly broad applicability, many senior managers—especially those involved in payments—only think of ML in the context of risk management and fraud detection.

Organizations' narrow focus on ML as a risk management tool is natural for two reasons. First, many organizations have teams dedicated to analytics, and a primary use case for ML is to improve analytic platforms' ability to manage large datasets and perform more refined detection of relationships and anomalies that exist between the data elements. As a result, most analytic platforms now tout AI or ML as a core capability and new ML platforms abound that have been designed specifically to manage large datasets and identify risks. A second reason for the focus on ML as a risk management tool is that financial institutions have a fiduciary responsibility to manage risk. However, it will prove to be a major mistake if, in their zeal to adopt ML as a risk management tool, senior management fails to grasp all the additional areas within their own organization where machine learning can be applied and how it can be used to better align partners and establish new products and relationships.

Within an organization, not only can machine learning perform menial tasks more effectively and efficiently than humans can manually but ML also can significantly speed up the process for customers and prospects and streamline operations. Consider typical Day Two operations in banking, which include items from the ATM, mobile devices, online deposits, back-counter images, and incoming electronic files from other financial institutions and the Fed. These clearing decisions can be automated utilizing ML to process all of the low-risk transactions in the same day if not nearly real time. Once automated, volume can be scaled easily by adding more processing power, although high-risk items will still require manual review. Stop payment and other time-sensitive special instructions can also be automated, reducing the time it takes to execute these instructions.

Another example is the application of machine learning in law firms to review laws and judicial proceedings to enable faster and more precise searches. ML can also be applied to review standard contracts and flag missing or problematic sections. This makes the legal review of repetitive contracts far easier and less time consuming.

ML solutions operate entirely on probabilities. Every decision is rated and can be flagged for human review as required. In the Day Two operations, unless an item is flagged for review, every item can be processed immediately except those items that require actions by legacy systems and networks and thus a day's delay.

ML Advancements Are Happening Fast!

It is hard to comprehend just how quickly ML is being enhanced. Consider AlphaGo, the ML platform developed by Google that learned to play the game of Go. AlphaGo beat five human Go champions in May 2017.ⁱ Just five months later, a new model called AlphaGo Zero beat the original AlphaGo and accomplished this with significantly less training (only 3 days), becoming arguably the world's best Go player in just 40 days.ⁱⁱ AlphaGo Zero didn't use any prepared training data or human interaction; rather, it learned by playing against itself. It achieved champion skill level in GO with far fewer training runs than the first platform (3.9 million games vs. the original 30 million games)

Related Concerns

If you find this piece of interest and would like to explore this issue further, possible proprietary project work could be done by Mercator Advisory Group to examine questions like these:

How should my institution or department develop a strategic plan for machine learning?

How do we select a machine learning platform?

What machine learning platforms will we ultimately need to integrate?

How will authentication systems that utilize ML be used across other channels and platforms?

How frequently do consumers today utilize natural language interfaces, and how will this drive demand for financial institutions?

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using far less processing power (4 tensor processing units (TPU) vs. 48 TPU). This is an amazing accomplishment in just 5 months.

AlphaGo Zero learned by reinforcement, which utilizes positive and negative feedback to guide the development of the neural network model over many generations of game play. This arrangement works well for many applications, but it isn't the only machine learning method. Another—generative adversarial networks (GAN)—works by pitting two ML models against each other. One application of a GAN is to create new original content (for example, a check image) that is indistinguishable from sample content (all the checks processed this year). The content can be data in any structure, including transactional data, game scenery, and images of checks or even faces. NVIDIA utilized a GAN for the latter, creating pictures of fake celebrity faces based on pictures of actual celebrities.

To accomplish this, NVIDIA designed a generative model that creates random pictures of faces based on nothing—it starts by generating random pixels. The second model is established as a discriminator. It tries to identify if the generated pictures are real celebrity faces and communicates a yes/no signal back to the generative model. Figure 1 shows two pictures that the generative model created that fooled the discriminative model into thinking it was looking at real celebrities' faces.ⁱⁱⁱ Watching these faces evolve as the adversarial networks compete with each other to create them is fascinating. The Nerdist published a GIF that reduces the 19 days required to generate these faces into a 5-second movie that can be seen [here](#).

Figure 1: Faux Celebrity Faces Generated by NVIDIA's Generative Adversarial Network



Source: NVIDIA Research website

It is not yet well understood what applications would benefit from use of the GAN. One interesting application being discussed would be to generate new and large volumes of training data when only a small sample is available. If this were possible, it would expand the problem areas to which machine learning can be applied since lack of good training data is often a central problem. To be effective, the discriminator no doubt needs to have an accurate model of what constitutes an acceptable counterfeit, so it may take some time to understand the

limitations of this approach. A GAN could be applied to recognizing Trojans and other viruses from network attacks, to test and improve fraud systems, and to build web and natural language customer interaction models.

This isn't science fiction. It is a technological fact that machine learning tools are already being used in the GAN configuration to improve the effectiveness of machine learning platforms and these upgraded platforms can be quickly deployed via the cloud. But don't worry! Before we become too concerned that machine learning overlords will take over the planet, note that these models, as brilliant as they are at playing Go, are incompetent at many other tasks. Think of them as "software savants," capable of exceeding most humans at a single task but totally inept in other areas.

What could your organization do with a software savant? Mercator Advisory Group urges large organizations to begin by applying machine learning tools to payment-related fraud mitigation. In the report [*Biometrics: A New Wrinkle Changes the Authentication Landscape*](#), we urged the implementation of behavioral biometrics to protect against account takeovers and bot attacks. Beyond that, ML tools should be applied to reducing card fraud. Discussions with a processor indicate that fraud that was accounting for 5 to 8 basis points across multiple portfolios but was reduced to less than 2 basis points after ML tools were deployed. From another discussion, we understand that a major processor reduced false positives by 75%, greatly reducing cardholder declines and inconvenience.

The second important activity is to staff the Information Technology department with machine learning experts—IT folks not limited to big data analytics, which is where most companies start. Other areas to consider include network protection, detecting insider fraud, general process automation (perhaps dispute processing), and implementing other risk mitigation strategies. For example, ML could be applied to mitigate risk associated with email bombing attacks, which use bots to sign up your organization's email addresses to thousands or even tens of thousands of email subscriptions. The reception of email verification messages from all of these subscriptions can overwhelm networks and servers, but ML tools could detect verification messages and when they exceed a threshold, remove them from the Simple Mail Transfer Protocol (SMTP) stream. As you consider areas in which ML can be applied, it is important to avoid focusing too narrowly on specific capabilities and instead consider all possible application opportunities.

Big data analytics has certainly benefited from machine learning, but the next thrust in the deployment of ML will be in the automation of business processes and software development. Traditional software teams and business managers will need the technical chops to recognize where machine learning can be leveraged to reduce costs and drive competitive advantage.

It will be critical for smaller organizations to make sure their business managers are well versed in machine learning technology so they can recognize the business opportunities and put plans in place to utilize outsourced development or prepackaged ML solutions to address these business needs.

The Role of the Business Manager in the Age of Machine Learning

Regardless of size, every business needs to establish machine learning expertise, both for implementation expertise and at a strategic level. Smaller organizations might utilize consulting services, but midsize and larger organizations should seriously consider forming an internal team.

A business manager familiar with machine learning can easily determine which tasks can be replaced or automated by ML tools. Reducing operational cost while increasing quality and reliability is the quickest and easiest application of machine learning. Human beings asked to perform rote work tend to make an increasing number of errors and over time become dissatisfied with the job. Applying ML tools to these tasks increases quality, reduces cost, and aligns scaling costs with acquiring more computer power and not headcount.

These are simply areas where machine learning can be quickly applied today. Business managers who understand ML tools will also be positioned to identify new solutions that can improve customer satisfaction and customer “stickiness.” The tools may be complex, such as natural language robots in the call center that support voice and/or text, or they can be mobile solutions that utilize existing customer data to deliver valuable new services. The Mercator Advisory Group report [*A Digital Future Compels Use of Technology to Automate Achieving Financial Goals*](#) describes a wide range of cardholder- and customer-facing solutions that can and should be deployed by financial institutions. Alphabet, Amazon, Apple, Facebook, Samsung, and others are utilizing machine learning to benefit customers. Financial institutions should follow the example of these consumer-focused companies and start utilizing ML technology to benefit the customer.

Software Development Reinvented in the Age of Machine Learning

The key takeaway from this ForeSight is that a company shouldn’t be looking for any one best use case to which to apply machine learning. Instead, look for all of the opportunities to improve your business operations with machine learning and deploy as many of these solutions as practical. To accomplish this goal you should plan now to integrate ML solutions into your payment and bank business units. Consider how ML can improve sales operations, improve customer interaction and satisfaction with natural language processing, monitor branch operations with synthetic sensors, or identify at-risk customers to reduce attrition. By implementing small ML projects that reduce costs and improve efficiency and outcomes, an organization will outperform its competitors.

One major strategy that should certainly be evaluated is deployment through the cloud. In some instances, when properly deployed through the cloud, machine learning solutions will deliver a first-mover advantage. It is certainly worth reviewing your firm’s assets to determine if such an opportunity exists for your organization or if competitors are gaining that advantage.

The first-mover advantage of machine learning solutions derives from the fact that ML learning platforms become more accurate because they continuously use feedback from examples of correct and incorrect actions to refine the model. The activities of each customer can be captured and used to help refine the machine learning model. At

some point that depends on the model's complexity, the retrained model will be sufficiently skilled that it represents the best of breed in market, which attracts more new customers, which in turn drives more training examples and an ever-improving market position. This feedback loop is what has established Google as the dominant search engine, Facebook as the dominant social media site, and Netflix as the dominant streaming media site. In each case, every customer interaction is used to improve the information the platform delivers to consumers. Google replaced traditional software with machine learning models to deliver better search results. Facebook uses it to connect more friends. ThreatMetrix uses it to identify threats across multiple websites and mobile devices.

Recognizing the growing consumer dependence on machine learning capabilities to search the internet by voice, convert voice to text, deliver driving instructions, and apply brakes to avoid accidents, combined with the opportunity to capitalize on first-mover advantage by using machine learning, it is Mercator Advisory Group's belief that institutions should begin a strategic review of these opportunities immediately. Your business with a focus on payment data should develop a vision today for how the world will look in 5 to 8 years in light of the following five factors:

- **Consumer behavior is rapidly adapting to the new environment enabled by machine learning tools**, from natural language interfaces and cloud-based assistants such as Siri and Google Assistant to more customized services and improved customer service experiences.
- **Machine learning will become a distributed function that operates easily and securely in mobile devices.** This function, which Google calls Federated Learning,^{iv} enables mobile phones to work collaboratively on a shared prediction model. All the training data is maintained on the device, not the cloud, so the device can respond locally. This new approach enables the local device to update a common prediction model stored locally with its own local data in order to make new predictions that are unique to that device and its user. The ramifications are huge. A bank can distribute to its customers a machine learning model that becomes personalized to that user's life and context without communicating data to the cloud. It will be interesting to see how many different devices and models will be enabled with this technology. Internet of things (IoT) devices and Smart Contracts are likely candidates.
- **Achieving a first-mover advantage utilizing ML requires collecting data across multiple participants to train the ML platform with the broadest possible dataset.** As more data becomes available, the ML model becomes smarter and delivers better results. This approach therefore requires a business model that incentivizes participation and data sharing. As more participants join, the model delivers enhanced performance, which establish a first-mover advantage. A new solution entering the market later simply won't be able to perform as effectively as one that has already been trained on a larger dataset.
- **The introduction of the web enabled new competitors to enter the market, and so will machine learning technology.** Apple and Google are already leveraging machine learning to entrench their position as gatekeepers to the smartphones that consumers love, but other suppliers are looking to leverage machine

learning as a mechanism to displace traditional suppliers in areas that range from ThreatMetrix for fraud management and business process automation, to software development itself.

- **Machine learning will quickly be applied to a range of problems as software has been, and ML is similarly likely to have many areas of specialty.** ML-based platforms for managing transactional fraud will be different from those used to surface identity fraud, and ML tools applied to business process automation will be much different from those applied to software development and application programming interface (API) integration. Each application of ML requires a unique implementation.

In the last few years, machine learning has progressed from an experiment in the laboratory to tools that can be managed by trained IT organizations enabled by cloud computing. It's as if software development leaped from the machine language assemblers of the early days of computing to Cobol in a year. And this progress doesn't appear to be slowing down. In fact, recent advances suggest the pace is picking up. Recent breakthroughs utilize today's tools to create the even more capable tools for tomorrow.

Planning Implementation of Machine Learning

We already described how ML can streamline Day Two operations at banks, but that may not be the most important area of enhancement for your financial institution. Perhaps your strategy is currently focused on multichannel integration, front-office operations, customer segmentation and sales, or improving customer services while lowering cost. ML will be central to enabling all of these priorities and many others, but where and when ML should be applied will be unique to your organization and decided by your management team.

Benefits will ensue when ML platforms can be integrated in a way that enables decisions to be shared and leveraged across the enterprise or even across the industry (for example, if ML tools associated with behavioral biometrics were to be shared across banks and merchants). Behavioral biometrics evaluate and identify users based on how they type on a keyboard, how they traverse and interact with a website, and even how they react to an injected error, such as a pointer suddenly moved to a new location. These tools are capable of recognizing individuals with a reasonably high degree of accuracy after just a minute or two of interaction. As a result, a user who is discovered to be utilizing synthetic identities on one website can be identified more quickly when moving to another website if both sites share the same solution provider.

Providers that can perform updates to their detection algorithms based on data collected from multiple websites will be well positioned to establish a significant first-mover advantage. The ability to deliver greater accuracy based on data collected from multiple customers enables a best-of-breed solution. This in turn helps the supplier win more customers, which establishes an ever more accurate and useful service. This first-mover advantage is not limited to security solutions but can also be associated with user solutions and even market-specific solutions. In the Mercator Advisory Group report [Bringing AI into the Enterprise: A Machine Learning Primer](#), we identify how a first-mover advantage could be gained if a supplier focused on utilizing synthetic sensors^v specific to monitoring activities in bank branches for multiple banks. It is critical that senior managers at financial institutions build teams

that understand this machine learning dynamic and consider operational areas where this dynamic can be leveraged to benefit the institution.

We also identified opportunities to benefit when ML solutions are integrated across the enterprise. Perhaps the most obvious example is once again associated with identity. If the institution utilizes ML-based behavioral biometrics to protect itself from synthetic identities and bots, then it is only logical to leverage that support across all operational areas, including account access, loan applications, and even customer support and chat solutions.

Market Segmentation and Suppliers

Eventually machine learning environments will displace software environments over an increasingly broad range of applications. Today ML solutions can only be applied to a narrow set of problems as compared to software development, but that gap will shrink over the next 5 to 10 years and is likely to shrink rapidly if current advances in ML continue apace. The challenge today is that advances are happening so fast that the market is almost impossible to segment for new solutions. Exciting new machine learning capabilities are being released as open source. As a result, some ML platforms are designed to incorporate and manage open source models, including data cleansing operations, model selection, output refinement, and production-level deployment.

Solution suppliers such as Facebook, Salesforce, Oracle, and others add machine learning to their existing solution sets or acquire relevant ML start-ups. Frequently as well, a supplier of a general ML development platform discovers a use case that drives considerable business and what was a general ML development platform supplier suddenly converts to become a solution provider of a single, specific use case.

In short, any market segmentation performed today is likely to omit some suppliers and is sure to have errors within a month or two, if not a day or two. However, this fact doesn't make the effort any less valuable to those trying to understand where to look for help, so Mercator Advisory Group is developing a separate research report for our members that will identify ML solutions providers in the following areas:

Analytics

Most big data platform suppliers have already added machine learning tools to their inventory of analytical tools, but there are also suppliers that develop analytic platforms from the ground leveraging ML assets. The latter typically have the advantage of importing new open source ML algorithms into the environment quickly. This approach keeps the platform up to date as machine learning rapidly advances.

Fraud, Risk, and Cybersecurity Platforms

Machine learning tools enable massive amounts of data to be analyzed to discover anomalies and identify clusters. Because every participant in the payments value chain has access to different data sources and data elements, suppliers have applied ML to evaluate payment transactions from every perspective, including the merchant's, the acquirer's, the network's, and the issuer's perspective. More broadly, these tools are also used to evaluate files to

detect malicious payloads and to analyze network activity to identify hacking attempts or system log files to detect penetrations or system errors. Some platforms have also been tuned to look for insider threats.

Recommendation / Prediction Engines

Prediction engines are another common usage for ML. The predictions are often applied to making recommendations that support sales and marketing by suggesting additional products to customers or products for new prospects, or perhaps to predict the next location a visitor wants to visit on the organization's website. Mercator has previously predicted that these tools will be utilized on mobile handsets to establish contextual awareness so that the handset can predict what the owner needs without having to ask for it. This capability exists today to a limited degree but will expand rapidly as ML algorithms improve with Federated Learning such that more user data can be collected and analyzed privately while more predictive models are created.

Natural Language Processing (NLP)

Natural language processing is utilized to perform a range of functions against speech and textual information, including information extraction, translation services, categorization to detect categories such as spam, to summarize the content, recognize emotional state, or answer questions (see discussion of bots below). A common usage today is to enable search functions across a corpus of knowledge, which for Google is the entire internet but for a financial institution would be internal product and support documentation.

Image / Facial Recognition

Limited space requires oversimplifying the complex field of pattern recognition in this ForeSight focused on the application of machine learning in financial services. In this context "image recognition" mimics a human's ability to recognize a specific category or item for character recognition, facial recognition, gait recognition, scene recognition, and other solutions that should prove practical for use in financial services applications.

Emotional Recognition

Machine learning tools have been trained to detect the emotional states observable in images, video, audio, gestures, text, and even ambience. These solutions typically measure emotional status in seven categories considered common—namely, anger, contempt, disgust, fear, joy, sadness, and surprise.

Robotic Process Automation

Employees are often used to perform simple observational tasks and then update a range of traditional computer systems based on what they see. The cost of writing a program to perform the same task is too high, especially if it must take into account unusual situations. Robotic process automation (RPA) is designed to address these manual tasks utilizing machine learning. The model will capture and interpret how the user interacts with existing applications and computer systems, how data is manipulated by the user, what actions are taken when by the user, and how to communicate results with other systems. It is certain that these robots will get smarter and more capable over time. Already BNY Mellon states that RPA has achieved total accuracy associated with account-closure validations implemented across five systems and achieved an 88% improvement in the time required. BNY Mellon also added a bot to implement funds transfers and thereby not only improved accuracy but also saved \$300,000 annually.^{vi}

Virtual Assistants

A virtual assistant is a software agent that can perform tasks or services for customers or employees. This capability has been expanded beyond chatbots to performance of tasks normally assigned to a human assistant such as scheduling meetings or performing search and analysis of market activity.

Software Development

Machine learning is used today to review software for common errors and perform autocomplete functions that are more predictive and accurate. Advancements occurring with robotic process automation will gradually move upmarket and to the low end of software development.

Customer Service / Website Agents

Customer self-service will be enhanced as ML tools including NLP and knowledge-based artificial intelligence are combined to enable natural language access to the library of documents and information maintained by the enterprise. Initially these tools will appear as relatively low-level virtual assistants that simply collect user information, but they will evolve into solutions that operate at a much higher level against private datasets.

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Legal

Banks and processors are buried in legal contracts. In fact it is common for a relationship to be postponed because the requirement for legal review of the contract is simply too onerous. Machine learning tools can review standard contracts during negotiations to determine whether standard terms and conditions are included and changes to specific clauses fall within a normal range. If they do not, a lawyer is asked to review the clauses in question. ML is also used to automate legal research. Identifying previous cases, relevant laws, and legal precedents are all more easily accomplished with a machine learning assistant.

Conclusions

Machine learning has already had an impact on almost every aspect of business, even if your own business doesn't recognize it. Your customers and prospects utilize machine learning multiple times a day as they interact with their mobile phones, streaming video and audio services, and an increasing number of websites. ML is now embedded in many third-party solutions, from sales and marketing platforms to analytics solutions, IT infrastructure (especially for intrusion detection), remote deposit capture software, authentication solutions, and much more.

Management may not realize that just as machine learning is changing the game for all of the third-party platforms operating across the enterprise, it is also changing the game for the enterprise as well as its competitors. Positioning a company to benefit from machine learning requires vision, planning, staffing, and investment.

Moving an enterprise forward via ML will require that all business unit managers become familiar with machine learning technology so they can evaluate its applicability to operations. Specialized teams can be assigned to a business unit manager, but that manager must still be able to comprehend how ML can deliver a first-mover advantage, why internal and external data is critical to feed the ML platform (which may require a new approach to sharing data between business units), and how multiple ML implementations across the enterprise can be integrated to deliver something even more spectacular.

Once the vision is articulated, planning can begin. The specialist teams brought together to evaluate strategies can begin to staff up and evaluate platforms for each operational area that will be targeted. The platform that is required to better authenticate the user will be different from the platform that gathers data to make improved recommendations. Alternative data is likely to be required to feed the ML platform.

Machine learning is a new and fast-changing discipline that requires new staff and new platforms, combined with big data, which will certainly require new investments, but the payoff can be large. Operations are more easily automated with ML, which lowers cost, increases accuracy, and enables a level of instrumentation and measurement that was impossible before. A well-constructed ML strategy can deliver a first-mover advantage that opens up new markets, perhaps as a supplier to other financial institutions or by delivering new and compelling services to corporate users, merchants, or consumers. It is critical that financial services executives consider these opportunities first, as this type of first-mover advantage doesn't come often.

Endnotes

- ⁱ <https://techcrunch.com/2017/05/26/googles-alphago-ai-defeats-team-of-five-leading-go-players/>, accessed 11/2/2017
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For more information about this report, please contact:

Tim Sloane, VP, Payments Innovation, and Director, Emerging Technologies Advisory Service
tsloane@mercatoradvisorygroup.com
1-781-419-1712

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