

DRIVING AGILITY IN RETAIL WITH AI

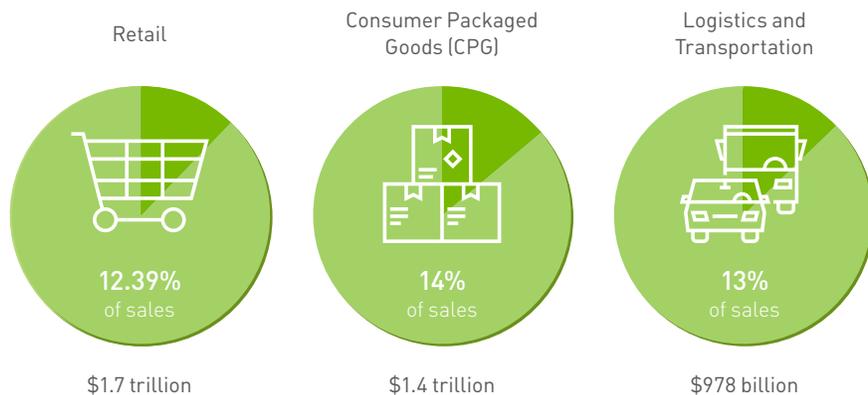


In today's highly challenging environment, consumer behavior is rapidly shifting making it critical for retailers to transform their business to respond to market demand and opportunity.



Retail has identified artificial intelligence as critical to its future success. It's the industry most heavily invested in the technology with a current adoption rate of 40 percent, which is projected to grow to 80 percent in three years.¹

Total Potential Annual Value of AI and Analytics by Industry²



¹Source: IBM
²Source: McKinsey

AI has a proven track record of helping leading retailers improve business agility through innovation at every stage of the business value chain—from predicting demand to warehouse logistics to the customer. Stores are gaining visibility into in-store behavior for improving merchandising, implementing contactless checkout, reducing shrinkage and stockout, and enabling efficient last-mile delivery. They're rethinking omnichannel management and engaging consumers with personalized e-commerce recommendations at the right time. And supply chains are being optimized with predictive forecasting to accurately anticipate buying trends, automate fulfillment, and get products into the hands of customers sooner.

By implementing AI, smart retailers are able to enhance the overall customer experience across all channels. These changes are essential. Retailers must evolve or increasingly risk falling behind as consumers adopt faster, more convenient, and more personalized shopping experiences.

Learn about the most important AI use cases in retail today across intelligent stores, omnichannel management, and supply chain optimization.

> **Intelligent Stores**

- > Store Simulation
- > Autonomous Shopping
- > Stockout Management
- > Asset Protection

> **Omnichannel Management**

- > E-commerce
- > Conversational AI
- > Augmented, Virtual, and Mixed Reality

> **Supply Chain Optimization**

- > Warehouse and Distribution Center Simulation
- > Predicting Demand and Forecasting
- > Routing Optimizations and Last-Mile Delivery
- > Logistics

INTELLIGENT STORES

With AI-enabled intelligent stores, retailers are reducing shrinkage, eliminating stockout, and gaining visibility into in-store customer behavior to optimize merchandising. They're using AI and computer vision to gain valuable insights from camera and sensor data, enabling real-time, smart decision making, improved operations, and increased efficiency. Additionally, the same infrastructure can be used for a faster customer checkout experience, including fully automated checkout systems and autonomous shopping.

STORE SIMULATION

Retailers such as Lowe's and Kroger are leveraging **NVIDIA Omniverse™** to improve the next generation of its stores with digital twins, simulation, and advanced tools that remove friction for customers and associates.

What's a digital twin?

A digital twin is a large-scale, physically accurate simulation of an asset, process, or environment with multiple autonomous systems that's perfectly synchronized with real-world data streams.

USE CASE: Store Simulation with Digital Twins

Lowe's is shaping the future of home improvement retail, using NVIDIA Omniverse and AI to enhance store layout, optimize merchandising, and improve associate productivity.



Image courtesy of Lowe's

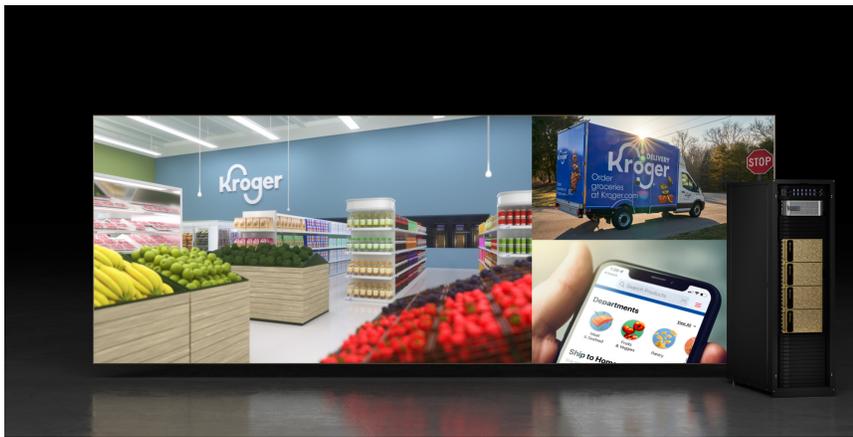
Kroger, the nation's largest grocer, and NVIDIA are partnering to build a state-of-art AI lab that uses digital twins and simulation to expand Kroger's freshness initiatives, improve shipping logistics, and create better shopping experiences in stores.



NVIDIA Omniverse Enterprise is an end-to-end collaboration and simulation platform for creating digital twins of stores, warehouses, and distribution centers.

▶ Watch this video to see how Lowe's is reinventing retail.

▶ Watch this GTC session to learn about customer-driven grocery shopping.



AUTONOMOUS SHOPPING

Autonomous shopping doesn't require cashiers or even self-checkout lanes. Customers simply select the products they want and walk out of the store. They receive a digital receipt of the products purchased and their credit card is charged automatically. This model is being offered both in fully autonomous and hybrid stores.

USE CASE: *Autonomous Shopping*

Żabka Group is now the largest chain of autonomous stores in Europe after launching 50 locations powered by AiFi within months. Those stores are spread out in six cities, providing a checkout-free experience to shoppers 24/7 in city centers, railway stations, subway stations, and universities. They consist of different store formats, including standalone container-based stores, retrofitted brick-and-mortar stores, and store-within-a-store.

AiFi expanded into the United Arab Emirates (UAE) as well in 2021 in partnership with the Majid Al Futtaim Group, the leading shopping mall, communities, retail, and leisure pioneer across the Middle East, Africa, and Asia, to launch the region's first checkout-free store, Carrefour City+.

As of August 2022, **AiFi's autonomous stores have served over 800,000 shoppers** and processed the purchase of nearly 2.5 million items worldwide.

STOCKOUT MANAGEMENT

When U.S. consumers are confronted with empty shelves, 20 percent postpone their purchase, 10 percent purchase the item elsewhere, and 16 percent shift to an online source, leading to retailers losing 46 percent of possible sales. Store associates are the face of retail organizations, so it makes sense to reduce the time they spend on tasks that aren't customer facing, such as performing inventory counts or scanning for out-of-stock situations. Large retailers are using AI to handle these critical, repetitive tasks. The technology can scan items to check stock levels and alert associates to restock, correct shelf location, and even adjust prices when needed.

▶ **Watch this video to learn how AiFi is providing autonomous checkout solutions.**

"By 2023, five Tier 1 grocery retailers will have adopted hybrid store models, installing "go-style," smart checkout formats within their larger superstores. "

—Gartner

ASSET PROTECTION

Retailers worldwide are losing over \$100 billion per year due to shrinkage, and half of that is happening in North America. To combat this, retailers can use intelligent video analytics (IVA) to accurately and efficiently reduce shrinkage. By improving asset protection at point of sale (POS) and reducing shoplifting throughout the store, brands can work to stop loss in real time. IVA applications from NVIDIA software partners can be integrated into existing camera systems to significantly reduce shrinkage without major infrastructure changes.

📺 **Watch video:**
Learn how AI-driven computer vision can protect assets.



Image courtesy of [Everseen](#)

EXAMPLE SCENARIO

The average shrinkage rate for a retailer is 1.62 percent according to a [study by the National Retail Federation \(NRF\)](#). As an example, if we use a hypothetical large retailer with an annual revenue of \$35 billion and 1,000 stores, that equates to \$567 million in loss due to shrinkage per year.

ASSET PROTECTION	BUSINESS VALUE
Annual Revenue	\$35,000,000,000
Percent Annual Shrinkage	1.62%
Total Shrinkage/Year	\$567,000,000
Number of Stores	1,000
Shrinkage/Store/Year	\$567,000
Shrinkage Reduction at Point of Sale (98% accuracy): 20% of Total Shrink	\$113,400,000

However, if AI-enabled asset protection is implemented at the point of sale, it has the potential to decrease shrinkage by up to 20 percent for a recovery of \$113 million in annual revenue.

EXAMPLE INVESTMENT	
Shrinkage Reduction per month (at POS)	\$9,450,000
Cost of One Server with three A30s (AP only)	\$22,000
Total Cost of Servers for 1000 Stores	\$22,000,000
Hardware Investment Recuperated in Months	Less than 3 Months

Installing edge infrastructure in the 1,000 stores would require an investment of \$22 million in hardware, plus the cost of software. With the deployed solution delivering a 20 percent reduction in shrinkage (over \$9 million per month), the infrastructure pays for itself in less than three months.

OMNICHANNEL MANAGEMENT

E-COMMERCE

Understanding consumer behavior and demand has never been more critical for retailers. To drive growth, real-time recommendations and augmented reality (AR) environments are being used to create personalized experiences. Retailers are achieving this with **NVIDIA Merlin™**, an open-source recommendation system powered by machine learning and deep learning algorithms. It accelerates the entire pipeline, from ingesting and training to deploying GPU-accelerated recommender systems. Significant benefits can result from personalization, according to a Boston Consulting Group (BCG) study, with retailers seeing "incremental revenue growth of 10 percent or more." According to BCG's Personalization Maturity Index, **"best-in-class retailers consistently realize a revenue lift of 25 percent or more from their efforts."**

Personalized customer experiences can give retailers a revenue lift of 25 percent or more.

USE CASE: Recommendation Systems and Visual Search

Consumers' shopping needs and desires can change daily or even within the same shopping session, requiring real-time recommendations. Additionally, the internet offers trillions of items that are constantly changing. Home Depot, the largest home improvement retailer in North America, uses AI to improve the online customer experience. They provide online shoppers with recommendations for visually similar products, predict future products of interest, and more.

—BCG

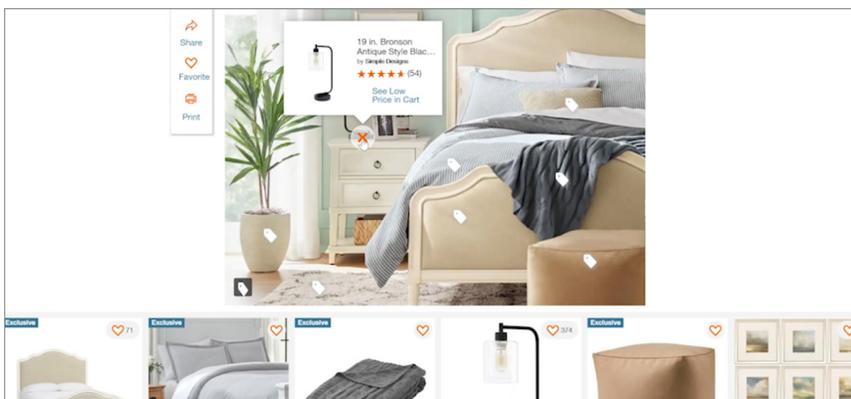


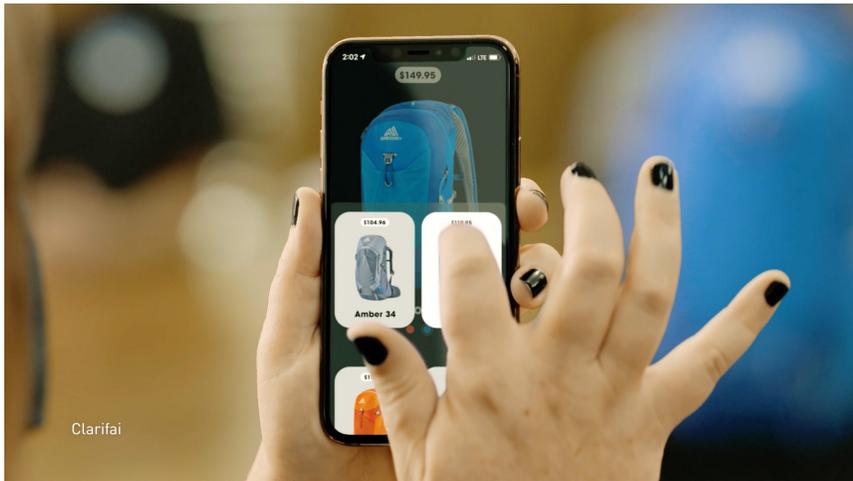
Image courtesy of HomeDepot.com

USE CASE: *Personalized Recommendations*

Stitch Fix, the fashion e-commerce company, combines the art of personal styling expertise with insights powered by GPU-accelerated deep learning to recommend outfits to its clients. Clients use Pinterest imagery to communicate their personal style to the Stitch Fix stylists. But, with four million active users, and rapidly growing, having stylists map the volume of photos to inventory wasn't scalable. Stitch Fix changed the game with its deep learning image recognition system that finds items for clients based on the clients' Pinterest style boards. Now Stitch Fix's 50+ style recommendation algorithms match clothing and accessories to clients based on their unique style preferences.

“Clients know what they like when they see it, so imagery is very helpful in allowing our clients to express their style to us.”

— TJ Torres, Data Scientist, Stitch Fix



CONVERSATIONAL AI

NVIDIA® Riva, lets retailers expand services by building and deploying AI applications that fuse deep learning models for speech recognition and speech synthesis, language understanding, and vision. For example, Square improved conversations between businesses and their customers by deploying conversational AI in its virtual scheduler. The Square Assistant can understand and provide help for over 75 percent of customers' questions.

 **Discover how Square is enhancing customer services.**

AUGMENTED, VIRTUAL, AND MIXED REALITY

Retailers have had to reimagine their omnichannel approach to create a seamless customer experience. Given consumers' increasing sophistication and changing buying behaviors, many companies have implemented virtual try-on and furnishing solutions to improve the online product-selection experience and reduce the burden and cost of returns.

USE CASE: *Furnishing Virtual Rooms*

Geomagical Labs uses mixed reality (MR)—powered by state-of-the-art computer vision, graphics, and AI—to help consumers design rooms in their homes. **IKEA has launched the application under the name IKEA Kreativ for its shoppers.**



SUPPLY CHAIN OPTIMIZATION

WAREHOUSE AND DISTRIBUTION CENTER SIMULATION

NVIDIA Omniverse™ Enterprise is an end-to-end collaboration and simulation platform for creating digital twins of stores, warehouses, and distribution centers. An Omniverse Enterprise digital twin is a large-scale, physically accurate simulation of an industrial asset, process, or environment with multiple autonomous systems perfectly synchronized with real-world data streams.

With Omniverse, companies can build a digital twin of their warehouse and then simulate and run multiple scenarios—such as increased demand during holidays, variations in layouts, and new workflows—to both train AI models and identify operational efficiencies that can accelerate throughput and optimize results. Retailers can use digital twins to discover how even small adjustments will impact operations before they make substantive changes or investments.

USE CASE: Optimized Distribution Centers

One billion PepsiCo products are consumed each day, enabled by a complex network of hundreds of distribution centers. With NVIDIA partner Kinetic Vision, PepsiCo is developing AI-powered digital twins of their distribution centers in NVIDIA Omniverse and optimizing operations with NVIDIA Metropolis and TAO—improving throughput, reducing downtime, and reducing energy consumption.



📺 [Watch this video to see how PepsiCo is exploring Omniverse Enterprise.](#)

"The downstream possibilities of digital twins is unlimited. From quality systems to robotics design development to consumer insights, digital twins bring value to the entire supply chain and product development cycle."

— [Jeremy Jarrett, President, Kinetic Vision](#)

PREDICTING DEMAND AND FORECASTING

Demand prediction uses data from numerous sources to ensure the right products are available in the right store at the right time. Using [machine learning](#) to improve forecast accuracy and inventory management has had a significant impact on optimizing the supply chain.

Effective demand prediction takes more than traditional forecasting data such as demographics and location into consideration. Many external future events such as weather or local sporting events can impact supply and demand too. By leveraging the [NVIDIA RAPIDS™](#) open-source data processing and machine learning software libraries on NVIDIA GPUs, retailers can accelerate training of their machine learning algorithms. This means that they can use more data and process it faster and more frequently to increase accuracy.

USE CASE: Improving Demand Forecasts

With over 100,000 different products in its 4,700 U.S. stores, the Walmart Labs data science team predicts demand for 500 million item-by-store combinations every week.

"Sixty-five percent of retailers consistently stock out on fast-moving categories and products, and 63 percent have too much inventory in slow-moving categories and products."

— [Intrado GlobeNewswire](#)

By performing forecasting with open-source RAPIDS libraries, built on CUDA-X AI™ on NVIDIA GPUs, Walmart speeds up feature engineering 100X and trains machine learning algorithms 20X faster, resulting in improved forecast accuracy, faster delivery of products, real-time reaction to shopper trends, and inventory cost savings at scale.

📺 Watch to learn how Walmart uses RAPIDS to optimize forecasting.



ROUTING OPTIMIZATIONS AND LAST-MILE DELIVERY

Several factors can impact the last mile of delivery, including mixed fleet management, dynamic rerouting for drivers, delivery time windows, ability to pick up and deliver, and real-time analytics. Using real-time data from a variety of sources—from GPS data to weather forecasts—routes can be optimized, which can significantly impact fuel, personnel, and other overhead costs. Beyond that, by using NVIDIA GPU-powered smart solutions, carriers can provide more accurate delivery windows, improving the level of service provided to customers. This instills a higher degree of trust, which matters when customers have an array of online shopping options.



of overall supply chain costs are attributed to last-mile delivery



of consumers didn't complete a purchase because it wouldn't arrive in time



of consumers will switch to a competing retailer if it offers a faster delivery service

Source: Capgemini The Last Mile Delivery Challenge 2019, Ecommerce Statistics

USE CASE: Routing Optimization

NVIDIA cuOpt™ lets developers leverage larger datasets and faster processing to optimize intra-logistics routing and last-mile delivery with new capabilities like dynamic rerouting, simulations, and sub-second response times in the warehouse and on the road.



 **Learn how cuOpt delivers new tools for dynamic logistics and supply chain management.**

The Benefits of cuOpt:

Reduces travel times and fuel costs by 15% with dynamic rerouting, which saves companies millions

Routes 1,000 packages in 10 seconds instead of 20 minutes with the same level of accuracy

LOGISTICS

Warehouse logistics, more specifically “intralogistics operations,” is the art of integrating, automating, and managing the flow of products in fulfillment or distribution centers. NVIDIA GPU-powered AI solutions deliver a level of consciousness throughout. With **intelligent video analytics (IVA)**, **robotics**, and autonomous automation, operations become more intelligent and efficient, throughput accelerates, and warehouse robots deliver end-to-end visibility, increasing the accuracy of orders picked, packed, and shipped.

USE CASE: Adding Intelligence to the Warehouse

In 2021, retail e-commerce sales amounted to approximately \$4.9 trillion USD worldwide. This figure is forecast to grow by 50 percent over the next four years, reaching about \$7.4 trillion by 2025. In the U.S., Walmart’s e-commerce sales have grown 79 percent year over year. This rapid growth for all retailers has put incredible pressure on both the supply chain and logistics throughout.

“Businesses will gain between \$1.3 trillion and \$2 trillion each year in economic value by using AI in their supply chains.”

— **McKinsey & Company**



Image courtesy of **KION Group**

Thousands of orders are placed online every hour. To respond to this pressure and increase business agility, data scientists at Zalando, Europe’s leading online fashion retailer, applied deep learning powered by NVIDIA GPUs to develop the Optimal Cart Pick algorithm. The algorithm resulted in an 11 percent decrease in workers’ travel time per item picked.

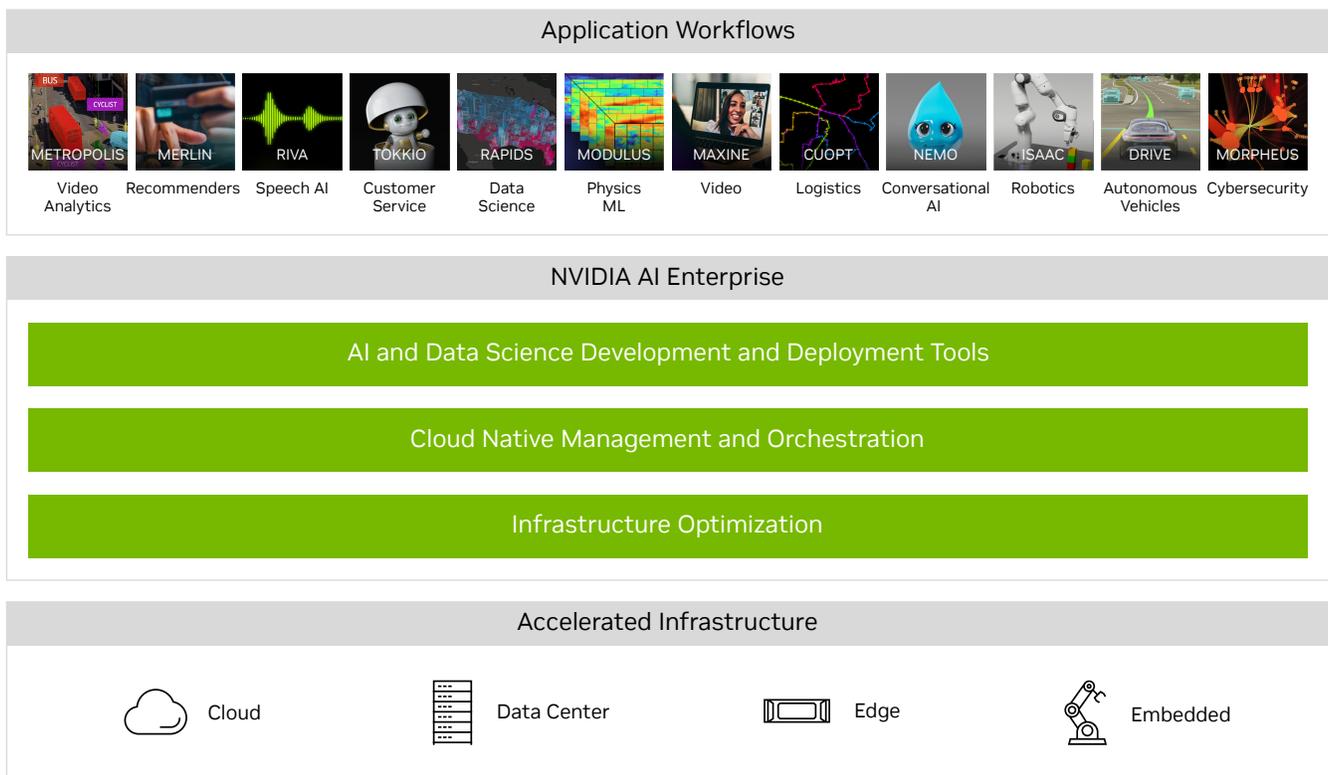
[Learn more about AI in warehouse logistics.](#)

INTELLIGENT RETAIL POWERED BY NVIDIA AI

Retailers can unlock the potential of AI with **NVIDIA AI Enterprise**, a cloud-native suite of software optimized for the development and deployment of AI. The operating system of the NVIDIA AI platform, NVIDIA AI Enterprise includes an extensive library of frameworks that are essential for building smart retail applications: NVIDIA Riva for speech AI in chatbots and voice assistants, NVIDIA Merlin for highly accurate, personalized recommenders, NVIDIA Metropolis for computer vision, and more. It’s certified to deploy anywhere and includes global enterprise support to keep AI projects on track.

NVIDIA AI PLATFORM

End-to-end open platform for production AI



SHAPING THE FUTURE OF RETAIL

NVIDIA offers industry-leading technology combined with extensive, expertise and a broad network of software partners that enable retailers to implement ready-to-use AI solutions or build an internal AI Center of Excellence. With solutions for intelligent stores, omnichannel management, and supply chain optimization, NVIDIA is uniquely positioned to power end-to-end AI in retail, from the edge to the data center to the cloud.

Ready to Get Started?

To learn more about how AI is reinventing retail, visit www.nvidia.com/retail or contact an AI expert from our Retail team at retail@nvidia.com