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POWERING IoT AND EMBEDDED INNOVATION

AI Boosts Brick-and-Mortar Sales

While e-commerce gets all the attention, research conducted by the IHL Group shows that big chains plan to open more than 5,500 more stores than they close in 2018.

But even as traditional stores continue to thrive, retail is becoming ever more competitive. To deal with the ongoing transformation of the marketplace, many merchants are seeking to emulate e-commerce in how they use data to increase sales and improve customer service. Bringing these smarts out of the cloud and into the store requires a new approach to collecting, managing, and analyzing data.

Specifically, retailers need deep learning solutions that provide value at the edge, handling large volumes of images and data within retail locations. The solution often requires using heterogeneous mixes of CPUs, GPUs, FPGAs, and other processors, while adhering to strict power, space, bandwidth, and privacy requirements.

With that in mind, developers are discovering ways to use existing APIs and frameworks to maximize the portability, flexibility, and scalability of their retail solutions. Developers are also relying on a new generation of off-the-shelf AI hardware and software specifically designed for edge applications. Suchtechnologies simplify and speed up the creation of new solutions, allowing developers to apply the power of AI and machine learning to new environments.

XXXL Performance in Petite Sizes

A retail AI solution must produce, store, and manage a vast amount of data—particularly for solutions based around video analytics. Cloud-based solutions are often infeasible due to latency, network bandwidth, reliability, and security issues.

What's needed for retail is an edge solution that offers tremendous compute power while requiring relatively little energy. On top of that, it must fit into a small form factor. Recent developments at Intel® support solutions that offer the necessary requirements.

UP Bridge the Gap, a brand of AAEON Europe, has developed a family of neural accelerators that run on cutting-edge hardware. Powered by Intel® Movidius™ Myriad™ X VPUs, these cards are designed to handle computer vision and AI applications in a tiny, low-power package **(Figure 1)**.

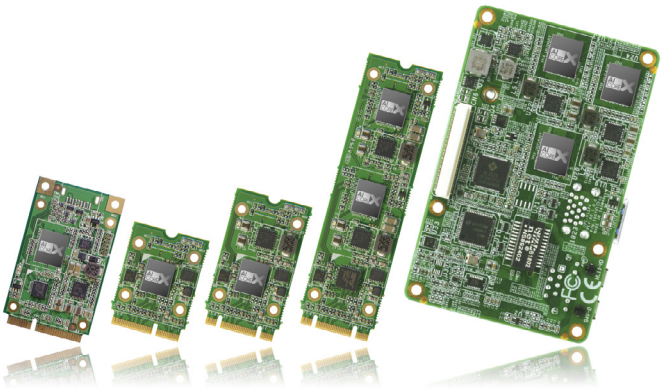

Figure 1. The UP AI Core X series is powered by Intel® Movidius™ Myriad™ X VPUs. (Source: UP Bridge the Gap)

For example, these cards are used in the UP Squared AI Edge: Retail Suite, a quick-to-deploy neural network engine designed for modern commerce. The Retail Suite comes preloaded with software from AIM2 and Cortexica, and supports frameworks such as Caffe, TensorFlow, and the

OpenVINO Toolkit. It comes with:

- A 30x51mm UP Squared board based on an Intel Atom® x7-E3950 4GB RAM
- An Intel Movidius Myriad X 2485 VPU
- 64GB eMMC, WiFi (2T2R), and Bluetooth
- A USB3.0 camera with 3.6mm lens
- A pre-installed 1-year subscription to Retail Suite by AIM2

Available as a developer kit, the Retail Suite with its Intel Movidius Myriad X VPU delivers an estimated 10X performance increase over previous generations, making it a powerful option for AI at the edge. **(See Figure 2.)**

AI and Machine Learning Empower Retail

The goal is an intelligent solution to extract insights from video analysis to perform demographic, behavioral, and sentiment analysis. Retailers want to easily call up data on the age or gender distribution of customers, be it by the month or day of the week, as well as their emotional state. Do they appear happy or confused? Are they focused on specific brands or are they ignoring them? All of this can help retailers enhance their stores.

We spoke about this solution with Luca Ruzzola, a machine learning engineer who leads data science and training at AIM2. He explained that the Retail Suite can be launched in Contextual Mode or in Brand Mode.

In Contextual Mode, retailers gain contextual information for customer analysis. "The solution associates key performance indicators (KPIs) to a specific context," said Ruzzola. "For example, a context can be the brand on a shelf, the name of a venue in a shopping center, or a specific zone of a venue such as the entrance or exit."

In Brand Mode, retailers can automate inventory tracking at the shelf level. Ruzzola said, "The solution enables retailers

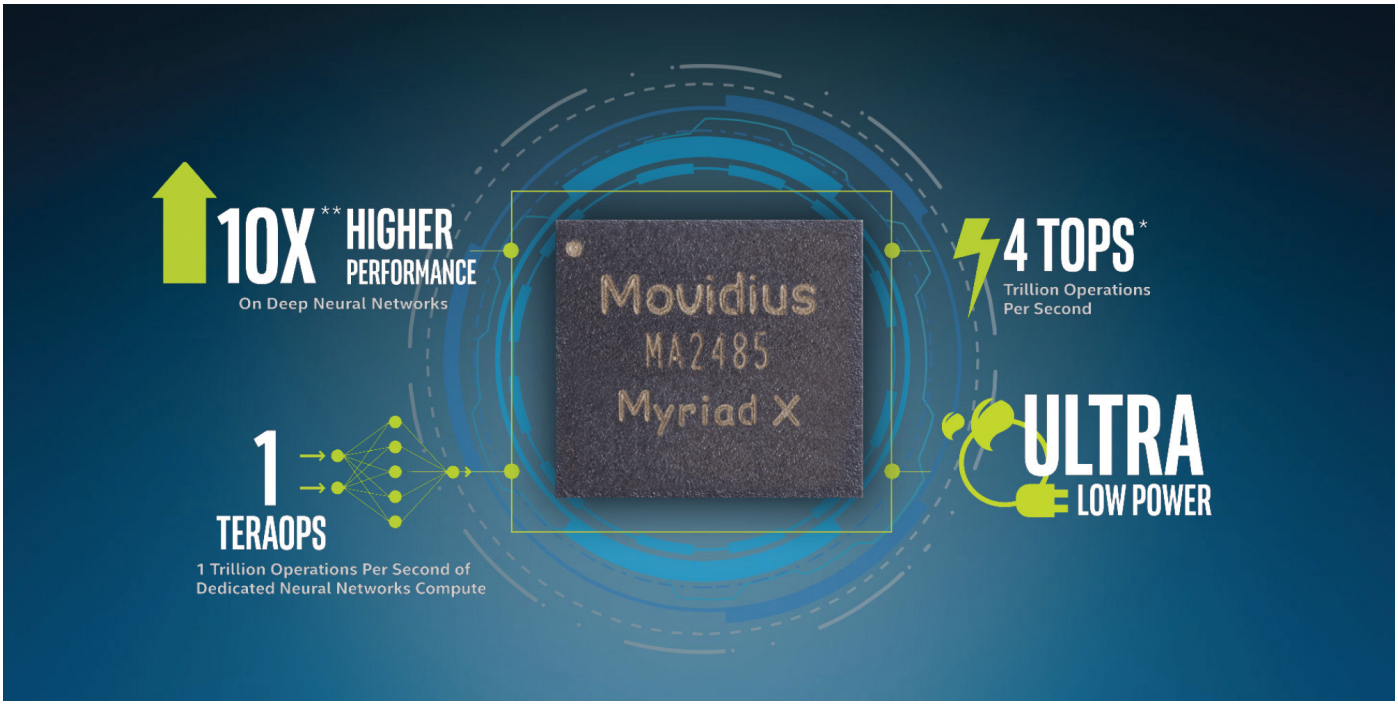

Figure 2. The Intel® Movidius™ Myriad™ X VPU delivers an estimated 10X performance increase over previous generations. (Source: UP Bridge the Gap)

to improve efficiency. This includes stock detection and shelf monitoring to make sure that brands are positioned correctly and in the correct amount."

Brand exposure is also measurable. "It tracks customers standing in front of branded products on a shelf and how they engage with the products," said Ruzzola. "It also enables retailers to track and analyze the types of customers that interact with the products—their gender, age range—while ensuring compliance with the General Data Protection Regulation (GDPR)."

The mention of GDPR led to a discussion on the solution's privacy settings. Ruzzola made clear that no video stream is transmitted and no frames are saved on the device.

"The video processing occurs in real time," said Ruzzola, "by creating a face signature using Neural Homogeneous Identities (NHI)." NHI enables the solution to automatically detect and organize identities without human support.

Each face signature is encrypted and stored in a database. "However, the process of creating a face signature can't be used to re-create an image of a specific face," said Ruzzola.

This face signature allows retailers to recognize when a specific customer re-enters the store without capturing his or her personal identity. That way the retailer can track an individual's shopping habits, age range and gender, while ensuring privacy and security.

Ruzzola described other face signature use cases, such as ensuring that only authorized employees can access restricted storage areas or offices. A related use case is to confirm that specific employees, such as security staff, are present in specific areas at specific times and performing specific functions.

Not All AI Acts the Same

Our conversation moved on to other companies developing in this space. Ruzzola explained that the Retail Suite differs from its competitors by providing three critical advantages.

First, the solution's dual-mode system enables retailers to capture and analyze both contextual data and brand interaction data. "No other solution handles both of these aspects in a single suite," he said.

A second advantage is low cost. "AAEON hardware and the Intel stack keep costs down," said Ruzzola.

The third advantage is that the solution can deliver standard KPIs or raw data. "Standard KPIs allow retailers to quickly gain insight without analysts," said Ruzzola, "or they can engage an analyst to scrutinize the raw data to achieve additional insight."

Closing the Gap with E-Commerce

As AI and machine learning technologies mature and their costs come down, brick-and-mortar retailers can perform the kind of customer, brand, and product analytics that e-tailers take for granted. Retailers, excited about such opportunities, are gaining insight into customer behavior and preferences as well as which brands outperform others. The result? Retailers are more competitive and customer-driven.