Solution Brief

Retail
Point of Sale

ShopAssist Addresses Retailers' Challenges with AI-Enabled Self-Checkout

Intel® Core™ processors, Intel® Arc™ graphics, and Intel® Distribution of OpenVINO™ toolkit power ShopAssist to accelerate checkout, improve customer experiences, and reduce shrinkage

ShopAssist's ease of use creates a happy experience for customers and employees alike.

Executive Summary

Many retail operations today rely on self- and autonomous checkout systems to help optimize their business. However, these checkout solutions introduce new challenges for the business, the customer, and the IT department. With the advancements of Artificial Intelligence (AI), machine learning (ML), computer vision, and hardware and software designed to accelerate AI, a new generation of checkout solutions is appearing. Enter ShopAssist by RadiusAI.

ShopAssist is an "Assisted" checkout solution that uses two party product design, advanced computer vision and Intel® architecture to address the challenges retailers face today with current self-and autonomous checkout systems. This solution brief looks at these challenges and how ShopAssist addresses them to create a more efficient operation, enable a better shopping experience, and simplify deployment.

Retailers' Challenges with Self/Autonomous Checkout

Many retail companies run on some of the thinnest net profit margins in commerce—0.5 to 3.5 percent, according to InvergeHQ.[1] Therefore, volume is paramount. Moreover, retailers have difficulty hiring qualified staff. Processes and technologies—including automation solutions—are critical to help drive and support volume and maintain excellent customer service with limited personnel. While retailers have embraced self- and autonomous checkout solutions to meet these needs, these solutions present important challenges to business operations, customer experience, and technical application as summarized in Table 1 (on the next page).

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"ShopAssist is the holy grail of retail."

– COO of top 10 convenience store chain

Benefit	Challenge
Business Operations	
Reduce cashiers needed	Increased risk of shrinkage, to the point some stores have closed or limited self-checkout[2]
Improve inventory tracking	Not effective for reducing shrinkage, resulting in unexpected out-of-stock items
Customer Experience	
Self-service for faster experience	Non-coded items and non-inventoried items can lead to frustration and slow down checkout Large numbers of items become cumbersome Inefficient handling of age-verified products, slowing down checkout Intimidated by technology and other checkout experiences
Reduce store staffing	Customer waits for assistance, checkout is delayed Store assistant becomes a troubleshooter for frustrated customers Less friendly human interaction erodes in-store retail's biggest advantage over e-tail
Technical	
Standalone, integrated, dedicated system	Expensive, complex, not easily adaptable to modern AI approaches

Table 1. Self/Autonomous Checkout Challenges.

AI Comes to Retail

From Barcodes to Computer Vision

Retail technologies have evolved, with each stage benefiting both the business and customer at some level. While barcodes helped automate inventory and accelerate the checkout process, limitations remain that hamper the customer experience. RFID tags, although expensive and limited like barcodes, enable some autonomous checkout and serve as a good inventory management tool but are not ideal for checkout.

AI is one of the fastest-growing methodologies in technology-based solutions. Technology solution developers at-large have embraced AI methodologies, enabling innovative solutions for retail. Computer vision is one of these AI methodologies with the following capabilities:

- Enables frictionless checkout and enhances loss prevention for brick-and-mortar stores.
- Uses artificial intelligence to "see," interpret and learn new product image data.
- Instantly recognizes products, anomalies, and anything that can be captured in an image.
- Can be deployed in cameras, edge servers, or the cloud.

Computer vision is magnitudes faster than human recognition, and trained models are incredibly accurate. Retail solutions are incorporating computer vision into many areas of the store, including:

- Analysis of customer traffic patterns to gain insight into customer behavior and product presentation.
- Acceleration of the checkout process without requiring the customer or associate to scan barcodes.
- Reduction or elimination of the need for ID tags.

Applying AI and computer vision technology to retail applications is compelling for the industry, enabling new methods of understanding customers, tracking inventory, and optimizing operations to help reduce costs.

RadiusAI—Intelligent Solutions for Retail

RadiusAI develops AI-based computer vision solutions for the retail industry. RadiusAI's human-centric approach drives its design of products to complement the skills of retail staff and enhance the customer's buying experience. Collaborating with retailers to create solutions that are both advanced and pragmatic, RadiusAI engineers use leading technologies, including Intel® processors and Intel® AI technologies, to address the challenges retailers face daily.

ShopAssist—AI-Powered Assisted-Checkout

The ShopAssist Platform

ShopAssist (Figure 1), from RadiusAI, is a small, easily deployed platform for accelerating customer checkout and simplifying the customer shopping experience. Cameras and AI software recognize items placed on the ShopAssist platform, reducing the need for customers to manage scanning, while the software updates the Point of Sale (POS) terminal. The system can be provided as a standalone platform or integrated into an existing POS system. It is ideal for convenience stores, grocery chains, and many other environments where customers can check themselves out quickly and easily.

ShopAssist provides:

- Significantly improved physical design enabling a two-party or one-to-many experience for customers.
- Automated item scanning of multiple products at once using computer vision/AI.
- Adaptive product handling to improve efficiency with special items, like age-verified goods.
- Automated SKU learning adapts to new stock items during checkout for up-to-date inventory management, helping to lower operating costs and reducing customer frustration.
- Recognition of foreign items, such as phones, keys, or wallets which may be placed on the platform with checkout items.
- Seamless integration into existing POS systems, maintaining the continuity of an existing checkout process while simplifying deployment.
- Further reduce shrink by automatically building a basket for the customer and avoiding intentional or inadvertent scanning errors (requires Shop Assist Pulse license which leverages existing store cameras).
- Improved labor efficiency without drop in customer satisfaction or increased shrink.
- Improved flow at rush hours thanks to faster checkout times, saving 15-30 seconds for each transaction.

Intel® AI and Computer Vision

Computer vision uses a process called deep learning to form computer neural networks that train systems to recognize—and even track—objects in images (and video). Convolutional neural network (CNN) techniques are among the types of computer neural networks used in computer vision. Software is used to build these CNNs to train computer vision models and to analyze and recognize object characteristics in images (a process called inference). Valuable in a wide range of environments, from cloud to edge, computer vision systems can quickly recognize objects, inspect manufactured products, and much more.

Intel has a rich portfolio of technologies to accelerate AI-based solution development and deployment, including solutions using computer vision. Intel's portfolio includes software, libraries, CPUs for general purpose processing, GPUs for AI training and graphics processing, and vision processing units (VPUs) for acceleration. Among the many AI software tools from Intel, the Intel® Distribution of OpenVINO™ toolkit provides computer vision solution developers the capabilities to accelerate image analysis and object recognition.

OpenVINO stands for "Open Visual Inference and Neural Network Optimization." The Intel Distribution of OpenVINO toolkit provides developers with improved neural network performance on a variety of Intel devices and helps them further unlock cost-effective, real-time vision applications, such as in retail. The toolkit enables deep learning inference and easy heterogeneous execution across multiple Intel® platforms (CPU, Intel® Processor Graphics, FPGA, and more), enabling implementations across cloud architectures to edge devices.

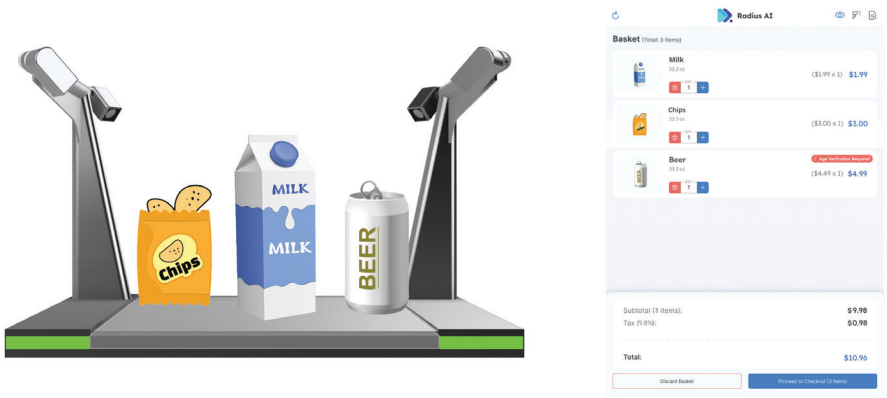


Figure 1. ShopAssist platform uses computer vision to quickly recognize multiple products at once, updating the checkout terminal. This includes age-verified products with cashier alerts for items such as alcohol.

ShopAssist helps improve the experience for the customer and between store personnel and the customer. The system promotes closer interaction with customers, like the familiar face-to-face experience, while accelerating the checkout process and reducing the length of checkout lines (Figure 2). Thus, it helps improve the overall shopping experience and ultimately customer loyalty.

ShopAssist allows a balanced approach that adapts to a wide range of products and store layouts. It integrates seamlessly with many existing systems, avoiding the need for extensive modifications. ShopAssist also helps reduce shrinkage with automatic, accurate product recognition, reducing accidental or intentional scanning errors.

ShopAssist addresses the challenges with self- and autonomous checkout systems. Table 2 summarizes the differences between self- and autonomous checkout and ShopAssist.

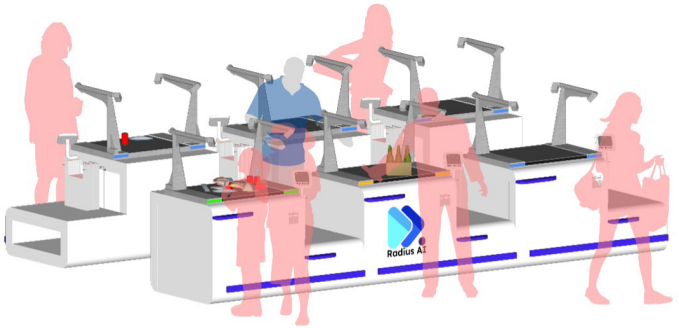


Figure 2. Figure 2. One employee (blue person in the middle) can oversee multiple ShopAssist devices and interact face-to-face with customers.

Optimized to Accelerate Retail with Intel® Architecture and Intel® AI Technologies

ShopAssist was optimized to run on Intel® Core™ processors and Intel® Arc™ GPUs and can be easily installed on any platform with the 12th Gen Intel® Core™ processor (or later), including 14th Gen Intel® Core™ Ultra processor and the Intel® Arc™ A770M graphics card.

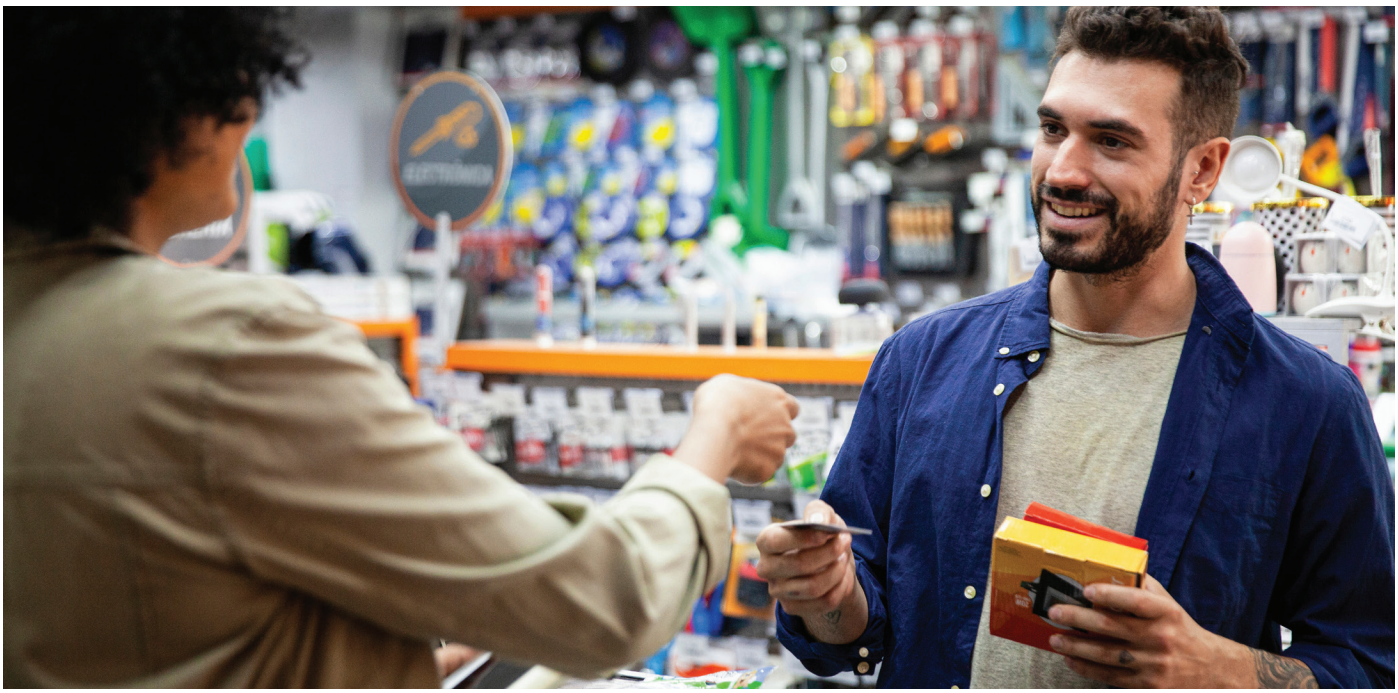
14th Gen Intel Core Ultra processors integrate an advanced hybrid architecture with up to eight Performance-cores (P-core) and up to 16 Efficient-cores (E-core). With built-in AI acceleration, high clock speeds, performance and efficiency cores, plus more cache, these CPUs are ideal for business and retail applications.

Intel Arc GPUs are high-performance graphics solutions that accelerate graphics, video, and AI operations. As part of the ShopAssist self-checkout solution, the Intel® Arc™ A770 and Intel Arc A770M graphics cards integrate video codecs to speed processing of each video frame, while advanced AI accelerators quickly inference features of objects in the image.

The Intel Distribution of OpenVINO toolkit optimizes model inferencing on Intel architecture, accelerating the performance of ShopAssist on Intel Core processors. Designed to enable AI applications across heterogeneous Intel technologies, the Intel Distribution of OpenVINO toolkit allows easy migration and upgrades of ShopAssist across different generations of Intel Core processor-based platforms, making it a long-term solution to retail challenges.

ShopAssist	Self-Checkout	Autonomous Checkout
Reduced Customer Workload	High customer workload	Minimal customer workload
Enhanced Shrinkage Control	Variable shrinkage control	Challenging shrinkage control
High Adaptability to Diversity of Product Offerings	Limited diversity of product offerings	Limited diversity of product offerings
Automated Learning of New SKUs	Manual learning of SKUs	Manual learning of SKUs
Requires No Modifications to the Store	Requires modifications to the store	Requires modifications to the store
Supports Thousands of SKU Handling Capability	Limited SKU handling capability	Limited SKU handling capability
Seamless Age-Verified Products Handling	Complex age-verified products handling	Complex age-verified products handling
Seamless Integration with Existing POS Systems	Variable integration with existing POS systems	POS included

Table 2. Overview of how ShopAssist excels in comparison to self-checkout and autonomous checkout solutions.



With the ShopAssist checkout solution, employees are able to better assist customers through face-to-face interactions.

Summary and Conclusion

RadiusAI is committed to creating technology that's not only smart but also empathetic to human needs, aligning with the real-world challenges of brick-and-mortar stores. ShopAssist accomplishes this mission using computer vision with built-in accelerated AI capabilities to enable a new generation of self-checkout solutions for many retail environments. ShopAssist solves a multitude of business challenges not addressed by today's self- and autonomous checkout systems. It improves overall efficiency, helps reduce shrinkage, accelerates checkout, allows easy addition of unrecognized inventory, and addresses age-verified goods.

ShopAssist improves the customer's buying experience by reducing the expectations on the customer (no more barcode scanning) and gives the customer a face-to-face experience with the store associate.

ShopAssist is easy to deploy, with easy connection to the existing POS terminal and software infrastructure. It runs on standalone hardware with a minimum of the 12th Gen Intel® Core™ i7 processor and Intel Arc A770 or Intel Arc A770M GPU. For more sophisicated, virtual operations, it can be deployed in a container on a larger platform. The software is optimized for reliable, high-performance Intel technology.

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Contact RadiusAI at radius.ai/contact to learn more and see ShopAssist in action or visit radius.ai/shopassist.

intel

[1] https://invergehq.com/what-is-the-average-profit-margin-on-retail/#:~:text=The%20average%20gross%20profit%20margin%20of%20retail%20businesses%20is%2053.33%25

[2] Gibson, Kate. "Walmart Joins Other Big Retailers in Scaling Back on Self-checkout." CBS News, April 19, 2024. Link: Walmart joins other big retailers in scaling back on self-checkout - CBS News

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