



# Modernize machine learning development at scale

Easily overcome the challenges  
of modernizing machine learning  
development processes



# The challenges of harnessing machine learning at scale

Machine learning (ML) has become a core technology ingredient for organizations to drive real-world innovation. However, despite the rapid expansion of machine learning, the ability to harness its power comes with several challenges:

**Scaling infrastructure** - To achieve business objectives with machine learning, customers need scalable infrastructure and purpose-built machine learning tools. The cost of investing in scalable infrastructure and integrating different tools can be excessive; the expenditure often exceeds the cost of developing the machine learning code itself.

**Responsible use of ML** - The explosion of datasets has caused rapid growth in the number of people interacting or building with machine learning. From data security and privacy to bias mitigation in data, machine learning comes with an inherent responsibility for all those who harness its benefits. Putting data science best practices in place ensures the responsible use of machine learning within organizations.

**Difficulty in acquiring data science skill sets** - A shortage of skilled data science professionals makes it difficult to acquire new talent or train existing talent for machine learning development. A machine learning service that caters to all data science skill levels, from beginners to experts, helps to avoid the one-size-fits-all approach often found within homegrown machine learning platforms.

**Managing costs** - The escalating growth of machine learning within organizations necessitates managing costs, including maximizing the efficiency and utilization of resources such as GPUs and CPUs.

## How AWS delivers machine learning success

Now you can reach your business goals faster by modernizing machine learning development processes across your business.

- Scalable infrastructure and integrated tools made available in the cloud by Amazon SageMaker, the most comprehensive machine learning service, empowers your organization to accelerate innovation.
- Amazon SageMaker provides bias detection, explainability, and security features to help you standardize data science practices across your business to encourage the responsible use of machine learning.
- To accommodate every machine learning skill level, Amazon SageMaker offers a fully integrated development environment as well as low-code development options.
- Amazon SageMaker offers efficient resource management to drive cost-effectiveness as you modernize your machine learning environment at scale.



# The challenges of harnessing machine learning at scale

To maintain focus on your core business objectives, avoid the struggle of building your own machine learning environment. Instead, offload the heavy lifting to Amazon SageMaker, which provides high-performance, cost-effective, and scalable machine learning capabilities to implement a modern machine learning environment across an entire business. No matter what the machine learning skill set of your developers and data scientists, they can use Amazon SageMaker to prepare, build, train, and deploy machine learning models for virtually any use case. With Amazon SageMaker, your team can access a broad set of purpose-built machine learning capabilities under one unified visual user interface.

## How Amazon utilizes machine learning to delight customers

Organizations can tap into Amazon's two decades of experience developing real-world machine learning applications, including product recommendations, personalization, robotics, voice-assisted devices, and intelligent shopping.

[Watch the video](#) and discover how the machine learning capabilities of Amazon SageMaker are powering Amazon Fulfillment Centers.



**Intuit started out on its machine learning journey with just one model that empowered its customers to get the most out of their tax deductions.**

Since then, machine learning models have become a core part of Intuit's business and the company has seen a massive expansion of the number of machine learning models it uses—from fraud detection to customer service and from personalization to the development of new features within its products.

In 2020 alone, Intuit increased the number of models deployed across its platform by over 50 percent. Intuit turned to Amazon SageMaker to develop and deploy at the scale of hundreds of models. Using Amazon SageMaker, Intuit modernized its machine learning platform and saved their tax filers over 25,000 hours by utilizing self-help tools and cutting expert review time in half, which ultimately improved customer confidence.

**Watch the video ›**

## The challenges of harnessing machine learning at scale

**1** Acceleration of ML innovation

**2** Responsible and secure use of ML

**3** ML accessibility to builders of all skill sets

**4** Reduction in the total cost of ownership

The next section will dive deeper into each of these points and provide further insight into how AWS enables modernization of machine learning development.

# 1

## Acceleration of ML innovation

When your goal is to get to market faster, your organization needs the tools to develop machine learning models rapidly. At every step of machine learning development, Amazon SageMaker provides access to purpose-built machine learning tools.

Throughout the machine learning process, including labeling, data preparation, feature engineering, training, tuning, hosting, monitoring, and workflows, your team can build models in a single web-based visual interface using [Amazon SageMaker Studio](#). You can automate machine learning workflows and continuous integration and continuous delivery (CI/CD) of machine learning models using MLOps to move more models from research to production. In comparison to a self-managed machine learning environment, the productivity of your data science team can improve by up to 10 times and model development time is reduced from months to weeks.

### Accelerate your organization's ML development with:

- [Amazon SageMaker Studio](#) ›



## THOMSON REUTERS

Thomson Reuters—the world's leading source of news and information for professional markets—accelerated research and development of natural language processing solutions with cost savings and flexibility using Amazon SageMaker.

With Amazon SageMaker, Thomson Reuters developed an internal platform to apply machine learning at scale to help its developers and data scientists quickly gain new insights from real-time and historical data in a fully managed and secure environment. The platform saves developers and data scientists countless hours of coding by providing all of the components used for machine learning in a single toolset. This helps the company put models into production faster, with much less effort, and at a lower cost.

[Read the customer story ›](#)

## 2

# Responsible and secure use of ML

To use machine learning in a responsible manner, machine learning models need to be built with transparency, fairness, and security in mind. [Amazon SageMaker Clarify](#) provides bias detection across the machine learning workflow and includes feature importance graphs. These explain model predictions and produce reports to support internal presentations while also identifying issues with models to enable course correction.

To help your organization meet security criteria applicable to machine learning workloads, Amazon SageMaker includes encryption, private network connectivity, authorization, authentication, monitoring, and auditability.

### For responsible and secure ML usage, Amazon SageMaker features:

- [Amazon SageMaker Clarify](#) ›

AWS security services include:

- [AWS Identity and Access Management \(IAM\)](#) ›
- [Amazon Virtual Private Cloud \(Amazon VPC\)](#) ›
- [AWS PrivateLink](#) ›
- [AWS Key Management Service \(KMS\)](#) ›
- [Amazon CloudWatch](#) ›
- [AWS CloudTrail](#) ›
- [Amazon SageMaker compliance certifications](#) ›



**BUNDESLIGA**

The Deutsche Fußball Liga (DFL) GmbH, responsible for organizing and marketing German professional football, set out to create a more engaging experience for Bundesliga fans around the world by uncovering interesting game insights during football matches. Powered by AWS, Bundesliga Match Facts gives viewers information on the difficulty of a shot, the performance of their favorite players, and an exploration of offensive and defensive trends of their team. Using Amazon SageMaker Clarify, the DFL can now interactively explain the key components of the Bundesliga Match Facts insights predictions to improve its machine learning models and ultimately deliver higher-quality game insights to fans.

*"Amazon SageMaker Clarify seamlessly integrates with the rest of the Bundesliga Match Facts digital platform and is a key part of our long-term strategy of standardizing our ML workflows on Amazon SageMaker. By using AWS's innovative technologies such as machine learning to deliver more in-depth insights and provide fans a better understanding of the split-second decisions made on the pitch, Bundesliga Match Facts enables viewers to gain deeper insights into the key decisions in each match."*

### Andreas Heyden

Executive Vice President of Digital Innovations at the DFL Group

[Read how the Bundesliga uses Amazon SageMaker Clarify](#) ›

# 3

## ML accessibility to builders of all skill sets

Amazon SageMaker enables developers at all machine learning skill levels, from beginners to experts, to develop machine learning models the way they like.

For data scientists and developers who prefer to write code in Python, Amazon SageMaker offers fully managed Jupyter notebook environments available through the Amazon SageMaker Studio integrated development environment (IDE). For builders who prefer a point-and-click experience, Amazon SageMaker Autopilot automatically builds, trains, and tunes machine learning models without any loss of visibility or control. When projects need to get fast-tracked, Amazon SageMaker JumpStart offers pre-built solutions for the most common use cases, which can be deployed in just a few clicks.

### To ensure accessibility for all, Amazon SageMaker features:

- [Amazon SageMaker Studio ›](#)
- [Amazon SageMaker Autopilot ›](#)
- [Amazon SageMaker JumpStart ›](#)



Freddy's Frozen Custard & Steakburgers, a fast-casual restaurant chain headquartered in Wichita, Kansas, turned to data science to find a better way to evaluate the quality of its restaurants. Leveraging the accessibility of Domo AutoML powered by Amazon SageMaker Autopilot, Freddy's built machine learning models to optimize staffing levels in its restaurants without having to hire machine learning experts.

[Read the case study ›](#)



# 4

## Reduction in the total cost of ownership

Compared to a self-managed machine learning environment, Amazon SageMaker lowers the total cost of ownership by over 54 percent, providing organizations with an unmissable opportunity to improve the overall cost-effectiveness of machine learning. The ability of Amazon SageMaker to automatically optimize infrastructure enables organizations to gain maximum value from their machine learning models. The key factors that lower the TCO include:

- Automatic data labeling reduces labeling costs by up to 70 percent with **Amazon SageMaker Ground Truth**. Data is only routed to humans if the model cannot confidently label it. The active learning model then uses the human-labeled data to train the machine learning model to improve its accuracy.
- **Amazon EC2 Spot Instances** let you take advantage of unused Amazon EC2 capacity in the cloud. Spot Instances are available at up to a 90 percent discount compared to on-demand prices.
- **Amazon EC2 Inf1** instances offer the lowest cost per inference in the cloud.
- **Amazon SageMaker Studio** provides a fully integrated development environment for machine learning. Prepare data and build, train, and deploy models with a single visual experience. Enable your data science teams to be up to 10 times more productive using Amazon SageMaker.

### To reduce the TCO, Amazon SageMaker features:

- [Amazon SageMaker Ground Truth ›](#)
- [Amazon EC2 Inf1 Instances ›](#)
- [Managed EC2 Spot Instances ›](#)
- [Amazon Elastic Inference ›](#)



The personal finance startup relies heavily on data science and machine learning to connect customers with personalized financial solutions, such as paying off debt or buying a house. To add business value faster and keep costs in check, NerdWallet used Amazon SageMaker to modernize its data science engineering practices.

With Amazon SageMaker, NerdWallet can pay per use rather than pay for infrastructure to run endlessly. As a result, expenses are only incurred when compute resources are needed, lowering machine learning training costs by around 75 percent. The use of machine learning and Amazon SageMaker represents a shift in how NerdWallet is leveraging technology to differentiate itself in a crowded and competitive financial services market.

[Read the case study ›](#)

# Accelerate innovation by modernizing machine learning processes

Modernizing machine learning processes can help organizations like yours achieve business objectives and accelerate innovation. Amazon SageMaker overcomes the challenges of time-consuming, difficult, and expensive self-managed machine learning platforms. Instead, Amazon SageMaker helps to accelerate machine learning development with access to efficient infrastructure, purpose-built machine learning tools, and MLOps made available under a single visual interface.

Amazon SageMaker helps to ensure responsible and secure use of machine learning and opens up the accessibility of machine learning to all developers, no matter what their machine learning skill level. With Amazon SageMaker, you can reduce the TCO and increase cost-effectiveness as you modernize your machine learning environment at scale.

**Further explore ML modernization use cases ›**

