Mining intelligent insights with machine learning in Financial Services

Cloud services create a tipping point for AI/ML in Financial Services

Adoption of artificial intelligence and machine learning (AI/ML) has accelerated in recent years due to the availability of cost-effective and virtually unlimited capacity in data storage and compute power from cloud services. While the fundamental concepts of machine learning have been around since the 1950s, the success of machine learning workloads is directly linked to an organization's ability to collect, prepare, and process vast amounts of relevant data.

Particularly within financial services, AI/ML is becoming a key component for business transformation. With the abundance of data collected by companies, as well as the labor-intensive, manual, and in some cases, paper-based processes still used by many financial institutions, it is an industry ripe for product enhancement and disruption due to AI/ML.

Cloud has removed many of the barriers to experiment and innovate with AI/ML

The hype of AI/ML has transitioned to real impact on businesses. From core processing to client-facing applications, AI/ML tools are powering devices and software used across Financial Services to solve problems and create opportunities.

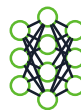# What do we mean by AI/ML?

Artificial intelligence
Any technique that enables computers to mimic human intelligence using logic, if-then statements, and ML (including deep learning)

Machine learning
Subset of AI that uses machines to search for patterns in data to build logic models automatically

Deep learning
Subset of ML composed of deep multi-layered neural networks that perform tasks like speech and image recognition

Financial institutions embrace AI/ML for a competitive edge

Financial institutions are increasingly investing in AI/ML, thanks in part to the availability of cost-effective, easy-to-use, and scalable AI/ML cloud services. Banks are enhancing customer experiences through chatbots and customized product recommendations; capital markets firms are optimizing investment portfolios by mining alternative datasets and streamlining business operations through more efficient document reviews; insurance companies are able to better assess risk and offer personalized quotes while streamlining the claims process; and payments companies are improving their fraud prevention algorithms.

Fraud detection and surveillance

AWS analytics and AI/ML services help organizations identify anomalies in the data while reducing the number of false positive alerts generated by rules-based models.

Document processing

AWS AI/ML services make it easy for organizations to process, analyze, and extract key information from documents to conduct due diligence, document reviews, and financial analysis.

Personalized products and recommendations

AWS AI/ML services enable organizations to make customized recommendations and develop new products tailored to the specific needs and behaviors of each customer.

Trading and predictive analytics

Trading firms and portfolio managers are identifying new investment signals by leveraging AWS AI/ML services to analyze alternative data sets such as social media and satellite imagery.

Customer experience

AWS AI/ML services help financial institutions provide enhanced customer service though chatbots and improve customer engagement through an intelligent contact center platform.

AWS helps accelerate AI/ML adoption for financial institutions

To implement AI/ML successfully, financial institutions need AI/ML capabilities coupled with the right security, data store, and analytics services to work together. Leveraging Amazon's experience at integrating AI/ML into its businesses has resulted in a set of tools that reduce the barriers financial institutions face when implementing AI/ML technologies. From the largest enterprise companies to the most innovative startups, AWS provides the critical elements financial institutions need to accelerate their ML journey.

Proven expertise to draw on

Amazon has been investing heavily in AI for more than 20 years. Machine learning is used in virtually every aspect of its business –from Amazon.com's recommendation engine to the checkout-free experience at Amazon Go. AWS offers our customers AI/ML services using machine learning technology perfected from years of use on Amazon.com as well as direct guidance and instruction from our ML experts.

Security and governance to build on

AWS provides a broad set of security and governance features which are critical to implementing machine learning at financial institutions, including end-to-end auditability, artifact management, model explainability, and concept drift detection. Additionally, AWS also provides robust capabilities around network security, data encryption at-rest and in-transit, user authentication, and authorization.

Broad set of services to choose from

AWS offers the broadest and deepest set of AI/ML services. Customers can choose from pre-trained AI services, build their own ML models leveraging Amazon's ML platform, or spin up deep learning AMIs pre-installed with popular deep learning frameworks. Tens of thousands of customers use AWS for their machine learning needs to improve customer experiences, automate manual processes, develop customized products, services, and more.

More machine learning happens on AWS than anywhere else.

AWS AI/ML services deliver choice and control

AI SERVICES

For developers with no prior machine learning experience, AWS offers a suite of pre-trained AI services that easily integrates with applications to address common use cases such as personalized recommendations, identity verification, and document processing.

VISION	SPEECH		TEXT			SEARCH	CHATBOTS	PERSONALIZATION	FORECASTING	FRAUD	DEVELOPMENT	CONTACT CENTERS
Amazon Rekognition	Amazon Polly	Amazon Transcribe	Amazon Comprehend	Amazon Translate	Amazon Textract	Amazon Kendra	Amazon Lex	Amazon Personalize	Amazon Forecast	Amazon Fraud Detector	Amazon CodeGuru	Contact Lens *For Amazon Connect*

ML SERVICES

For machine learning developers and data scientists, Amazon SageMaker is a fully managed ML service that enables our customers to quickly and easily build, train, and deploy ML models at any scale.

Amazon SageMaker	Ground Truth	ML Marketplace	SageMaker Studio IDE								Neo	Augmented AI
			Built-in algorithms	Notebooks	Experiments	Model training & tuning	Debugger	Autopilot	Model hosting	Model monitor		

ML FRAMEWORKS & INFRASTRUCTURE

For expert machine learning practitioners who work at the framework level and are comfortable building, training, tuning, and deploying machine learning models, AWS offers ML Frameworks & Infrastructure.

Frameworks			Interfaces					Infrastructure
TensorFlow	PYT✦RCH	mxnet	GLUON	K Keras	HOROVOD	learn	DeepGraphLibrary	GPUs, CPUs, FGPA, Inferentia, Deep Learning AMIs & Containers, Elastic Inference

AI services on AWS

AWS provides a broad set of pre-trained AI services to help employees of all skill levels solve business problems including use cases like fraud prevention, image and video analysis, speech and language analysis, document analysis, forecasting, personalization and recommendations, and building conversational interfaces.

Accelerating investigation timelines

FINRA, the primary regulator of broker-dealers and financial exchanges in the U.S., uses Amazon Comprehend, a natural language processing service, to analyze millions of documents that they receive from form filings and information requests. Using key features of Amazon Comprehend such as entity recognition and text classifiers, FINRA extracts the names of individuals and organizations from these documents and matches them with their internal records, flagging records of interest that should be further reviewed by human investigators. This data is also then used for higher level analytics including creating knowledge graphs so that the analysts better understand the relationships between entities.

Improving the customer experience

John Hancock, one of the largest life insurers in the U.S., uses Contact Lens for Amazon Connect to improve the efficiency and quality of the customer service in their call centers. As John Hancock provides a broad range of financial products and solutions to over 10 million customers, they are leveraging the machine learning capabilities in Contact Lens for Amazon Connect to better understand the underlying reasons for why customers are calling and to know the purpose of a call before it reaches an agent. Additionally, John Hancock can analyze and evaluate all customer interactions by conducting full text search on calls and chats to improve its customers' contact center experience.

ML services with Amazon SageMaker

Amazon SageMaker enables developers and data scientists to quickly and easily build, train, and deploy machine learning models at any scale. It removes the complexity that gets in the way of successfully implementing machine learning across use cases – from identity verification, to text extraction for due diligence, and real-time fraud detection.

Fueling product innovation

Intuit, a business and financial software company best known for its products QuickBooks and TurboTax, has spent over a decade developing AI/ML applications to help categorize transactions, identify patterns and anomalies in data, and provide overdraft protection. Using Amazon SageMaker, Intuit developed a feature called ExpenseFinder, which automatically pulls a year's worth of bank transactions and finds deductible business expenses through their machine learning algorithm, identifying on average $4,300 in business expenses. With Amazon SageMaker, Intuit reduced its machine learning deployment time by 90%, from six months to one week.

Mitigating fraudulent attacks in real-time

NuData Security, a behavioral biometrics company purchased by Mastercard, uses big data analytics and machine learning to verify that the person using a particular card is authorized to do so. In addition to using traditional methods such as passwords, security questions, and birth dates, NuData uses passive biometrics to authenticate account holders' identities by analyzing their digital profiles. As a user interacts with the system, hundreds of anonymized data points are analyzed in real time—from typographic rates to patterns in technology use—to detect anomalous activity before a fraudulent transaction occurs. With Amazon SageMaker, NuData reduced its machine learning development time by 60% and simplified their machine learning architecture by 95%.

ML frameworks

AWS takes an open and flexible approach to all major machine learning and deep learning tools and frameworks, allowing customers to build custom models with support for all of the popular open-source frameworks. AWS's capabilities are built on the most comprehensive cloud platform that's optimized for machine learning with high performance compute, enabling customers to quickly build and deploy their models at scale.

Expanding fund ratings system

Morningstar, a leading provider of independent investment research, applies machine learning to expand its fund ratings system by developing Morningstar Quantitative Rating. While most well known for their star rating system, which is a backward-looking measure of a fund's past performance, Morningstar also provides an analyst's forward-looking assessment of a fund's ability to outperform its peer group called the Morningstar Analyst Rating. Quantitative Rating is an extension of the Morningstar Analyst Rating. Using a machine learning model that incorporates the decision-making processes of the research analysts, their past rating decisions, and the data used to support those decisions, this ML model is applied to funds not covered by Morningstar analysts and rates six times more funds than human analysts, increasing the coverage from 1,800 open-end and exchange-traded funds to over 10,000.

Preventing fraud in real time

Capital One, one of largest banks in the United States, is adopting and applying AI/ML to nearly every facet of its business, including fraud detection. Leveraging a broad suite of machine learning tools and frameworks, such as TensorFlow on AWS, Capital One can analyze large sums of data, which helps revolutionize how it optimizes fraud detection while minimizing false positives. "With machine learning, we're protecting our customers by preventing fraud. But at the same time, it's a situation where there are two sides of the same coin," says Nitzan Mekel-Bobrov, Ph.D., managing VP of machine learning at Capital One. "On the one hand, this is an essential component of our defensive strategy. But on the other, it's preventing customers from having a negative experience where they're being declined when they shouldn't be. It's helping us be protective, but not overprotective."

Get started by accelerating AI/ML skills

With the wealth of AI/ML opportunities that can transform the financial services industry, many organizations are asking, "how can we accelerate the growth of machine learning skills on our teams?" AWS provides a number of offerings to help customers with their journey to machine learning success. The content is based on years of proven success helping organizations adopt AI/ML, as well as Amazon's own journey to put AI/ML first in all areas of our business.

Training

AWS Machine Learning University

The AWS Machine Learning University is a set of 65+ ML courses plus hands-on labs and documentation used to train Amazon's developers and data scientists. Developers, data scientists, data platform engineers, and business decision makers can use this training to learn how to apply AI, ML, and deep learning to their businesses unlocking new insights and value.

Learn more »

Development

Amazon ML Solutions Lab

ML Solutions Lab pairs your team with Amazon AI/ML experts to prepare data, build and train models, and put models into production. The Amazon ML Solutions Lab combines hands-on educational workshops with advisory professional services to help you 'work backwards' from business challenges, and then go step-by-step through the process of developing machine learning-based solutions.

Learn more »

Engagement

AWS DeepRacer

AWS DeepRacer is a fully autonomous 1/18th-scale race car designed to provide a fun and interesting way to get started with reinforcement learning (RL) through autonomous driving. AWS will help our customers set up a corporate AWS DeepRacer event that is designed to motivate employees and provide interactive and friendly competition. With the practical skills, knowledge, and motivation derived from the program, our customers will be ready to take their machine learning journey to the next stage.

Learn more »

Additional resources to propel your AI/ML journey on AWS

AWS Partner Network (APN)

AWS Technology and Consulting Partners have demonstrated success in helping customers evaluate and use the tools and best practices for managing and optimizing data AI/ML applications. Find APN partners that specialize across every stage of the AI/ML process from data collection, data prep and parsing, and data visualizing, to training and evaluating models, tuning parameters, managing models, and deploying, predicting, and integrating models.

For more information, visit https://aws.amazon.com/solutionspace/financial-services

Machine learning solutions in AWS Marketplace

Discover and procure machine learning algorithms and models from AWS Marketplace, a digital catalog that makes it easy to find, test, buy, and deploy software that runs on AWS. Choose from over 200 algorithms and models provided by over 40 partners that can be deployed directly on Amazon SageMaker.

Learn more at https://aws.amazon.com/marketplace/solutions/machine-learning

AWS Professional Services

AWS Professional Services provides strategic and technical guidance on evaluating machine learning use cases, developing proof-of-concepts, and designing production-ready implementations. It also includes executive support and industry best practices around security, governance, risk, and compliance.

For more information, visit https://aws.amazon.com/professional-services

> "Without the tools and techniques we have available on AWS, these would be much harder problems to solve."[1]
>
> **- Robert Capps, Vice President of Business Development at NuData**

Helpful resources

Learn about AWS Financial Services »

Get support to launch your ML journey with the AWS ML Embark Program »

Enterprise Machine Learning Guide »

Contact AWS sales to talk about your Financial Services needs »