

NVIDIA PRIMER

ARTIFICIAL INTELLIGENCE AND
DEEP LEARNING IN RETAIL



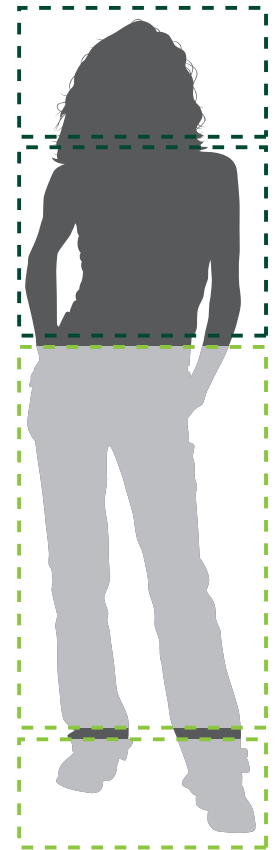
What are the Trends
Driving Change in Retail Today?



Change in the retail industry has been accelerated by new competitors and the massive global digital transformation of the last few years. Underlying this are two trends driven by technology.

First is the use of technology to understand the rapidly shifting attitudes and sentiments of highly informed buyers, whose changing preferences for web and mobile reverberate across the industry. The success of technology-savvy, aggressive, and 'think-big' startups (along with Amazon) are also putting pressure on more traditional retailers to come up with new answers.

Many do not realize that more than half of Amazon's sales are not anticipated in advance, but come from their recommendation engines which lay a sophisticated collection of related opportunities in front of buyers based on their basket, search history, and what others have done.

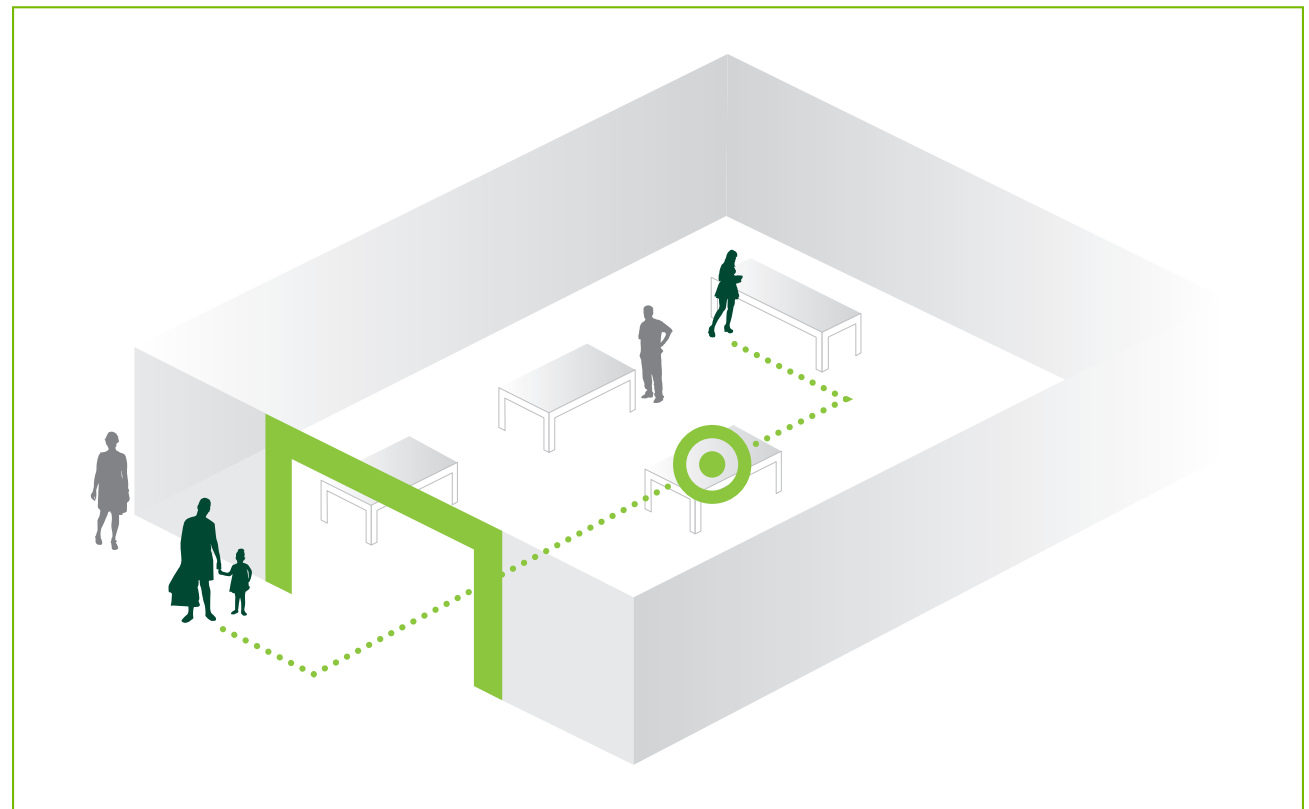


FACT: The amount of data is doubling every two years, to 44ZB by 2020. (IDC's Digital Universe Study)

The pressure traditional retailers face is how to utilize their own data to increase conversion rates and revenue by understanding behavior to find new ways to increase foot traffic or identify innovative new channels via mobile, web, social media and using ad tech. Big Data Analytics and now increasingly machine and deep learning are all being used in understanding the consumer in order to get more goods 'into the basket' and to the consumer quicker.

For companies with a lot of physical presence, this might mean analyzing everything from

weather and traffic to where shoppers are spending their time in the mall or on social media to a highly granular level, and then deciding where to put associates with the right answers closer to the hotspots where sales are not converting.



Second, retailers are searching for an efficient operating model to succeed in a digital world.

Retail fashion powerhouse Zara, for example, reportedly now needs just ten to fifteen days to develop and get a product into stores, compared to the six-month average. It launches around 12,000 new designs a year and ships to stores twice a week. Inditex, which owns Zara, prides itself on being 'the king of fast fashion' centered around speed in responding to the market by being deeply integrated and exerting control over the entire fashion process via data and technology.

▶ Only 15% of CPG executives currently believe they have the operational capability to rapidly respond to changing market conditions.

(Source: Accenture)

FACT: Companies with strong cross channel customer engagement see a 9.5% year-over-year increase in annual revenue. (Aberdeen Group)

What are the
Implications?



The Internet of Things (Iot) Has Continued to Drive the Explosion of Data.

From devices to sensors, in stores and on clothes such as wearable RF-ID tags, shelf beacons, smart hangers, smart location-sensing wifi, and smart context-aware mobile apps. The amount of data is doubling every two years, to 44ZB by 2020, and 90% of the retail data now in use is less than two years old.

(Source: IDC's Digital Universe study and ScienceDaily)

There is also a continued rollout of innovative new mobile technologies, such as personalized digital assistants (*think: where can I find ..*), to visual search (*think: find me something that looks like this*) to virtual reality fitting (*think: tell me if this will fit me*) creating a huge need for faster and deeper automated analysis of data.

Personalized Digital Assistants



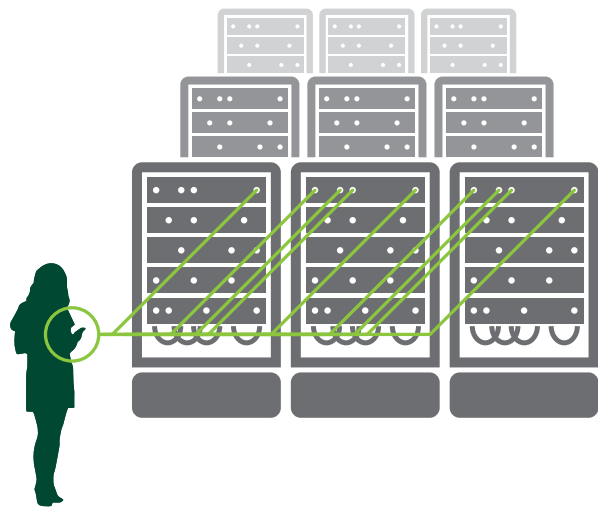
to Visual Search



to Virtual Reality Fitting

FACT: Customers return about 23% of their purchases both in-store and online, costing retailers \$643 billion per year. (MarketWatch)

Legacy retail IT systems were simply not originally designed to handle this volume and complexity of concurrent data, with up to millions of real-time simultaneous requests from multiple data silos and real-time streaming and a sub-second response expected. Existing data architectures are also too complex, and data integrations and processes too brittle.



- ▶ Executive, business case owners and data center architects are the ones pushing IT to provide adequate computing resources. IT realizes that GPU computing servers are the building block of the modern datacenter for accelerated analytics, machine and deep learning.

FACT: There are 5 Billion smart consumers with US \$5.4 Trillion to spend. (UpstreamCommerce)

What is the Opportunity
for Artificial Intelligence
and Deep Learning?



The mobile ad market alone will surpass \$100 billion by next year. Some projections put augmented and virtual reality investment in retail at close to \$30 billion by 2020.

(Source: WSJ; Harvard Business Review)

Retailers are most often looking to create an instant 360 degree view of every customer and to create new kinds of shopping experiences via **recommendation engines** that can interact with the consumer online based on this knowledge. The goal is to develop new disruptive products, services, and processes via predictive modeling and micro targeting and pricing.

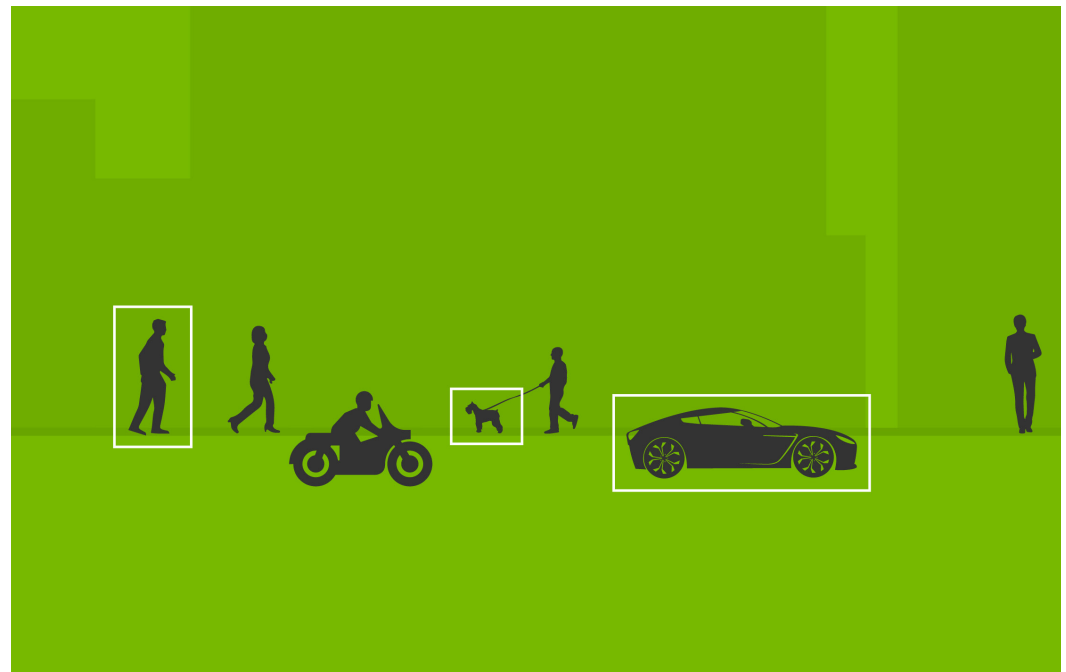
Retailers are seeking to understand sentiment: when we prefer to shop and why we shop in a store, online, or via a mobile device and be able to suggest new products in context via in real-time couponing, on mobile text or via email, as part of loyalty programs, or using intelligent ad tech. A mix of customer



knowledge (preferences, taste, buying power, spending, and patterns) combined with external factors (weather, sports, calendar) used by deep learning allow ad tech to issue highly relevant suggestions drastically increasing conversion rate at the store or during online shopping. Smart and dedicated communication based on a customer's unique taste and preferences is key to customer loyalty and retention.

Retailers have also turned to things like accelerated analytics, robotics and deep learning to help them to optimize their supply chain to make the journey of goods from the warehouse to the store and out of the door as fast and efficient as possible. The goal is to minimize shelf life and sell as much as possible before having to pay for it.

Although deep learning applies across the board, three current excellent examples are image object recognition, natural language processing, and autonomous robotics.



- > For image object recognition deep learning can be used to recognize and to track people and products detected by the cameras being put into the basket through to the point of sale.
- > For natural language processing, products like Amazon Alexa and Google Home are early examples of talking vs. typing at home. But you'll also soon be able to ask the robot in the store: "where are the men's accessories?"
- > Autonomous robotic devices are mostly used in distribution centers or hubs where goods are going in and out to speed the re-distribution to stores, or directly to the home.

How are Analytics Strategies
Being Accelerated by
AI and GPU Computing?



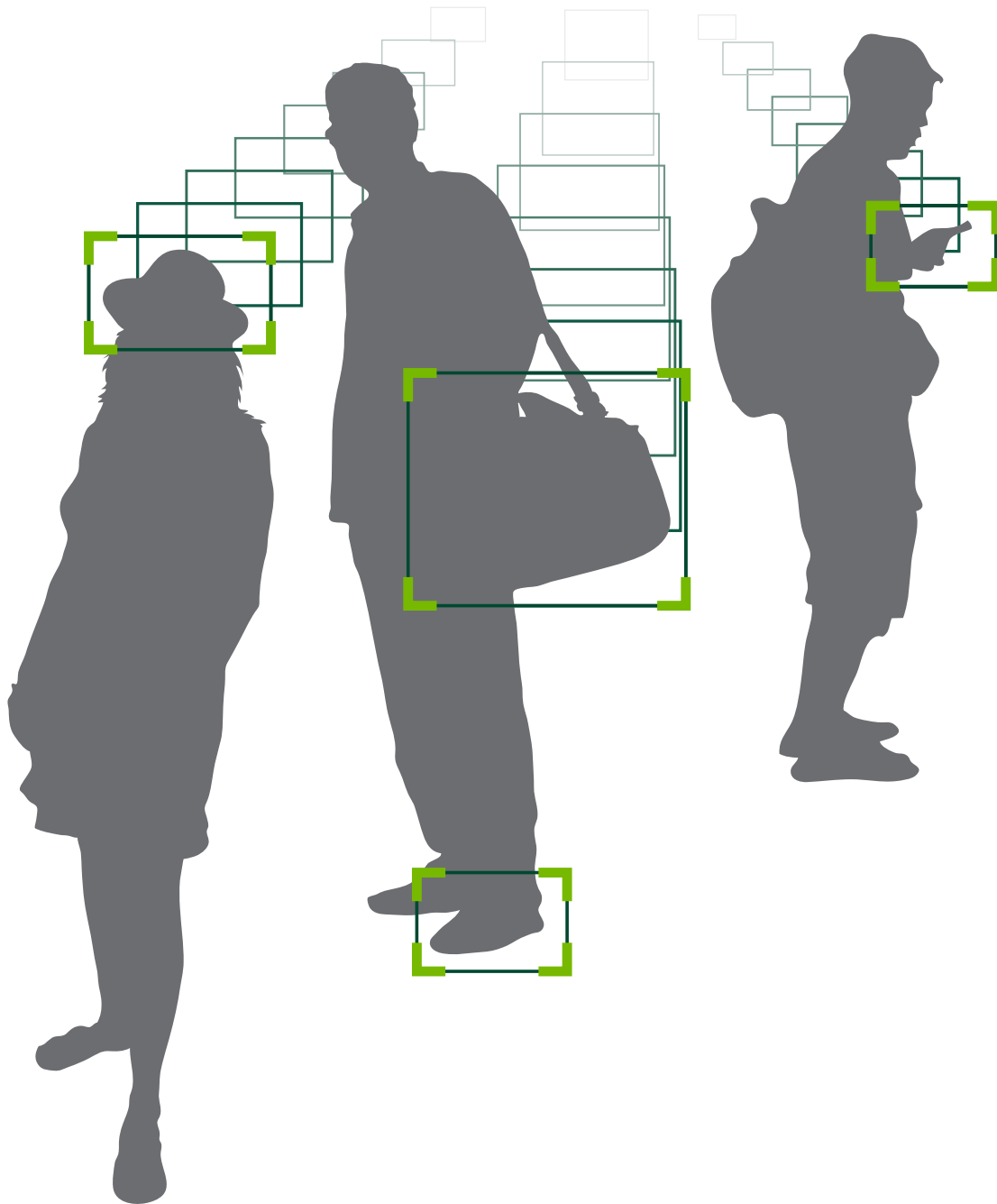
The Use of Data and Analytics has Been Widely Accepted and Recognized Across the Whole Retail Industry for Quite a While.

All retailers are using the data they're collecting to draw conclusions, understand processes, and to try to make the supply chain as efficient as possible. They are now starting to expand that to real-time data streaming.

The data explosion being experienced throughout the retail industry is opening up new analytics use cases. Things like managing inventory SKU proliferation, buyer preference tracking, integration between partners in the supply chain, and even linking overstock information to ad tech are possible now.



FACT: 90% of the data now in use is less than two years old. (ScienceDaily)



Retailers are using GPU computing to significantly shorten data processing time for analytics tasks, to visualize large data sets, in instantaneous ad tech, and to uncover patterns that can reveal new insights in sub-second times. For example there are a lot of vendors providing predictive price and forecast simulations that evolve over time based on competitive and public market data, aimed at increasing revenue by small percentages that add up to millions for a larger retailer.

What are the Top
Use Cases and Startups?





A leading profit optimization software company, enabling performance-driven retailers to leverage predictive analytics and demand-based science in building shopper-centric, responsive merchandising strategies that create a sustainable competitive advantage. Some companies are using a mix of accelerated analytics and deep learning to help retailers working on their pricing strategy.

Ad Tech

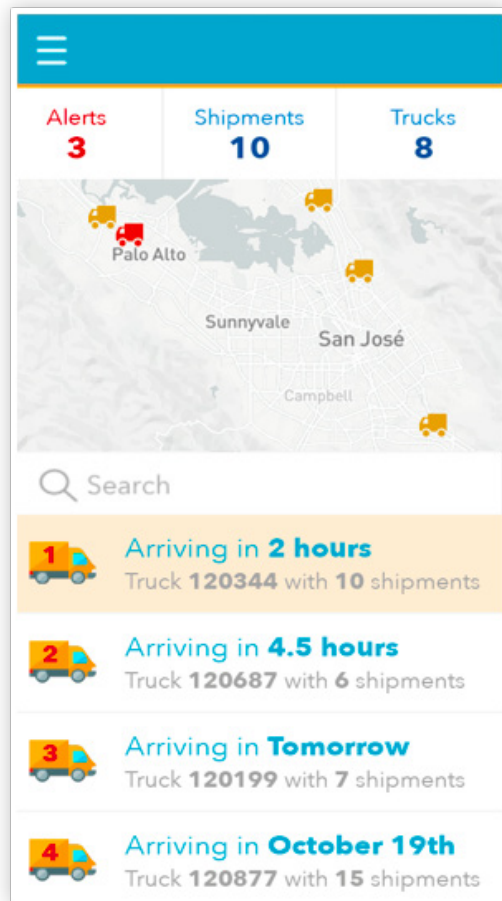
The term “ad tech,” which is short for advertising technology, broadly refers to different types of analytics and digital tools used in the context of advertising. Discussions about ad tech often revolve around the extensive and complex systems used to direct advertising to individuals and specific target audiences.



FACT: The Mobile Ad market to surpass \$100 Billion next year. (WSJ)

kinetica

Kinetica's distributed, in-memory database simultaneously ingests, explores, and visualizes streaming data for truly real-time actionable intelligence. Kinetica leverages the power of NVIDIA GPUs to deliver results 10-100X faster and 10X more cost effective than traditional databases.

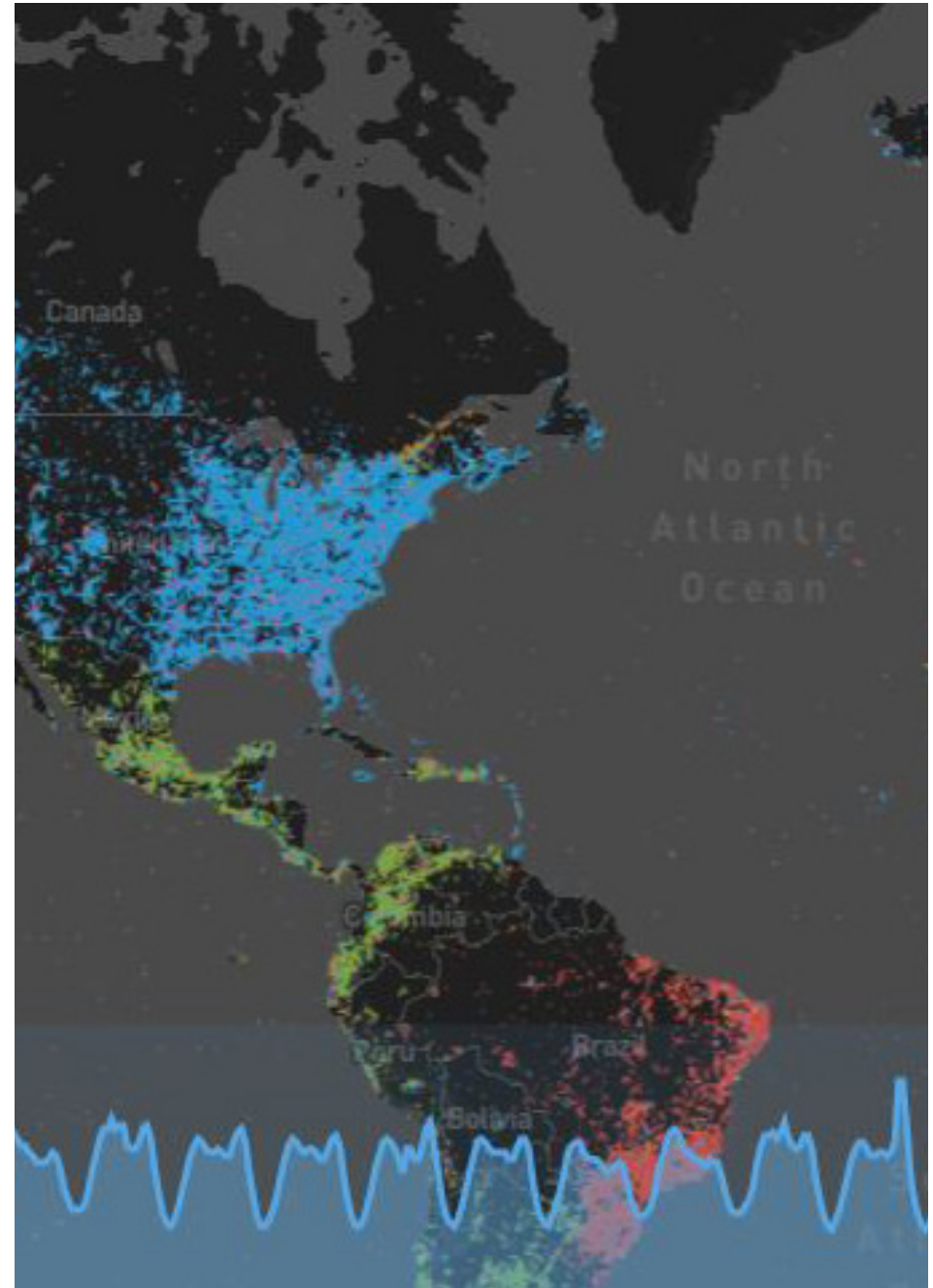


IN RETAIL IT IS USED TO CORRELATE DATA FROM POINT OF SALES (POS) SYSTEMS, SOCIAL MEDIA STREAMS, WEATHER FORECASTS, AND EVEN WEARABLE DEVICES. ALSO, TO TRACK INVENTORY IN REAL TIME, ENABLING EFFICIENT REPLENISHMENT AND AVOIDING OUT-OF-STOCK SITUATIONS.



MapD is a lightning fast, SQL-compliant database and visual analytics layer that harnesses the power of NVIDIA GPUs to explore multi-billion row data-sets in milliseconds. By combining a purpose-built GPU database with a rich visualization layer, MapD is able to deliver immersive, instantaneous analytics on data sets previously considered too large to explore interactively.

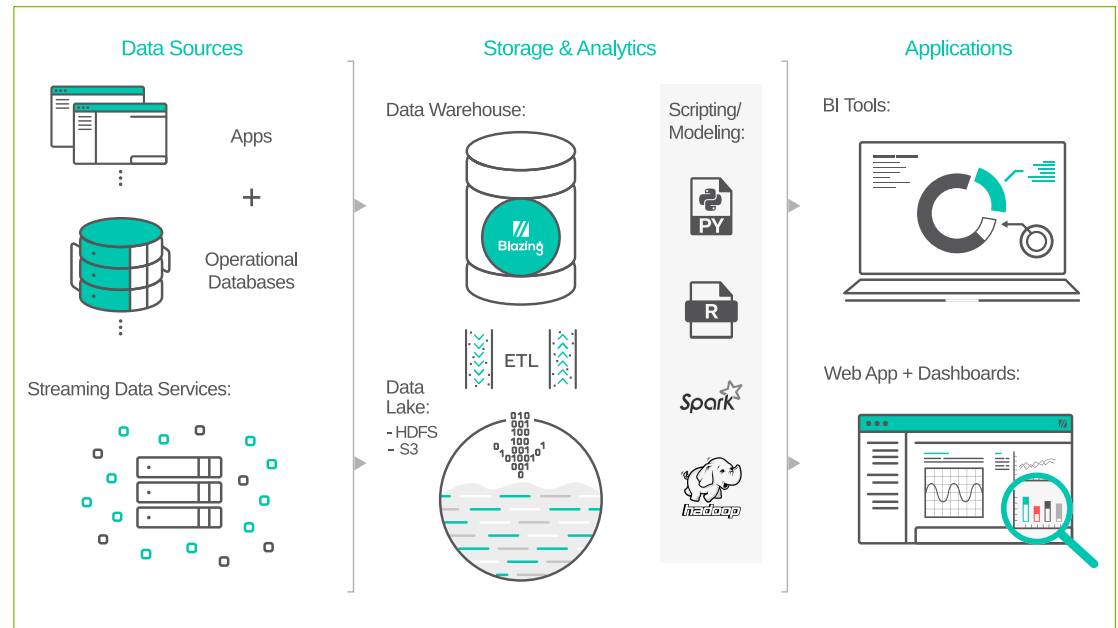
IN RETAIL IT'S USED TO ANALYZE HISTORICAL SALES TO ASSESS GEOGRAPHIC PRODUCT DEMAND FOR FUTURE INVENTORY AND STORE LOCATIONS.





BlazingDB is a high performance SQL database for petabyte scale needs. Through the use of a distributed and GPU architecture, BlazingDB offers a revolutionary new generation of SQL.

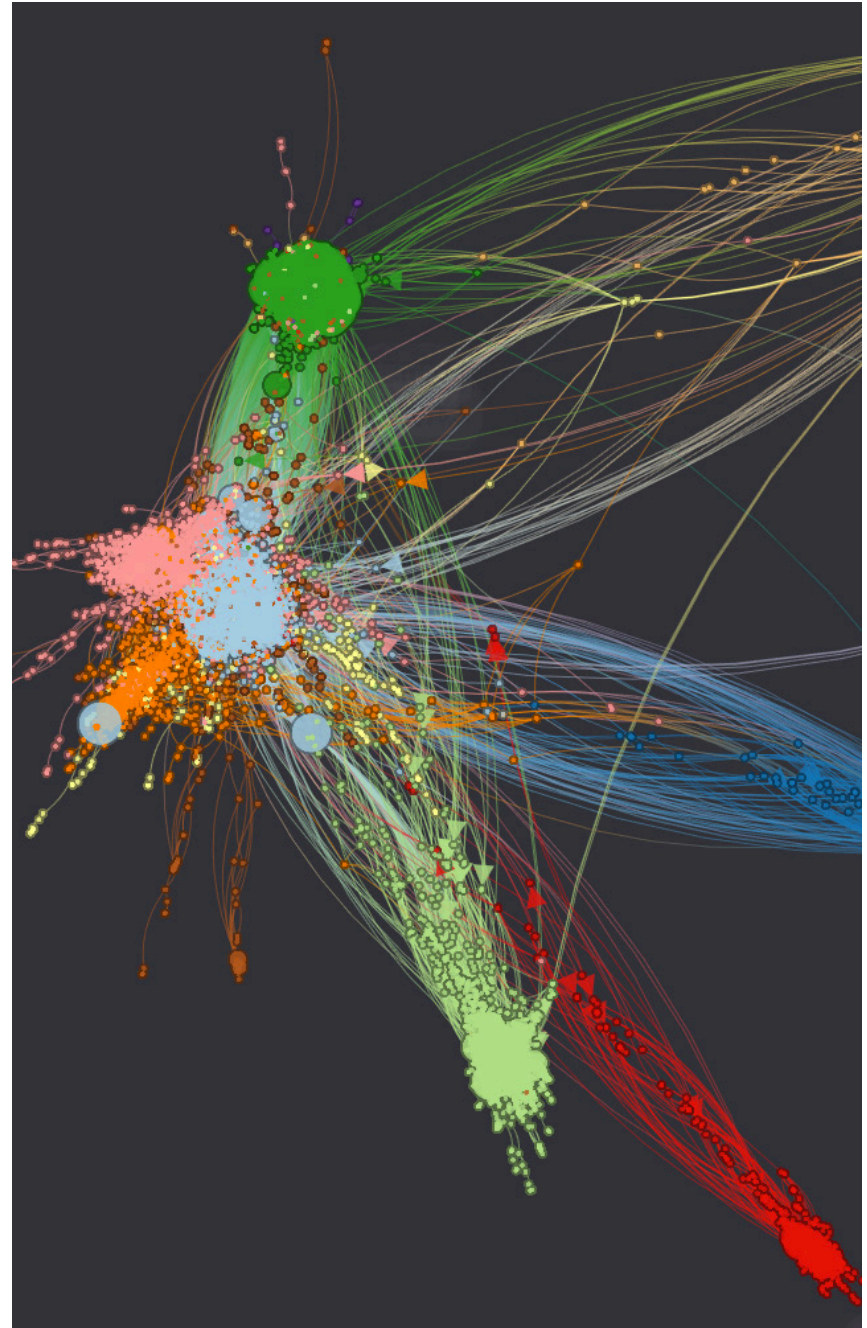
IN RETAIL BLAZINGDB IS USED FOR TRANSACTIONAL DATA, AS WELL AS TRACKING SALES AND INVENTORY FOR EASILY ANALYZED SQL DATABASES. FOR EXAMPLE, RETAIL ORGANIZATIONS RUN MASSIVE PROFIT OPTIMIZATION CALCULATIONS EACH DAY TO KNOW WHAT PRODUCTS TO DISTRIBUTE TO WHAT STORES. THE INTENSITY OF THIS CALCULATION, AND THE TIME-SENSITIVE NATURE OF DISTRIBUTION MAKES LARGE SCALE DISTRIBUTED SQL ATTRACTIVE.





Graphistry is a graph visualization platform, powered by NVIDIA GPUs, that allows customers to interactively visualize millions of data points. Enabling customers to see 100X more in subseconds change the dynamic of how customers will interact with and derive insights from their data.

IN RETAIL, GRAPHISTRY IS CREATING AN INTERESTING TECHNOLOGY TO CONNECT AND UNDERSTAND CUSTOMER PREFERENCES. IT DRAWS CONNECTIONS BETWEEN CUSTOMERS, THE PRODUCTS THEY ALREADY USE, AND THEIR SHOPPING PREFERENCES IN A VISUAL WAY.





GoFind.AI. California-based startup GoFindAI launched their new fashion app that makes shopping for clothes a breeze. Simply snap a photo of something you like, and the app's AI-powered search engine scours over one million products from 1,000 online retailers looking for the same or similar items. Once trained, the app's intelligence analyzes patterns, structures, styles, colors, and other details to recommend the product you're looking for.

The image shows a smartphone displaying the GoFind app interface. The phone screen shows a search for a hat, with a photo of a woman on a boat as the input. The app's AI engine has identified the hat and recommended three similar products from different retailers. The search results are displayed on a red background. The first result is a "Woven Straw Fedora" from Forever21 for \$14.90. The second result is a "Maison Michel Virginia Straw Fedora Hat" from Farfetch for \$668.56. The third result is a "Gottex Alhambra Straw Fedora w/ Navy Band" from Last Call Neiman Marcus for \$60. The app interface also shows a "Share" button and a row of small thumbnail images of the recommended hats. At the bottom of the screen, there are buttons to download the app from the App Store and Android.

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GO FIND

Woven Straw Fedora Forever21 \$14.90

Farfetch \$668.56
Maison Michel Virginia Straw Fedora Hat

Gottex Alhambra Straw Fedora w/ Navy Band Last Call Neiman Marcus \$60

Share

DOWNLOAD on the APP STORE

DOWNLOAD for ANDROID



ThirdLove is an app that enables women to find the right fitting bra from home using a mobile device and deep learning.



VOLUMENTAL

Volumental Offers computer vision applications for sizing shoes and eyewear to create a individualized retail experience for customers.



Daisy Intelligence is using AI to determine what deals a retailer should offer or what the featured product on an ad campaign should be, using massive sets of consumer data.

New Zealand's IMAGR and Silicon Valley's Mashgin are helping supermarkets offer self-checkout to save shoppers time using artificial intelligence. IMAGR founder William Chomley wants customers to skip the checkout altogether, so you can just walk right out the door. It's similar to the idea behind Amazon Go, being tested in a grocery store in downtown Seattle, which lets customers shop without ever stopping at a cashier on the way out. [Read here.](#)

- **IMAGR** makes SmartCart, a grocery cart with an AI computing video camera attached. The device tracks what goes into the cart, tallies the total along the way and syncs that with payment information on the shopper's mobile phone.

- **The Mashgin** self-checkout station features a very simple user interface. Customers simply place their lunch on the device, where five 3D cameras examine it from different angles to identify and price each item. To pay, customers swipe a credit card.

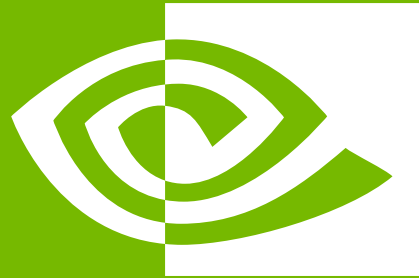


STITCH FIX

Fashion startup **Stitch Fix** is applying deep learning to match their customers with personalized clothing recommendations. Stitch Fix's natural language processing algorithms decode written answers from customers' feedback on what they liked or disliked about each item. This data is then used to make better recommendations to the next shipment.



Deep learning startup, **ebo box**, is helping consumers shop for gifts by learning about the gift-givers and recipients and combining that with data collected about general user preferences in the market.



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