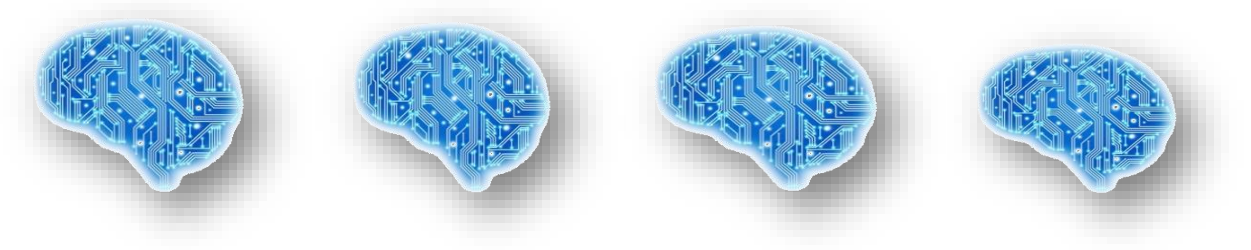
simularity

Artificial Intelligence (AI) for Financial Services

Deploying Deep Learning Techniques to Banking, Insurance and Financial Transactions



Customer Service

WHITE PAPER FOR STAKEHOLDER ENGAGEMENT

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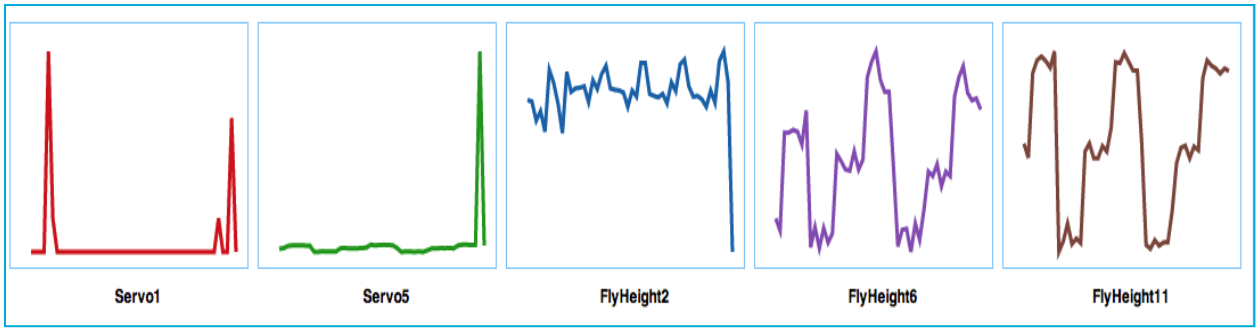


Simularity is among the few companies worldwide doing distributed deep learning ideally suited to multi-location global BFSC (Banking and Financial Services Companies). It captures multivariate time series patterns representing the patterns to predict anomalies and sends alerts 50% more accurately than machine learning algorithms that can be annotated and are explainable.

With Huge ROI Gains, Financial Services Industry is Spearheading Diverse AI Applications

As much as a 40% rise in productivity was reported by banks coming from diverse Artificial Intelligence (AI) applications including productive assistants. A survey of 424 senior executives from financial services and fintech companies released in March 2016 by law firm Baker McKenzie found that 49% of respondents expected their organization to use AI as part of its risk assessment process within the next three years. While 29% expected AI use in know-your-customer and anti-money laundering monitoring, those citing regulation, risk and compliance constituted 26% of the survey respondents. Darren Williams, Executive VP and Chief Risk Officer at United Bankshares expects AI to help reduce inefficiency in its monitoring processes from 95% to 50% or less with the trial of new technology leading to 30%-40% cost savings.

The seemingly wide range of emerging AI solutions in the financial sector are now expected to be triggered by new capabilities to process high speed and high volume data aided by cloud computing with advanced deep learning techniques. AI leverages a set of technologies rather than one single product or system. The most popular proposition is that of teaching machines to learn and interact to solve cognitive tasks normally done by humans. The implications extend to computers resolving problems, reasoning, processing natural language and much more.

The Drivers Identified for Simularity AI

This progress in technology is also propelled by the enormous volume of data from customers and market players with the automation as well as digitalization of financial services – banking, insurance and trading. Data explosion is clearly the key enabler. One can now dive into more than 10 years of banking, insurance, mortgages and financial trading history for every single of the million transactions that take place daily. This data could then be applied to deep learning to train and construct applicable algorithms to offer insight, improve decisions, mitigate risk and detect minor to major anomalies to prevent frauds or disasters. AI technologies are currently being applied by the banking industry in the realm of knowledge management, identity authentication, market analysis, CRM, anti-money laundering and risk control.

Here is a listing of AI application needs (not necessarily in that order of priority) captured from a Global bank, based on an interactive session conducted by Simularity with the bank's Executive Director at San Francisco, who is scouting for technology solution.
Money laundering – very involved cross border data tracking and intelligence on transactions
Fraud detection – anomaly detection and predictive analytics (ready pilot)
Compliance - help in recovering layers of bank documentation/data to meet regulatory policies (evolving)
Correlating and linking multivariate transaction data - individual and business accounts (ready pilot)
Analyzing behavioral data captured from all online activities and those from digital devices including smart watches for personalization based on spending and other preference patterns (some form in use)
International Trade – web and digital space crawling to map buyers/suppliers' data to generate leads for contacting potential clients. Network analysis of trade transaction databases to find details of connectedness of companies (ready pilot)
Financial markets – tracking to detect anomalies in the behavior of key players (some form in use)

Marketing and lead generation AI products are gaining acceptance. Goldman Sachs, Amex and Citi Ventures funded Persado software. This software uses AI and a massive database of marketing performance metrics to suggest language that can elicit certain emotional responses to advertising and email subject lines. It can also warn marketing teams about cultural sensitivities to certain words and timing of campaigns. The software is used by 80 global brands including financial services firms Citi and AmEx as well as software giant Microsoft and retailers Neiman Marcus and Sears. The software can be used to fine tune email campaigns, Facebook messages, websites, display ads, and text messages.

Simularity Positioning and Scoping

To leverage AI, banks are also aggressively recruiting statisticians and data scientists, who dabble with new uses of data across the banking and financial services sector, aiming to significantly better services and enhance profits. The market space is getting crowded by AI companies engaged in bot messaging/support, document discovery, simple machine learning, voice analytics, crawling techniques and generic algorithm based trading. Deep learning and real time data analytics are gradually on the rise.

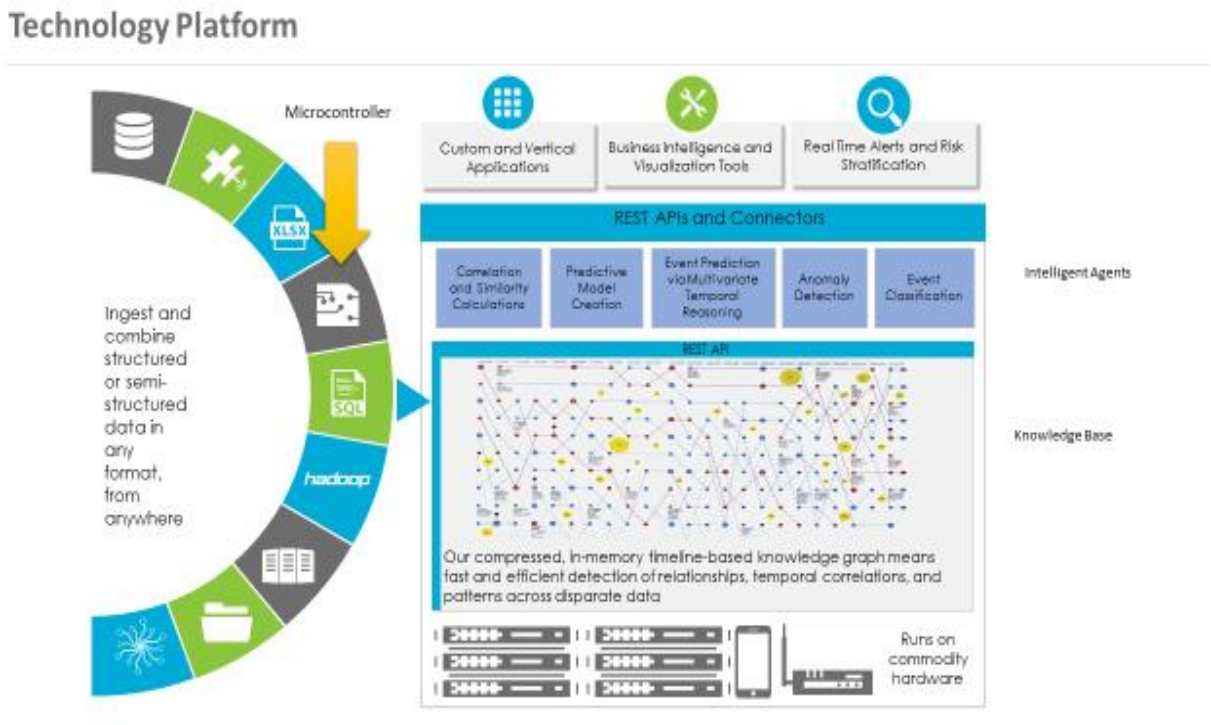
Simularity can leverage its proprietary platform to capture real time as well as historical time series data for deep learning and predictive analytics to improve stakeholder relationship and mitigate risk. It has the capability of self-configuring and adaptive spatio-temporal reasoning to make predictions based on multi-variate patterns it discovers. This opens up the scope for cost savings as well as higher returns for banks, insurance and trading companies. Simularity's high speed self-learning process actually dispenses the need for costly data scientists at several stages. Rather, such professionals could delve on last mile decision making on cost benefit analysis and aligning insights with the short and long term goals.

Deep Learning, Insights and Recommendation Engine

From the client's data center or cloud, Simularity accesses data to construct application based algorithms through deep learning for predictive analytics and recommendation engines. Alerts are sent after anomaly detection or deviation from the deduced signature pattern. The technology platform could be seamlessly integrated with proximity as well as remote sensing technologies for data capture. Simularity's data processing capabilities range from structured and unstructured data to camera images including low resolution satellite imaging.

So, with the proliferation of AI applications in the financial sector, Simularity is well positioned with its impact generating uses cases offering further insight. Its helping an insurance major to derive intelligence

and make recommendations from customer online behavior. The horizontal nature of Simularity applications with low switch cost and time across diverse banking applications, make its solutions amenable and attractive. It could also tap the burgeoning Financial Services sector in multiple ways.



Why do Banks and Financial Services use AI?
In the Baker and McKenzie survey carried out with Euromoney, three main problem areas for banks to apply AI include risk management, financial analytics and investment/portfolio management. It's all about decision making - internally by the banks and externally on the client side. These could range from decision on branch office location, loan optimizing, customer preferences and investment advice.

AI is impacting the Financial Services sector more than the others with sophisticated algorithmic trading, posing a serious challenge for traders as well as regulators. Demand for non-equity trading algorithms serving institutional asset managers and retail investors is expected to expand AI usage in global financial markets. A report from the US Commodity Futures Trading Commission cited that algorithmic trading systems were responsible for nearly 80% of foreign exchange futures trading volume, 67% of interest rate futures volume, 62% of equity futures volume, 47% of metals and energy futures volume, and 38% of agricultural product futures volume between October 2012 and October 2014. Algorithms were deployed to manage risk and exposure. Thomson Reuters' recent report estimates algorithmic trading systems to be handling 75% of the volume of global trade and industry insiders predict steady future growth.

Three prime reasons cited for Algorithmic Products are:
1. Futures and institutional investment market trigger demand for innovation in wide ranging algorithms.
2. New regulations and compliance in institutional investment markets compel extensive automation of trading in assets that were traditionally not digitalized. One instance is the anticipated shift from telephone to electronic trading in fixed income markets.

3. As the retail trading market continues to expand globally, it opens up algorithmic trading to new areas pushing for enhanced tech applications driven by AI

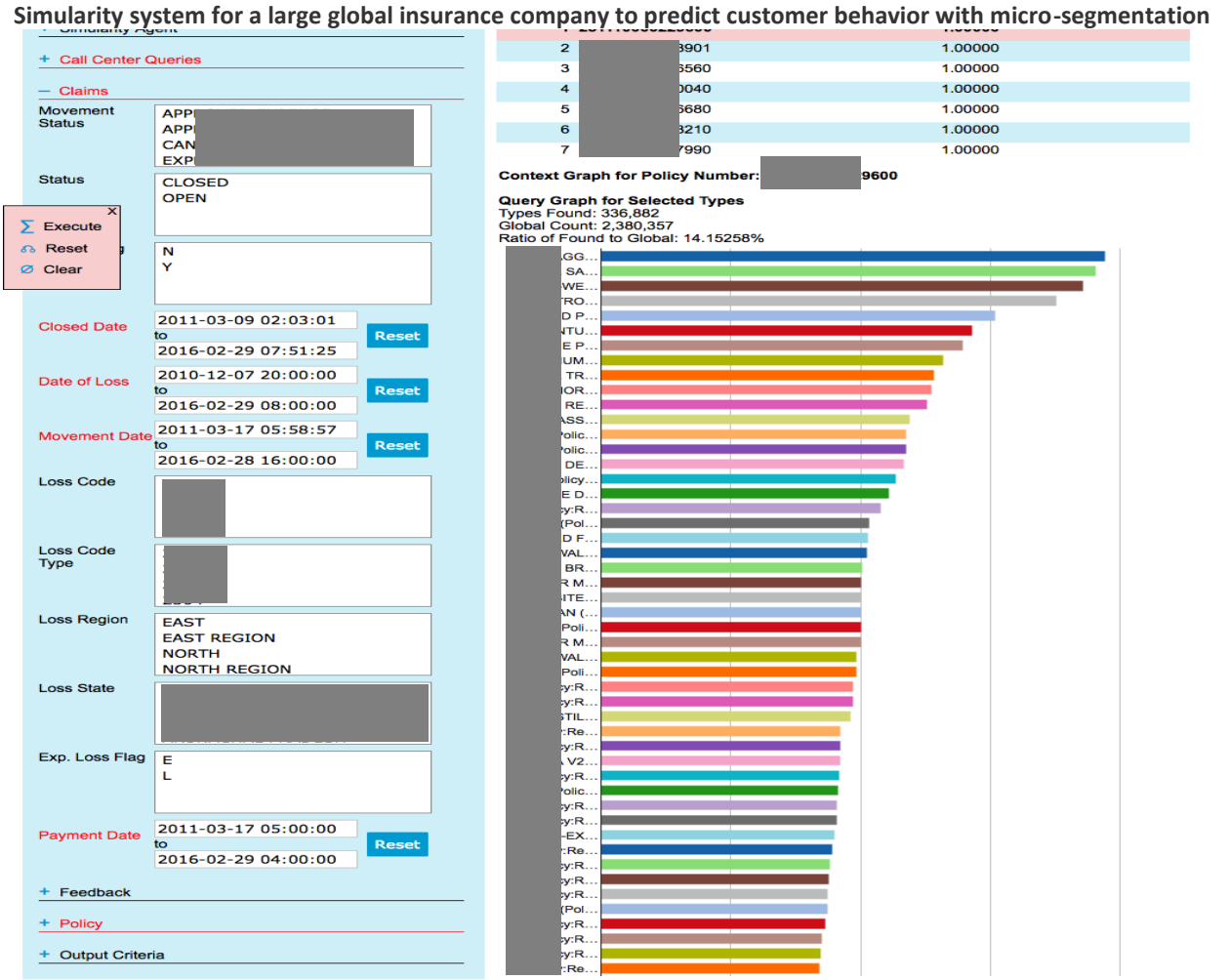
The focus is now more on speed and correlating multiple variables thus opens up extensive opportunities for Simularity. Market players are now looking for the ability to chase short-lived opportunities across different venues, asset classes and geographies.

Simularity goes Deeper, beyond Algorithms to Machine Learning Technology

Markets recognize the significance of machine learning, whereby the algorithms learn from their mistakes to ensure greater accuracy of predictive analytics. Some investment management houses are now employing risk premia or smart beta strategies. Its argued that with improvements in back-testing, execution and liquidity, it is possible to account for the slippage factors and margin requirements. Trading algorithms would assess the best liquidity providers during execution. With more sophisticated machine learning and algorithms, regulators are better equipped to prevent major accidental market movements.

Tony Virdi, banking and financial services head in the UK and Ireland of Cognizant says - as machine learning improves, further growth of algorithmic trading is expected. Machine learning advanced rapidly over past 10 years with more flexible and cost-effective solutions that banks could implement, even with their traditional IT systems. Computers analyze new information and compares it with existing data to look for patterns, similarities and differences. With repetitive process, the machine improves its ability to predict and classify information to make data-driven decisions much like the solutions Simularity offers. Banks and fintech companies use machine learning to detect fraud by flagging unusual transactions and other trends. This is more efficient than human monitoring to become the norm in banking and finance.

Simularity system for a large global insurance company to predict customer behavior with micro-segmentation



Championing Transformation in Banks

Consumers, particularly millennials, prefer digital servicing channels over branch office visits or calling in. With digital voice assistants like Siri, Google Voice, Alexa and Cortana, machine learning based AI applied to customer servicing is another big opportunity for retail banks and help reducing cost of serving customers. This again throws up rich data for Simularity AI solutions to offer further insights by capturing customer data from digital assistants for anomaly detection and predictive analytics. Just to draw an analogy, the enterprise digital assistant needs to combine a Siri-like speech interface, a Google-like knowledge of stakeholder interests and an IBM Watson-like ability to reason. With such integration, Simularity can solve more complex problems through predictive analytics and anomaly detection. Many vendors in the enterprise search space are working toward unified information access - prerequisite for deriving insights by correlating information. The attempt by banks would be to get beyond silos and correlate disparate pieces of information. Key to making use of correlated data is the interface between the user and the data that Simularity platform could suitably address.

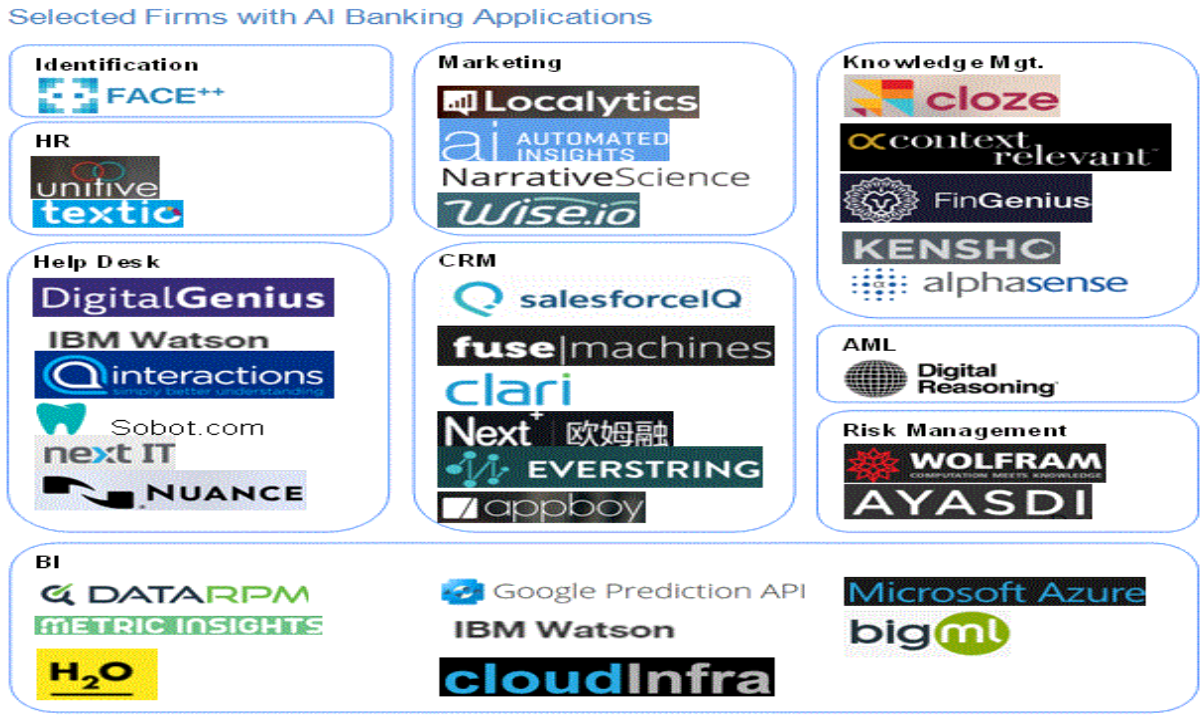
AI to become more Ubiquitous

As evident, AI is already impacting the financial sector and being used daily within payment systems, money management and for robo-advice. As already cited, **intelligent digital assistants** cope with regular customer service enquiries and tasks. It can process big data far more efficiently than humans and recognize speech, images, text, patterns of online behavior. These technologies help to detect fraud and support appropriate advertisements for upselling. With the likes of Persado, there is also immense scope for AI to drive customer loyalty for banks. Large Financial Services organizations are already using AI to deliver personalized advice to their wealthy clients. Several others invested in AI to answer complex financial questions posed by customers. Voice banking and selfie pay to gain popularity in near future.

Robo advisers as AI applications are getting robust over time. Digitalization and automation with the use of smart tools for customer support services are pushing AI solutions. The objective is to develop systems and platforms that not only resolve customer queries but also drive sales through recommendations engines. Nguyen Trieu, Fintech Resident Expert, Oxford University and CEO of The Disruptive Group, says the deployment of robo advisers depends on how effectively the banks are able to manage customer data.

Santander bank in London offers **secure transactions using voice recognition** through its banking app whereas, Royal Bank of Scotland is trying out its's AI customer service assistance tool Luvo to interact with staff to serve future customers. Swedbank's Nina Web assistant hit an average of 30,000 conversations per month and its first-contact resolution of 78% during the first three months. Nina can handle over 350 different customer questions and answers. Several other banks in US and elsewhere are putting in place such AI tools and platforms with active trials. Ally Bank launched Ally Assist, which displays on the smartphone screen answers to texted or voice queries on bill payment initiation, recent transactions or routing numbers. These suggests what the customer like to do next. Other banks offering virtual assistants include USAA, Tangerine in Canada and Garanti Bank in Turkey. Kensho in Cambridge, Massachusetts, is pioneering **scalable analytics and machine intelligence systems** - deploying them across the most critical government and commercial institutions in the world. This extends to complex indices driving industry verticals. The Wall Street Journal says Kensho is building a Siri for the Financial industry.

These organizations, alongside new challenger banks and payment providers, are leading the way in **intelligent banking**, with other traditional banks and financial institutions following them. Financial services, as a whole, will save billions annually when AI and robotic banking technologies that are more efficient and less expensive than humans, are used to provide services to customers. AI and robotic banking could be game-changer in locating and recovering assets from foreign nationals who defrauded banks in Asia and fled to other countries. AI could predict where certain foreign nationals escaped and which global banks may be assisting them to move money internationally. Predicting both the activities of foreigners and of the banks could help swift and efficient recovery of assets. The same AI tech can be used for predicting terrorist financing activities and preventing fraud.



Personalization is high on the agenda of banks. As several of them are deploying innovative ways to match products and services to the consumer. For the customer, the technology can simplify the money management process and offer suggestions and recommendations for upgrades and new services by matching algorithms. There are agile companies leveraging personal financial management (PFM) benefits like the San Francisco startup Wallet.AI – an app to empowering consumers to make efficient purchase decisions, manage finances and enable cost savings leveraging smart tools.

For **marketing and promotion** of banks, AI applications could identify the characteristics of high-yield customers by mining existing data. "With their ability to fully understand the market, customers, and regulatory changes through data, banks are in the best position to apply these technologies in risk control, credit analysis, market tracking and customer demographic mining," says Hua Zhang, an analyst with Celent - a research and consulting firm focused on IT applications in the global financial services industry.

Multiple regulations since the 2008 financial crisis, banks recruited numerous compliance officers, who are now relying on AI to grapple with the persistently transforming regulatory scenario. Ranging from anti-money laundering programs, know-your-customer checks, sanctions list monitoring, billing fraud

oversight or other general compliance functions, AI could be deployed to improve efficiency, eliminate erroneous results, slash costs and raise productivity with optimal use of employee time and resources.

NextAngles uses **AI to help banks with compliance monitoring**. Its natural language processing system reads through regulations to reassemble the words into a set of computer-understandable rules. Its Chief Executive Mallinath Sengupta says that large banks are required to scan over 300,000 cash transactions of $10,000 or more every month as part of their anti-money laundering programs. While several of these could be false-positives, that still leaves around 1,000 cases to be investigated. Each such investigation takes a couple of hours of wasteful time spent. AI-driven programs determine those requiring investigation so as to allow compliance professionals to tap their expertise and swiftly resolve the cases.

Rage Frameworks, which provides **knowledge-based document interpretation services**, said banks deal with several hundreds of regulatory changes each month that need to be adopted immediately and must compile information from many different sources. Each bank also needs to have their system that provides total auditability to track who did what, and when. AI has to be very context specific here to address the systems adopted by the banks. The systems need to be configurable, intuitive and logic-driven to quickly switch from anti-money laundering monitoring to a know-your-customer investigation and be scalable for types of banks. Distributed deep learning technologies like that of Simularity are in demand for compliance alerts using structured data, semi-structured data and unstructured data.

In the realm of **wealth management**, OpenFinance takes data from multiple sources, analyzes and aggregates to distribute to banks and financial institutions. The technology deployed allows the company to access information from numerous institutions, put it into a "common language" so it can be worked on, then return it to each institution in the form they want, says Edward Loughran, the MD. This allows OpenFinance to handle investment portfolio, asset management and various transactions data. With common nomenclature, it allows bank compliance departments to access larger data to detect those most likely to be affected by new rules and also which section of the business gets impacted.

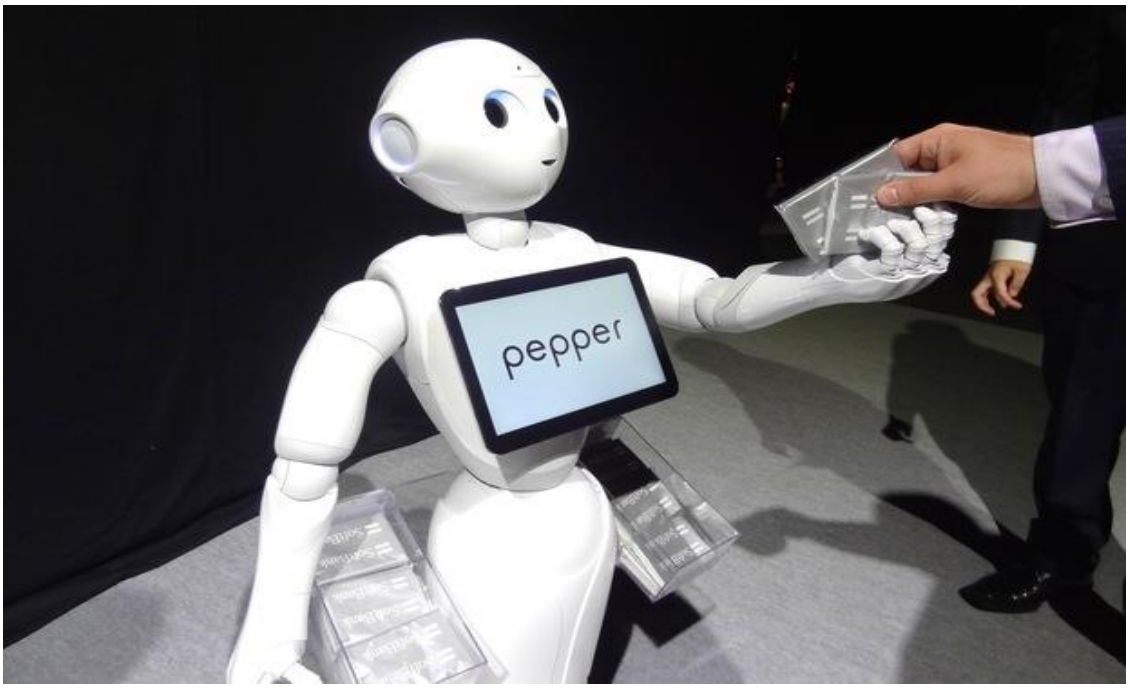
Lavastorm software offers analytic data processes to help bridge the gap between an organization's technology people and business people is **leveraging AI to eliminate project bottlenecks**. Its VP, Dan Donovan emphasizes the need as it makes the process more agile, reducing the use of traditional "waterfall approach" where the business people document the regulatory requirements and sent them to a disconnected tech team to develop some functionality toward those requirements that they may not understand. Thus, in addition to being faster and more accurate, AI should make compliance easier. Banks spend much time and effort on comprehensive capital analysis and review, conduct stress tests thereby

duplicating the work for the next reporting period. This kind of approach works better than operating with separate analyses and silos that have to unroll and then roll back to converse with regulators.

Advanced Technologies, Robotics and Customer Benefits

Personalization is priority for banks and many are dabbling with smarter ways to match products and services to the consumer. For the customer the technology can simplify the money management process and offer suggestions and recommendations for upgrades with new services by matching algorithms. We have interesting examples of companies exploring personal financial management (PFM) like the San Francisco based start-up Wallet.AI - a new app to help consumers make smarter purchase decisions, manage finances and make savings while on the move.

Google's Rat Kurzweil predicts robots will reach human levels of intelligence by 2029 if they can overcome current limitations – the point termed as Singularity.



Advent of Robots

Mizuho Financial Group bank introduced Pepper (the world's first humanoid robot with human emotions, developed by Softbank, one of Japan's biggest telecommunications companies, in collaboration with Paris-based robotics experts, Aldebaran) to its flagship branch in Tokyo after mid 2015 to address customer enquiries. Whereas, Mitsubishi UFJ Financial Group trialed "Nao", a humanoid robot to interact with customers. Robotics are already being used for back office tasks, but Pepper and Nao are pushing the boundaries of what an autonomous, AI robot can do within a banking setting.

Pepper is being used in customer services as replacement to information booth or welcome desk. A partnership with IBM implies the Watson-powered version offers a service that developers can build into their apps or devices to make them smarter by analyzing data, making personal recommendations and

even understanding human language and emotion. The Watson-powered Pepper will be able to tap into data such as social media, video, images and text with more types of jobs in development.

Cognitive Computing and AI Applications in Financial Services

Financial services organizations are aggressively tracking AI technologies to plan future initiatives. Businesses are discovering and implementing innovation with venture capital and captive incubators to groom and deploy new technologies. With the growth of automated services, AI and robotics are compelling traditional banks, financial services and payment providers to work closely with proposition designers, coders, developers and marketers to identify new concepts and astutely commercialize them.

Simularity solutions are aligned in servicing clients directly, through partners and system integrators. As Financial Services companies declare war on hackers investing millions of dollars towards AI integration to offer security against fraud and theft to build sustained and transparent relationship with customers, Simularity needs to co-create solutions directly with clients as well as strategic partners. It's also critical to work with leading banks and their partners on major projects to combat cyberattacks and cybercrimes.

Retail Case – the Simularity ROI that could be readily deployed in banks and financial services companies

Simularity Code In Production Since 2012

"Simularity gives us an edge that other recommendation services just can't offer: better and faster recommendations, powered by all our data, on a single inexpensive server." **Casey Carey, VP of Marketing, Alibris**

- Simularity Uses High Performance Correlation Engine for recommendations
    - Product recommendations for alibris.com and halfpricebooks.com
    - Personalized recommendations for marketing emails
- 18 million products, 45 million actions
- Better (more complex) algorithm
- Custom business rules: no self-help books
- Measurable Results
    - Proven in live A/B test
        - Repeat rate **up 5.8%**
        - Revenue Per Visitor **up 8.9%**
        - Average Order Value **up 7.5%**
        - Orders/session **up 13.2%**
    - Speed of recommendation generation improved dramatically

Simularity is already into project mode with insurance and banking companies. With few iterations and deployments, it could offer packaged products by co-creating with players in the Financial Services sector. Through the integration of its deep learning AI platform, Simularity's predictive analytics with recommendation engines are well positioned to solve big ticket and complex problems like customer behavior, fraud detection, managing risk in compliance, financial exposure and investment portfolios.