AYASDI Machine intelligence for financial services
Big data: your opportunity and challenge

As artificial intelligence operating on big data becomes a reality, financial services firms will radically transform. A new generation of computing systems will augment your human capital with machine intelligence, driving speed, efficiency and precision into your business that has never before been possible. You will leverage your vast data assets to deploy whole new classes of intelligent, predictive applications that allow you to transform your relationships with your clients, capitalize on rapidly evolving market conditions, mitigate risk, block fraud and collaborate with regulators far more effectively than you ever thought possible before. This is not a small step – banks are already leveraging machine intelligence to be hundreds to thousands of times more effective.

Machine intelligence is fundamentally about tapping into the latent insights in the massive volumes of unique data that you already have to better inform and empower your enterprise. It automates and accelerates the process of discovering critical patterns and insights from your big and complex data. It leverages commodity high-performance computing to generate mathematical models that you can deploy to drive a whole new generation of intelligent processes and applications across your enterprise.

With machine intelligence, small teams of analysts and business people can solve major analytical and operational challenges in days. Because machine intelligence is literally thousands of times more efficient than manual analytic processes, your organization can get much more done, with far fewer resources. Think of businesses like Google, Facebook or Amazon – like them you can scale with compute instead of by adding people.

The ultimate goal is to become an automated, data and compute-driven enterprise – machine intelligence is helping financial services firms become radically more efficient by leveraging raw computing power and predictive algorithms tapping your own unique data to drive your business.

The future of analytics

Analytics used to be based on the direct interaction between business analysts and data stored in your enterprise applications or data warehouses, typically using graphical query tools, spreadsheets or dashboards.

Big data has broken this model, requiring your business people to engage with expensive and scarce programmers and data scientists who interrogate your data lakes and Hadoop repositories using statistical computing, machine learning and data mining. While these technologies do successfully act on big data, they force iterative approaches to analytics that are time-consuming, expensive, and heavily reliant on manual programming by specialized experts.

The result is a slow, manual and inefficient process that might or might not eventually get your teams to the correct answer – but it moves far too slowly and is far too costly to transform your business.

“Citi’s unmatched multinational business footprint creates a complex data analytics landscape. Ayasdi’s big data technology simplifies and accelerates the analysis of thousands of discrete variables and delivers insights that enable Citi to tailor services to specific client needs, operate more efficiently, and mitigate risk.”

Deborah Hopkins, Chief Innovation Officer
Here is a real-world example. For many large banks, it takes hundreds of quants the bulk of the year to complete the modeling needed for stress testing. There is little time left over for interaction with business people, and at the end of the process, the models are thrown over the wall to regulators. With machine intelligence, model development for stress testing can be finished in hours. It becomes possible to create and update models on demand, and enables collaboration between quants, the business and regulators.

And manual analytic processes also cause a serious business scaling problem. The more problems you need to solve, the more analysts and data scientists you need to hire, which costs even more money and takes even more time. In the 21st century, the clear need is to use intelligent software coupled with inexpensive high performance computing, not huge teams of expensive and scarce experts, to scale your business.

The need is for machine intelligence – an entirely new class of analytics in which high performance computers directly interrogate your big and complex data using a wide range of algorithms – and then automatically surface trends, anomalies and insights that your business analysts and decision makers can investigate, and you can deploy in operational and production systems.

Machine intelligence lets your data tell its story in a stastically provable fashion, so your analysts and executives can make rapid, informed decisions. What’s more, machine intelligence is not just about insights – it also automatically generates mathematical models, which you can operationalize to deploy fully automated and intelligent business processes.

In multiple global deployments, machine intelligence has been proven to be as much as 1,000 times more efficient and effective than manual approaches to big data analytics using machine learning and statistical tools.

Figure 1: Machine intelligence is about automation, leading to intelligent operational systems
The Ayasdi machine intelligence platform

Ayasdi is an enterprise scale machine intelligence platform that provides a new approach to gaining competitive advantage from your big and complex data, without requiring large teams of data scientists to write queries or code algorithms. It supports large numbers of business analysts, data scientists, end-users, developers and operational systems across your organization, simultaneously creating, validating, using and deploying sophisticated analyses and mathematical models.

Ayasdi layers on top of information already resident in your business applications, data warehouses, data lakes or other big data infrastructure and automatically applies many algorithms to your data, dramatically speeding the discovery and model development process.

Ayasdi uniquely features a breakthrough mathematical framework called topological data analysis that layers on top of machine learning, statistical and geometric algorithms to extract critical intelligence from your data that was previously hidden or overlooked by conventional analytical approaches.

Ayasdi Workbench is a graphical modeling environment that creates a compressed visual summary of all of your data so your analysts can rapidly uncover the relationships, clusters, progressions, anomalies, and cycles in your data, and explain the underlying reasons for these patterns.

Ayasdi automatically creates and validates mathematical models based on your data, and allows these models to be deployed into your production systems. Your developers can leverage scalable APIs, web services and robust scripting capabilities to deploy intelligent applications at enterprise scale.

The Ayasdi machine intelligence platform can be deployed in public or private cloud infrastructures, and leverages inexpensive, scalable Intel-based computing platforms and Hadoop infrastructure.

And finally, Ayasdi is a software company. We focus on creating an amazing machine intelligence platform and we train your people to become self-sufficient and productive – so you can scale to get maximum ROI and transform your business.
Machine intelligence excels at big, complex and wide data

The idea of big data is relatively self-explanatory – most people think of huge volumes of data with billions of rows. But banks also have wide and highly dimensional data – think of data with tens or hundreds of thousands of columns. In your large data sets, the rows typically represent a single event, and the columns represent the dependent and independent variables related to that event.

Machine intelligence is particularly effective at surfacing which variables really matter in wide, highly dimensional data. Today your data scientists will often have to use intuition to choose which variables are most appropriate to use in their analyses. The wider your data, the less the likelihood that they will be lucky and choose the right ones. Imagine the power of a system that can automatically calculate which of 10,000 internal and external variables really matters to hundreds of different types of risk.

This is a big part of why Ayasdi is helping quants at global banks to become 1,000x more effective – with machine intelligence they can spend their time actually adding value to the business instead of the drudgery of manually selecting variables and programming and reprogramming models.

Avoid accidental bias

A major challenge with big data is that your business people and data scientists cannot directly interpret it – it’s simply too large and complex. Instead they will manually choose which variables to investigate and which adjustments and algorithms to apply. This can introduce accidental bias – it’s just too easy to adjust results to match preconceived notions. Ayasdi machine intelligence eliminates bias because it automatically interrogates your entire data set, and it automatically chooses which algorithms to use based on statistical best fit. It has no preconceived notions; it simply lets your data tell its story.

Agile deployment at scale with a center of excellence

Our clients are attacking their biggest analytical challenges with teams of just 2-4 people, solving real-world problems in days. It could not be more different than the traditional manual method of throwing hundreds of people at year-long problems. Since Ayasdi is a multi-user enterprise platform, many teams of analysts and business people can simultaneously generate a large number of analytical solutions in industrialized workflows.

Our clients quickly find they can apply machine intelligence to solve hundreds of analytic challenges throughout their business; many are implementing internal centers of excellence with a charter of propagating machine intelligence across their enterprise.

“Credit Suisse intends to lead our industry in understanding complex datasets. We evaluate employing the world’s most advanced analytic technologies, to gain the greatest possible advantage for our clients. At today’s accelerated pace of business, rapidly uncovering subtle signals across our massive data sources, would help us to deliver superior results for our clients.”

Marco Abele
Head of Digital Private Banking
Widely applicable across a broad range of business challenges

Leaders in the financial services sector are using Ayasdi machine intelligence to tackle some of their toughest big data problems – from revenue-related challenges like client micro-segmentation and product recommendations, to market regime forecasting, risk analysis and mitigation, anti-money laundering, fraud detection and stress testing. Our clients quickly find hundreds of applications across the business.

![Customer Insight and Risk Insight Diagram](image)

**Figure 3: How financial services firms are deploying Ayasdi machine intelligence**

**REVOLUTIONIZED CUSTOMER SEGMENTATION**

Financial institutions are always seeking to gain more and more profitable clients and to provide better service to existing clients. There is a tremendous opportunity to develop a deeper understanding of what your clients really value by correlating and analyzing the massive amounts of client, product, and market-related data that you already possess, and to enrich your internal data with third party data plus newer data sources like social media, sensor and Internet of Things information.

Conventional approaches to analytics that rely on business intuition and armies of analysts cannot keep pace with evolving client behavior, products, market conditions, regulations and the growing complexity and volume of your data. While these approaches can surface the macro-trends in client preferences, they are fundamentally static and they fail to uncover the subtler relationships that exist between your clients and your products. And they are not designed to build and execute mathematical models that you can use to deploy automated systems that will completely transform your customer acquisition and product offering capabilities.

Machine intelligence represents an innovative, new approach to helping financial institutions create behavior-based client profiles to meet these goals. It rapidly correlates and analyzes client, product, and market-related data, and can also use external information from third party providers as well as social media and other behavioral information. It uncovers subtle, precise client sub-segments from your big and highly complex data. The underlying attributes that describe each segment inform the development
of precise client profiles as well as predictive models that can be dynamically updated and deployed into operational systems.

Using Ayasdi’s platform, you can rapidly create models that help precisely segment your clients and predict the likelihood of their transacting in specific products. You can also create models that inform the composition of optimal portfolios based on specific market conditions. You can develop models that accurately predict asset churn to devise targeted retention strategies. Ayasdi also empowers your relationship managers with data-driven insights that help them personalize product recommendations to their clients, thereby driving higher-value relationships and revenue. Ultimately, Ayasdi drives fully automated systems that make intelligent, informed decisions about which prospective customers to target, what products and services to offer them, and how to build lasting, profitable relationships.

**DEEPER RISK INSIGHTS**

Accurately assessing your risk exposure requires a deep understanding of the complex and dynamic interplay of a large number of market and macroeconomic variables as well as the ability to continuously update models as conditions change.

Ayasdi’s machine intelligence platform is uniquely suited to accelerate the delivery of more accurate and defensible risk models. The key to defining effective risk models involves identifying and incorporating the right combinations of variables that can serve as indicators of risk.

Ayasdi rapidly identifies combinations of factors that impact your revenue streams. By incorporating the appropriate variables, you can create more accurate operational risk models. You can also create many more models. Our highly automated, highly scalable platform is literally hundreds of times more
productive than using traditional statistical or machine learning tools and languages for creating and validating risk models.

For example, following the 2008-09 financial collapse, major institutions are required as part of the Comprehensive Capital Analysis and Review (CCAR) and Basel III processes to demonstrate to regulators that they have adequate capital in reserve to withstand stressed economic and financial conditions. These tests put your internal teams under immense pressure to create models that can accurately forecast revenues and reserves required to absorb losses, for all lines of your business.

Using conventional approaches such as statistical modeling tools, machine learning technologies and spreadsheets to identify the key variables that impact your revenue streams is a time-consuming, and manually intensive process. Worse, this often turns into a “black box” approach, leaving your business unit leads with little room or time to weigh in on the logic behind the choice of variables selected for inclusion in the models – before you run out of time in the annual stress testing cycle. The risk is that your teams cannot confidently defend the models that you are presenting to regulators.

Ayasdi’s machine intelligence platform helps streamline your capital planning and stress testing processes. Our platform is adept at correlating and analyzing thousands of market and macroeconomic variables to help you understand their impact on your revenue performance.

Ayasdi provides your business leaders with the ability to screen the identified variables prior to their inclusion in models that represent their business. Our software also automatically conducts exhaustive statistical tests (including stationarity and multicollinearity tests) to validate the models’ ability to predict revenues for your business.
Ayasdi automatically winnows down trillions of possible models to a small set of statistically valid models that best represent your business. This automated approach to identifying, validating, and selecting the variables and models ensures that business logic is built into the process, and that you end up with accurate and defensible models that will stand up to regulatory scrutiny. As an added benefit, the entire process is transparent and self-documenting – eliminating manual model documentation with traditional tools.

![Image of variable selection interface](image)

**Figure 6: Your developers can build intelligent applications that make it easy for your business people to leverage advanced analytics and big data**

**DEEPER MARKET AND INVESTMENT INSIGHTS**

Price trends for publicly traded securities, as well as their relationship to macroeconomic indicators, often demonstrate stability over selected periods of time. However, these trends and relationships, referred to as regimes, can also shift quickly to form new patterns as the market enters new phases. Investors with a deep understanding of the characteristics of each regime, as well as the ability to recognize early indicators of the onset of new ones, can capitalize on the accompanying opportunities.

A precise understanding of market regimes aids the creation of better asset allocation strategies and more accurate liquidity forecasts. However, gaining this understanding requires the ability to analyze highly complex market and economic data to uncover and capture the key characteristics of each regime. Conventional statistical tools and machine learning techniques limit analyses to small sets of explanatory variables, and require your analysts to hypothesize relevant partitions and analytical forms prior to analysis. As a result, uncovering regimes, their explanatory variables, and the implications for the future can be difficult and time-consuming.
Ayasdi's machine intelligence platform uncovers subtle, valid combinations of features that characterize different market regimes. It then rapidly pinpoints similarities to past regimes so your portfolio managers can more accurately assess the performance of various asset classes. Ayasdi can also surface the complex relationships between market regimes and liquidity proxies to aid your teams in the creation of more precise liquidity forecasting models.

As opposed to making global assumptions regarding all of the underlying data, Ayasdi effectively constructs an ensemble of models, each representing different market regimes and responsible for a different segment of your data. An ensemble of asset allocation or liquidity forecasting models is likely to be much more accurate than your current monolithic models as each is optimized for different segments of your data, thus reducing the possibility of systematic errors in the model output.

The insights derived from Ayasdi's machine intelligence software can supplement your portfolio managers' professional experiences, helping them create effective regime-based asset allocation strategies and more precise liquidity forecasting.
KNOW YOUR CUSTOMER, ANTI-MONEY LAUNDERING, FRAUD AND SECURITY

With the rise in global terrorism, international crime and fraud, every year sees a commensurate rise in regulatory pressures concerning your Anti-Money Laundering (“AML”) and Know Your Customer (“KYC”) initiatives, with the threat of high profile fines and investigations always looming.

Compliance with KYC, AML, and sanctions requirements continues to be a key focus area from the board level on down, and firms must ensure they are following appropriate compliance procedures to meet the increasing regulatory demands. Banks operating at global scale must also ensure that each territory has sufficient management oversight such that that all of these requirements are being adhered to at both a local and global level.

To comply with AML/KYC standards, most banks have deployed a combination of software such as Mantas, Actimize and Norkom with an internal army of as many as 10,000 people to perform investigations on suspicious parties and transaction, ultimately to file Currency Transaction Reports and Suspicious Activity Reports (“CTRs and SARs”).

Banks are deploying Ayasdi Machine intelligence to dramatically reduce the number of false positives associated with their existing processes. Ayasdi can quickly and automatically build an ensemble of fine grained models that you can deploy to eliminate a significant percentage of the false positives generate by your existing systems.

And because generating and updating models is an automated, rapid and inexpensive process, you can refresh your KYC / AML / Fraud models as frequently as you wish – even daily or more frequently. This ensures that your systems always reflect your latest intelligence as well as the most current tactics global criminals and terrorists are using.

The end result is that by reducing false positives, machine intelligence can dramatically reduce the headcount you need for manual investigations, which is your primary cost-driver for compliance with KYC initiatives.
Summary

There is a tremendous opportunity for you to tap into the massive amounts of client, product, and market-related data at your disposal to uncover previously hidden insights, to create predictive models, and ultimately to automate your business with intelligent applications. It is difficult to understate how transformational this is for financial services firms – in effect your firm will start to behave like Google, Facebook and/or Amazon, where algorithms and raw computing power fed by your unique data will drive your business. Leading banks are finding Ayasdi machine intelligence to be as much as 1000x more effective than their current systems and processes for advanced analytics.

You can use machine intelligence to drive stronger and more profitable customer relationships, deploy your capital more effectively, mitigate risk, detect fraud, comply with KYC and AML regulations, provide better transparency to regulators, improve your asset allocation strategies, and much more.

You can leverage Ayasdi to support the industrialization of analytics within your firm, and to scale without having to hire armies of data scientists. You can repurpose employees currently dedicated to manual processes like AML investigations. And many financial services firms are further deploying internal centers of excellence, designed specifically to propagate machine intelligence and drive innovation across the enterprise.

Ayasdi’s machine intelligence platform combines innovations in scalable computing, automation, machine learning and topological data analysis to help your firm find previously unknown insights in massive volumes of data with thousands of variables. It leverages the shape of your data to surface subtle relationships, often hard to uncover using conventional analytical tools.

Using Ayasdi’s platform, financial institutions worldwide are building and deploying intelligent applications at scale to become truly data driven businesses.

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Figure 8: Why financial institutions are finding Ayasdi to be so transformative
Ayasdi is on a mission to help our customers gain transformative advantage through their big and complex data. Our revolutionary machine intelligence platform leverages automation, machine learning and topological data analysis to simplify the extraction of knowledge from even the largest and most complex data sets confronting organizations today and to facilitate the deployment of intelligent applications across the enterprise. Developed by Stanford computational mathematicians, Ayasdi’s unique approach to machine intelligence leverages breakthrough mathematics, highly automated software and scalable compute to revolutionize the process of converting big data into business impact. We are excited to count many of the Fortune 500, plus leading governments and research institutions as our clients and partners.