CDW PEOPLE WHO GET IT®

SMART DATA FOR FINANCE

Artificial intelligence helps financial firms transform data into insights.

EXECUTIVE SUMMARY

Financial institutions are no strangers to analytics. In fact, many data-driven analytical techniques were born in the backrooms of banks, insurance companies, credit agencies and other financial institutions that depend on data for their livelihoods. These institutions now have the opportunity to raise their efforts to the next level through the use of cutting-edge artificial intelligence technology. AI enhances existing analytics by adding new capabilities and allowing organizations to leverage analytics for real-time decision-making.

AI supports several important use cases for financial institutions, including fraud detection, market analysis, customer analysis and regulatory compliance. Firms that wish to use these capabilities effectively must transfer their unstructured data into a usable form and then leverage AI to unlock the knowledge buried within that data. Such efforts are possible only when they are built on a solid foundation of technology that includes adequate computing resources, storage that is capable of maintaining Big Data stores, analytical software that leverages AI and a robust network capable of tying these components together effectively and efficiently.

How Big Data Becomes Smart Data for Financial Institutions

Financial institutions are awash in data. From credit card transactions to payroll deposits, insurance claims to property records, the data warehouses of banks, insurance companies and other financial institutions are filled with petabytes of information that can provide business value. The challenge for financial institutions is taking the Big Data that they already have and transforming it into smart data that actually delivers business value.

The Big Data already stored in financial data warehouses shares three characteristics, often referred to as the "Three V's of Big Data." These are:

- **Volume:** The sheer quantity of data poses significant challenges to financial institutions. Recent advances in storage technology make it possible to affordably maintain large quantities of information that would have been cost-prohibitive in the past.
- **Velocity:** Data arrives at a dizzying pace. As just one example, more than 150,000 credit card transactions take place each *minute* in the United States. Big Data solutions must be able to rapidly ingest this data and store it for future analysis.
- **Variety:** While many financial records come in highly structured formats, most data that exists today is unstructured and comes as free-form text, images, audio and video. Big Data solutions that focus only on structured data may miss out on major opportunities.

Cutting-edge financial institutions are in the midst of a transition. While the past decade was about moving from traditional in-person financial services to a "digital first" strategy, the next decade will be "AI first." Financial institutions that spend time now building out their analytics capabilities will find themselves positioned as leaders in this new operating environment.

The Evolution of Data Analysis for Finance: From Big Data to Smart Data

Financial institutions have long embraced the power of computing to find needles of insight in haystacks of financial records. Credit reporting agencies pioneered the routine use of modeling by summarizing consumer credit histories with a single credit score. Credit card processors routinely comb through customer transactions in search of fraudulent activity. Insurance companies carefully scrutinize risk information, claims histories and financial records to accurately price products. These applications of analytics are nothing new. For decades, financial institutions depended on high-performance computing to crunch the data, often in the wee hours of night, so they could deliver business insight with the morning's first cup of coffee.

The overnight reporting model worked well for many years, but it simply isn't up to the challenge of competing in the modern business environment. Financial institutions need faster access to data to guide real-time decision-making. Loan officers can't make decisions based on yesterday's data, and they can't wait until tomorrow for the data to update.

Data input is equally challenging. Analytics systems must also be able to handle the crushing volume and velocity of modern financial data. Systems that lack the capacity to store and analyze this granular data simply won't rise to the bar set by competitors. Financial institutions now demand the ability to run many applications in parallel on the same stream of data, reacting in milliseconds to jump on opportunities before a competitor moves first.

Artificial intelligence solutions provide the technology platform that allows financial institutions to rise to this challenge. Designed to operate in Big Data environments, AI provides decision-making models that rapidly evolve in reaction to the changing financial environment. These models harness the power of Big Data by leveraging algorithms that quickly sweep through

Avoid Overfitting with Training and Evaluation Data Sets

As financial institutions come to depend on models generated by artificial intelligence algorithms, it's important that they also understand the limitations of AI. One of the most common issues with AI algorithms is that they tend to "overfit" the data when improperly configured. This simply means that the algorithm learns to recognize the specific characteristics of the data set, rather than making general observations that can be extrapolated to cover other situations.

For example, consider an algorithm that analyzes thousands of data points about customer visits to banks. In that data set, one man may enter the bank wearing a cartoon character tie and then proceed to open a multimillion-dollar investment account. The algorithm may then determine that 100 percent of customers wearing cartoon ties are multimillionaires. That's clearly an erroneous conclusion.

Data scientists avoid overfitting problems by separating their data into training and evaluation data sets. The training data is used to create the model; then, the evaluation data is used to test the model's performance, reducing the likelihood of overfitting. Using the same data to train and evaluate a model is one of the most common errors in artificial intelligence and may lead to an inaccurate model.

the massive amounts of information that are part of each record and pinpoint the data features that are most relevant to the decision-making process. AI focuses on teasing the story out of the data and making decisions informed by the data alone.

Institutions that leverage AI find themselves able to automate decision-making in unprecedented ways. AI technology that enters an organization as a tool designed to inform traditional human decision-making processes often moves into a new capacity when leaders witness its success. Instead of informing human decision-making, AI becomes the agent of digital transformation, allowing automation to overtake those processes and make them both faster and more powerful. Financial institutions that embrace this automation improve their reaction time, reduce their margins and increase their profitability.

The percentage of financial institutions that either use AI or will consider using it within the next 18 months[1]

Financial Use Cases for AI

Financial institutions use artificial intelligence in a variety of ways, ranging from traditional analytics targets to innovative applications of AI technology. Financial institutions seeking to improve their analytics capability often begin by conducting a data inventory and then aligning that inventory with business requirements to identify opportunities where analytics can make a powerful difference for the business. Common use cases for AI in the financial sector include fraud detection, portfolio management, sentiment analysis, product recommendations, customer service and compliance.

Fraud detection: The real-time analytics capabilities of artificial intelligence help financial firms improve fraud detection technology by increasing its predictive accuracy and, therefore, reducing the number of false-positive alerts generated by fraud detection systems. These false positives annoy customers, who may suddenly find their credit card cut off, and consume costly time from financial institution staff members who investigate alerts and handle contact with irritated customers.

AI improves fraud detection by allowing institutions to bring massive quantities of data to bear on the problem and mining that data for the nuggets of knowledge that can confirm or refute suspicions of fraud. For example, a bank might observe that a customer is suddenly making purchases in Thailand, having never before left the United States. Traditional fraud detection techniques might immediately trigger a location-based fraud alert that would cut off the customer's card during a critical period of international travel. AI-based fraud detection, on the other hand, might notice several events that are related, but separated in time:

- Four months ago, the customer purchased an airline ticket to Thailand.
- She checked into a Bangkok hotel yesterday.
- She accessed the bank's smartphone app using two-factor authentication from Thailand this afternoon.

Using this information, the fraud detection algorithm may note the unusual activity, but automatically evaluate it as not likely to be fraudulent because the big picture of that customer's activity indicates that she is traveling in Thailand.

This same technology can also be used to detect fraudulent activity that might otherwise go unnoticed. For example, if that same customer's credit card is used at a restaurant in Virginia while she is staying in a Bangkok hotel, that may trigger a fraud alert, even if the Virginia restaurant activity would not be unusual if the customer were at home.

Portfolio management: Artificial intelligence is also making inroads in the field of portfolio management. The past three years have seen the growth of AI-powered "robo-advisers" that move customer funds in and out of index funds and other investments based on the customer's investment objectives, risk tolerance and market performance. The services provided by these automated investment advisers recently expanded to include dividend reinvestment, portfolio rebalancing and tax-loss harvesting capabilities. Expect to see further growth in this area as institutions continue to invest in AI and introduce automated advising services capable of making more sophisticated investment choices.

Sentiment analysis: Financial institutions, like any other organization, want the ability to monitor consumer sentiment and gauge how customers react to news reports, social media coverage and other trends. Sentiment analysis techniques allow firms to monitor traditional media, social media, product reviews and other online sources and analyze whether coverage is favorable or unfavorable. Real-time updates allow the institution's social media team to rapidly respond to online activity and, when appropriate, intervene before a small issue grows into a crisis.

Product recommendations: AI solutions power product recommendations across a wide variety of industries, ranging from the "You May Also Be Interested In ..." section on Amazon to the "People Like You Watched ..." recommendations on Netflix. The technology powering these recommendations can also be brought to bear on financial products, by recommending credit cards, investment opportunities, insurance plans and other products to the consumers most likely to purchase them.

Customer service: AI is also finding applications in the customer service space. AI-powered solutions often answer the telephone in many call centers, handling customer interactions without requiring the intervention of a human specialist. Voice recognition and sentiment detection technologies leverage AI to evaluate the performance of human representatives when they do get on the phone. These AI solutions can detect frustration, anger and other emotions in a customer's voice and recommend appropriate interventions.

Compliance: Financial institutions face a wide range of compliance obligations that limit the commitments, assertions and information that representatives may offer. AI-powered

Source: [1]The Financial Brand, "Competitive Survival in Banking Hinges on Artificial Intelligence," October 2017

solutions can analyze the content of outbound email messages, interpret voice conversations, read text messages and evaluate other communications to identify potential compliance issues before they reach customers.

How AI Works for Financial Institutions

The benefits of applying artificial intelligence in financial institutions are clear: Firms may gain valuable insight into customer sentiment, improve product offerings and increase profitability. Often, what's not clear is how to actually apply artificial intelligence to the real-world problems a company is facing. Doing so requires a two-pronged approach that combines strong data-driven processes with a foundation of technology that supports artificial intelligence.

The Process for AI-Based Data Analysis

Financial institutions at the start of their AI journey should begin by focusing on the data available to them. Institutions should collect as much data as possible, from as many sources as they can. Recent advances in storage technology now make it feasible to inexpensively store massive quantities of information about individual customers and transactions. Institutions that are just beginning their efforts should inventory the data available from their websites, mobile applications and devices, existing transactional systems, marketing databases and other sources. If this inventory identifies data gaps that could hinder analytics efforts, firms may consider adding instrumentation to existing systems that captures the desired data, or purchasing data from data brokers that augments internal sources. All of the information identified during this inventory should be pooled in an enterprise data lake where it can be preserved and curated.

After developing their data inventory, financial institutions should next focus on transforming the data into a usable form. Almost every data source requires some degree of data wrangling, but this need is especially acute for unstructured data, such as social media interactions. As data is generated by an organization, it must be transformed into a useful format in order for an AI solution to analyze it and discover actionable insights.

Once institutions have performed the heavy lifting of data wrangling, they may then begin to apply AI algorithms to mine data for insight. This is a process of trial and error that requires the application of both data science skills and subject matter expertise. Institutions that recognize the interdisciplinary nature of this work have the greatest success with their artificial intelligence investments because they build data science teams that combine expertise in analytical techniques with a strong working knowledge of the field.

The Technology to Support AI

In addition to requiring strong processes, artificial intelligence efforts require a solid foundation of technology, including robust storage, networking and processing resources. Companies may develop these capabilities on-premises, or they may turn to the cloud for on-demand access to resources.

Storage: Financial institutions building out analytics efforts require significant investments in storage resources to maintain the data warehouses that power analytics. Supporting real-time analytics requires the use of high-performance storage that is capable of both storing massive amounts of information and delivering it quickly for analysis. Organizations designing storage for analytics should focus on creating solutions that provide high throughput and support a large number of input/output operations per second. Flash storage arrays are uniquely well-suited to analytics requirements and are increasingly the solution of choice for data science applications.

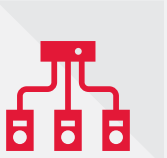
Networking: High-performance storage is useful only if analytics applications have a high-performance network connecting them to that storage. A strong network is the backbone of an analytics infrastructure and provides a conduit for the rapid transfer of data between storage and processing resources. Most analytics applications function on a 100-gigabit-per-second network platform that facilitates this high-speed

Artificial Intelligence vs. Machine Learning vs. Deep Learning

People often use the terms *artificial intelligence*, *machine learning* and *deep learning* interchangeably, but these actually refer to different (though related) concepts.

Artificial intelligence is the most general of the three terms, referring to any technique that attempts to use a computer to perform work that normally requires human intelligence. The AI field is well established and includes academic research dating back to the 1950s.

Machine learning is a subset of artificial intelligence techniques that includes algorithms that are capable of revising themselves in the face of new information. That is, the algorithm "learns" as it encounters new information and becomes better at its task as it works. As a subset of artificial intelligence, all machine learning algorithms are AI algorithms, but there are AI techniques that do not fit under the umbrella of machine learning.



Deep learning is a subset of machine learning. Deep learning consists of the use of complex artificial neural networks to develop analytics models. Deep learning techniques are especially useful for image processing, natural language processing and speech recognition tasks.

transmission of data. Slower networks may impede the ability to store and retrieve information quickly enough to conduct real-time analysis. Consider, for example, a product recommendation engine: If network congestion adds even a fraction of a second to the time required to build a web page, the site may lose the customer's attention and completely miss the opportunity to cross-sell products and services.

Processing: Processing power is the core infrastructure resource supporting AI applications. Modern analytics algorithms are mathematically intensive and require significant computing resources to train, evaluate and deploy models in support of business requirements. In most cases, analytics applications leverage the specialized capabilities of graphic processing units that are capable of performing the complex statistical operations required by analytics algorithms at a much faster pace than the traditional central processing unit. GPUs allow the parallel processing of deep learning's neural networks and other machine learning approaches, speeding up the operation of these algorithms through the use of distributed computing. Neural networks operate several times faster on GPUs, compared with running the same algorithms on CPUs.

Cloud and hybrid approaches: While many organizations are moving significant portions of their IT infrastructure to the cloud, the decision to move artificial intelligence applications requires nuanced analysis. Each company's situation is unique, and the benefits of adopting cloud-based analytics vary depending on a firm's specific workloads and on-premises resources. In cases where GPUs are used almost continuously, it probably makes more sense financially to keep those resources in on-premises data centers. On the other hand, workloads that place demands on servers only periodically may be better off with a cloud provider that offers computing resources on a part-time basis. Cloud providers allow customers to quickly and easily scale up operations, and then scale down when resources are no longer needed.

12,000

The number of loan agreements processed annually by AI systems at JPMorgan Chase[2]

For example, a bank may use machine learning algorithms to assign customers to different marketing segments based on their existing relationships with the bank, their available financial resources and their credit card spending patterns. Once a customer is assigned to a market segment, the bank would not expect the customer to change segments frequently. While the customer may gravitate toward a different segment over time, there is no need for real-time analytics in this scenario. The bank can run a weekly batch job that verifies the segment assignments of existing customers and assigns new customers to appropriate segments. Such a job would run once a week and would be ideal for cloud deployment because the bank can rent the servers required to perform the segment analysis on an hourly basis instead of leaving servers sitting idle in an on-premises data center for the rest of the week.

In many cases, an organization's analytics efforts don't fit neatly into cloud or on-premises buckets. Often, the best solution is to run some workloads on-premises while shifting other workloads to the cloud. This hybrid approach to IT provides the flexibility needed to deal with a variety of shifting workloads in a manner that optimizes performance and cost effectiveness.

Artificial Intelligence Professional and Consulting Services

Many financial institutions simply don't have the size or scale to employ full-time data scientists. Fortunately, third-party vendors, including CDW, offer an array of professional and consulting services to assist organizations that seek to build out their analytics capabilities without making costly investments in full-time staff.

Consulting service arrangements provide strategic guidance to financial institutions seeking to get their analytics efforts off the ground. Consultants can assist organizations in identifying analytics opportunities, developing data sources and prioritizing analytics work. Consulting teams bring a wealth of experience to the table from engagements with other firms in similar situations.

Once an organization outlines its analytics plans, a professional services engagement can provide some of the staffing resources required to get started. Professional services teams can design and implement data warehouses, develop and train data models, and perform other work that would typically be done by an internal business intelligence team.

Large organizations may have their own dedicated data science teams, but those teams often lack the resources required to complete all of the analytics work on their plates. Such institutions may turn to vendors to augment their in-house teams with professional and consulting services.

Source: [2]*Financial Times*, "AI big help for business negotiating red tape, survey finds," Sept. 10, 2017

CDW: A Finance Partner That Gets IT

CDW solution providers serve as comprehensive partners to help financial institutions select, deploy and manage artificial intelligence solutions. We regularly work with firms of all sizes to identify opportunities for AI deployments, design technology solutions that capitalize on these opportunities, train and test models, and deploy decision-making capabilities.

CDW account managers and engineers assist customers at every phase as they select and implement the AI technology they need. Our technology professionals take a comprehensive approach to identifying and meeting the needs of every customer. Each engagement includes five phases designed to help clients achieve their objectives in an efficient, effective manner. These phases include:

- An initial discovery session to understand goals, requirements and budget
- An assessment review of the existing environment and definition of project requirements
- Detailed vendor evaluations, recommendations, future environment design and proof of concept
- Procurement, configuration and deployment of the final solution
- 24/7 telephone support and ongoing product lifecycle support

To learn more about how CDW's AI solutions can deliver business value to your financial institution, contact a CDW account manager, call 800.800.4239 or visit **CDW.com/finance**.

The CDW Approach

ASSESS
Evaluate business objectives, technology environments and processes; identify opportunities for performance improvements and cost savings.

DESIGN
Recommend relevant technologies and services, document technical architecture, deployment plans, "measures of success," budgets and timelines.

DEPLOY
Assist with product fulfillment, configuration, broad-scale implementation, integration and training.

MANAGE
Proactively monitor systems to ensure technology is running as intended and provide support when and how you need it.

→ ***Learn more about how CDW solutions and services can help your financial institution make the most of its IT investments.***

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