ADLINK Application Story

Artificial Intelligence and Computer Vision Speeds Canteen/Restaurant Checkout

A win-win solution improves customer satisfaction and drives sales.



Frustrated Famished Workers

According to an online survey[1] of 15,000 employees in 27 countries, among the 27 nations that took part, the average lunch break duration is only 35 minutes. Unfortunately, a large portion of the time spent in a restaurant or work canteen—often 15 minutes or more—is devoted to queuing in the checkout line to pay for one's meal.

In addition to leaving only a short time for the workers to enjoy their food, spending 15 minutes standing in a checkout line—watching the seconds tick away—is stressful and frustrating. Such poor customer experiences undoubtedly have a detrimental effect on the restaurant's business.

All of this led to a business challenge for self-service restaurant owners in Spain. The restaurant's owners discovered that waiting for checkout at their establishments could take as long as 15 minutes, yet many of their customers' lunch breaks were only 30 to 60 minutes long. As a result, customers with longer lunch breaks left feeling agitated and frustrated, while many potential customers with shorter lunch breaks didn't even bother coming in at all, resulting in loss of income for the restaurant.

Artificial Intelligence and Computer Vision Saves the Day

Products and dishes served in the self-service restaurants in question normally do not have a barcode and require the cashiers to visually inspect each item on the tray and ring each item up individually, which is slow and time-consuming. The problem was exacerbated by the fact that the restaurant could update menu items daily and add new dishes periodically, thereby leaving the cashiers constantly having to look up and learn new prices. The ideal solution would be one that can simply look at the customer's tray, instantly identify all of the items, inherently know the price of each item, instantaneously add everything up, and promptly present the customer with the bill, which could be quickly paid via credit card or smartphone app.

[1] "Are American workers playing 'ketchup" with their lunch breaks?" https://www.tsheets.com/resources/lunch-break-survey

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In order to address this problem, the restaurant turned to solution provider Proppos, which has developed an intelligent and autonomous checkout system integrating Pervasive Technologies' artificial intelligence (AI) solutions and ADLINK's inference hardware platform. For this particular task, an AI-based self-checkout system called Proppos FastPay equipped with computer vision can satisfy the requirements for visual inspection and speed.

In order to create "Proppos FastPay", Proppos was looking for an industrial-grade edge AI platform for several reasons. First, the operating environment in a restaurant can have high levels of humidity. Second, the AI checkout system has limited space for installation and airflow. Third, it is required to dissipate the heat that is a byproduct of the high computing performance required to meet the demanding speed and accuracy requirements of heavy AI workloads. And, last but not least, long life support is a must since AI checkout systems in restaurants are expected to be used for several years at a minimum.

For this particular task, Proppos opted to use ADLINK's DLAP-201-JT2 industrial-grade edge AI platform, which was designed from the ground up to address size, weight, and power (SWaP) constraints faced by edge AI applications, and which meets all of the requirements laid down by the Proppos team.

From the software perspective, the development, deployment, and management of the AI checkout system is made easy with ADLINK's DLAP-201-JT2. The secret is the built-in NVIDIA Jetson™ TX2, a supercomputer-on-a-module that not only provides the computing power required for real-time AI inferencing, but also comes with NVIDIA's comprehensive edge-to-cloud solution for AI applications.

To enable the AI checkout system to live up to its full potential, Proppos needed an AI specialized partner with knowledge of NVIDIA's tools and ADLINK's hardware. Pervasive Technologies is an ADLINK and NVIDIA partner that specializes in industrial and retail AI solutions, and Proppos quickly determined that Pervasive Technologies was the ideal partner to help them build a robust solution with the best and latest tools.

Developing systems of this caliber used to take months of effort, starting with preparing the development environment, training and optimizing the AI models, deploying the AI models to the edge, and integrating the edge platform with the cloud to remotely manage and continuously optimize the AI models. Now, using NVIDIA's SDK, including NVIDIA DeepStream™, NVIDIA Jetpack™, and NVIDIA® TensorRT®, the amount of effort required is dramatically reduced by months when compared to other options.

> "In less than 1.5 seconds, the AI checkout system automatically identifies all of the items on the tray and presents the total for the customer's approval, which is 10 times faster than a regular checkout. Also, the data that Proppos generates will help our clients to have more profitable restaurants."
>
> ***Nil Salomó Bellavista**, CEO & Co-founder of Proppos*

Furthermore, updating menu items is fast and simple with the Proppos FastPay system. When new items are added to the menu, the restaurant staff can populate a tray with these items and have the tray scanned by the AI checkout system. The image of the tray will automatically be sent to the cloud for training, and updated AI models capable of recognizing the new items will be immediately deployed to ADLINK's DLAP-201-JT2. Also, customers can opt to provide feedback on the accuracy of the AI, where any such feedback will be sent to the cloud to help retrain and optimize the AI models, thereby providing continuous improvement.

Now, the restaurant's customers simply slide their trays under the camera. In less than 1.5 seconds, the AI checkout system automatically identifies all of the items on the tray and presents the total for the customer's approval, which is 10 times faster than a regular checkout taking 16 seconds[2]. With a quick tap of their credit cards, or by means of a smartphone application, customers are quickly on their way.

From the customers' point of view, the AI-based Proppos FastPay system offers a much faster and more enjoyable experience, leaving them with more time to appreciate their meals. Also, the restaurant enjoys many advantages, including the ability to optimize production, reduce operational costs, and improve the overall satisfaction of their customers. Furthermore, this speedy checkout process may entice additional customers with shorter lunch breaks to also visit the restaurant.

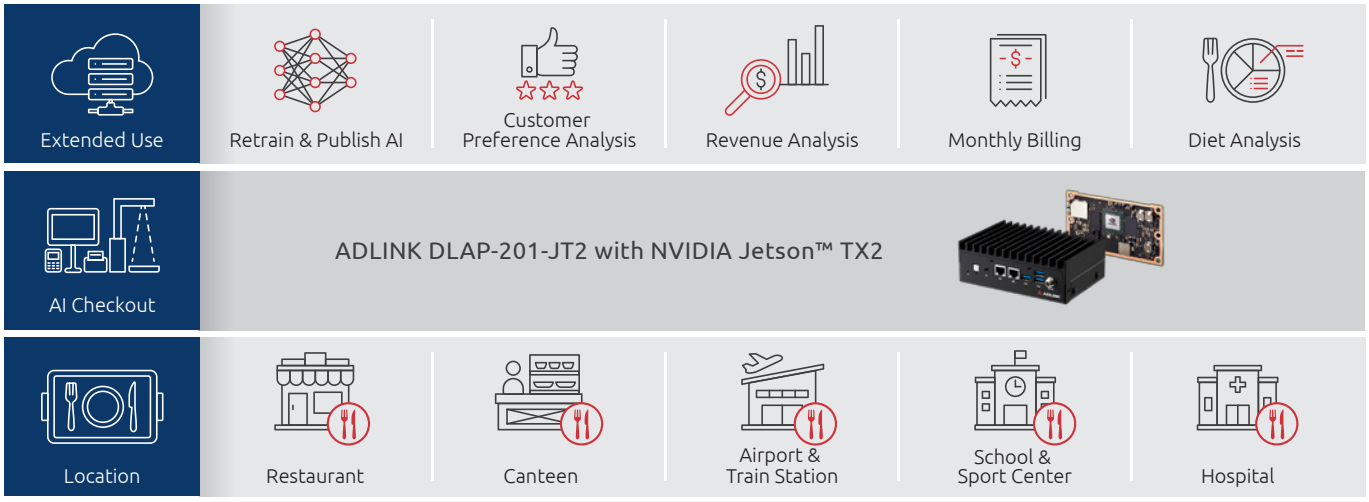


Figure 1. Restaurants can benefit from the AI checkout system in multiple ways.

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[2] "Proppos -- Computer vision self-checkout" https://www.proppos.com/

The Future is Closer Than You Think

Proppos FastPay is just the first step in what promises to be an exciting future. This system could also be employed by canteens and restaurants in hospitals, schools, bus stations, train stations, and airports.

Furthermore, this system could be extended in multiple ways (Figure 1). In the case of a company canteen, for example, the system could be augmented with facial recognition, thereby removing the need for users to pay on a daily basis. Instead, they could be automatically billed at the end of the month.

In the case of a healthcare facility, the system could monitor the dietary habits of patients. Or consider a canteen that serves an athletic facility such as a football team, for example, in which case the system could monitor the caloric intake and nutritional value of the food being consumed by the players on an individual basis, thereby allowing the coaches and medical staff to fine-tune each player's diet.

With regard to a chain of eateries, uploading the data from multiple establishments into the cloud and analyzing and mining that data may result in wide-ranging intelligence and the ability to predict customer requirements based on the day of the week, the season of the year, and even the current weather forecast in each restaurant's location.

In the next few years, systems employing artificial intelligence and computer vision will be deployed in myriad diverse locations to perform a vast array of applications—all designed to make our lives safer and more secure—and ADLINK will continue to be at the forefront of this exciting technology.

ADLINK Leading EDGE COMPUTING

About ADLINK

ADLINK is a global leader in edge computing. Our offerings include robust boards, real-time data acquisition solutions and application enablement for AIoT. We're an NVIDIA Jetson Elite Partner and a contributor to standards initiatives such as OCP, OMG and ROS 2 TSC. More information at **www.adlinktech.com**.

pervasive technologies

About Pervasive Technologies

Pervasive Technologies is an innovative company specialized in the construction of predictive solutions through the use of advanced artificial intelligence, machine learning and deep learning technologies for different sectors. More information at **pervasive-tech.com**.

NVIDIA

About NVIDIA

NVIDIA's (NASDAQ: NVDA) invention of the GPU in 1999 sparked the growth of the PC gaming market, redefined modern computer graphics and revolutionized parallel computing. More recently, GPU deep learning ignited modern AI — the next era of computing — with the GPU acting as the brain of computers, robots and self-driving cars that can perceive and understand the world. More information at **nvidianews.nvidia.com**.

PROPPOS AI Checkout solutions

About Proppos

Proppos is a software company based in Barcelona that is focused on the development of innovative AI checkout solutions for Retail and Hospitality to improve the shopping experience and the efficiency of their clients. More information at **www.proppos.com**.

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