ADLINK
LEADING EDGE COMPUTING



USE CASE

# AI-Based Facilities Monitoring Improves Workplace Safety

Compact ADLINK Deep Learning Acceleration Platform Expedites AI-Based Vision for Logistics




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# AI-Based Facilities Monitoring Improves Workplace Safety

## Facilities Monitoring Plays a Critical Role in Logistics

Facilities monitoring in manufacturing, warehousing, and other industrial sectors is key to ensure workplace safety, enforce safety protocols, and protect against trespassers, among other logistics responsibilities.

Traditional monitoring practices rely strongly on humans, which has its limits. For example, research by the UK Police Scientific and Development Branch examined how well operators could detect somebody with an umbrella in the main street using different numbers of monitors. They found observers viewing one, four, six, and nine monitors had accuracy detection scores of 85%, 74%, 58%, and 53%, respectively (Figure 1).[1] In real-world situations, the need for security guards to patrol the premises from time to time could further detract from detection accuracy.

The paper reviews how the use of artificial intelligence (AI) technologies can be used to automate monitoring tasks, thus increasing accuracy while reducing cost.

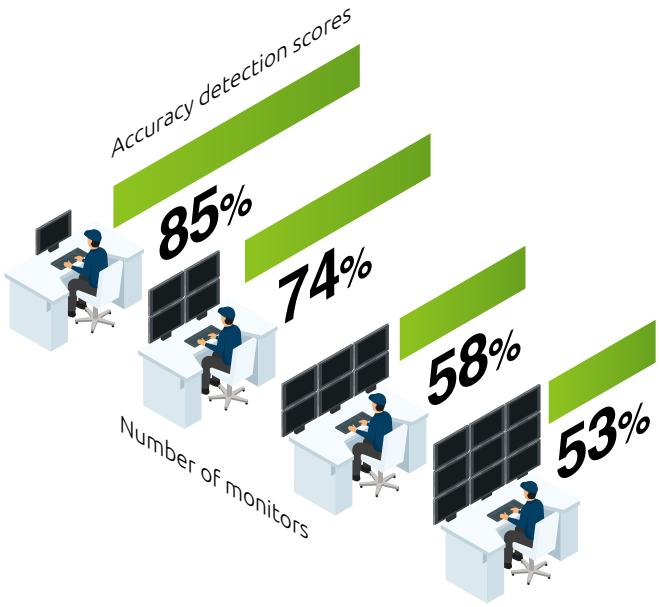



Figure 1. Operators score about 50% on a detection accuracy test when viewing nine monitors at a time.

## Improving Logistics Safety with AI-Based Vision

SAIC Anji Logistics, a systems integrator in China, develops logistics solutions for docks (i.e., factories, warehouses, and ports) using AI-based vision applications that run on the ADLINK industrial-grade deep learning acceleration platform.

The following describes some of the ways these solutions can be deployed to improve workplace safety and reduce facilities monitoring costs by increasing accuracy and coverage with fewer security guards.



### Restrict Dock Access to Authorized Personnel

Every year thousands of workers are seriously hurt in loading dock accidents due to congested workspaces, unwieldy loads, noisy environments, adverse weather conditions, and working four feet above ground level at a rapid pace.[2] It is critical to keep loading dock areas clear of unauthorized individuals who could suffer serious injuries from accidents, like a high-speed forklift crashing into a truck and causing it to roll over. AI-based vision systems deployed in "no-go" areas can detect workers entering or lingering at loading docks and activate a siren to inform them to leave.



### Spot Pedestrians at Vehicle-Only Entrances

Security guards dispatched at vehicle-only entrances must also ensure pedestrians do not sneak or stroll across the gate access area and onto the premises, possibly causing an accident around a loading dock. To help guards, AI-vision solutions notify them when pedestrians are around the gate.



### Boost Off-Hour Monitoring

Warehouses primarily rely on security guards to protect the premises during off-hours, like evenings, weekends, and holidays; however, patrol duties, fatigue, or negligence could lead to trespassers entering the facilities undetected. In contrast, AI vision solutions work continuously and steadily to pinpoint unexpected human presence.



### Identify Obstructions in Loading Dock Areas

AI vision solutions can recognize equipment and vehicles that are out-of-place, illegally parked, or have not moved for a long time.



### Maintain Appropriate Worker Levels

Loading docks can become overcrowded and accident-prone, or understaffed and overtaxed. It is possible to control crowd size using an AI-based system that broadcasts an alert if the number of workers on the dock is unsuitable and dangerous.



### Enforce Usage of Protective Gear

Loading docks are highly dynamic and sometimes dimly lit environments shared between forklifts and workers. AI-based vision systems can detect ill-equipped workers, issuing a safety warning to remind workers to put on protective gear, like safety vests with reflective stripes and helmets.

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## Design Challenges

Securing a large facility like a warehouse or port requires a lot of 'eyes,' and that is why SAIC Anji Logistics sought an AI computing platform that could analyze up to 30 video camera feeds simultaneously. In addition, the platform had to be highly reliable, compact, and capable of operating for long periods of time in harsh environments.

SAIC Anji Logistics also wanted to employ a heterogeneous computing platform that had a mix of computing cores to accelerate specific types of AI workloads. With heterogeneous computing, AI workloads run on the best-suited computing architecture, resulting in faster computation and less power consumed for a particular function, compared to a homogeneous platform with only one CPU architecture.

Most available AI computing solutions are server-based and not suitable for many warehouse applications because they are bulky, overpowered, and not industrial-grade; and their sheer size makes it difficult to deploy them on warehouse floors.

### Solution Overview

These design challenges, and more, are satisfied by the ADLINK DLAP-4000, the most readily available, compact, industrial-grade deep learning acceleration platform (Figure 2). It features heterogeneous computing using an Intel® Core™ processor for image transcoding and preprocessing, and NVIDIA full-height full-length PCIe graphics card for AI inference. The DLAP-4000 offers a cost-efficient and compact alternative to server-grade products since it is about 30% smaller than a 32 channel, 1.5U rackmount server, making it better suited for solutions deployed at the edge.

### Environmentally-Hardened Platform

The DLAP-4000 operates at extended temperature, shock, and relative-humidity ranges, providing the durability needed to withstand harsh industrial and embedded environments. These systems are built with long lifecycle products, including CPUs and GPUs, to extend their availability.

### Highly-Configurable Platform

The DLAP-4000 is a member of the ADLINK DLAP Series, which allows system developers to optimize around performance, budget, power consumption, and space limit constraints at the edge. For example, the series has platforms with high performance Intel® Xeon processors through to low power Arm® processors, and GPU performance ranging from up to 200 TFLOPs down to 0.5 TFLOPs.

## Why ADLINK

Developers of AI-enabled logistics applications can cost-effectively achieve the right mix of SWaP and AI performance using the ADLINK DLAP Series. These platforms support a wide variety of CPUs, GPU modules and cards, form factors, and power consumption ranges to satisfy specific application requirements. Designed for the embedded market, these products are compact, industrial-grade, thermally-optimized, and supported with an extended lifecycle. The DLAP-4000 is designed to run AI inferencing, facial recognition, object detection, and other AI-based applications at the edge, so there is no need to use a server that was not intended for use in harsh environments.

To learn more about the ADLINK DLAP-4000, please visit the ADLINK website (https://www.adlinktech.com/Products/Industrial_PCs_Fanless_Embedded_PCs/IPCSystems/DLAP-4000_Series?Lang=en).




Figure 2. Compact ADLINK deep learning acceleration platform delivers the high performance needed to simultaneously run AI inference on 30 live video camera feeds in real time.

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上汽安吉物流 SAIC AnJi Logistics

Established in August 2000, SAIC Anji Logistics Co., Ltd. is a wholly-owned subsidiary of SAIC Motor specializing in automotive logistics business. During years of development, SAIC Anji Logistics has continued to challenge itself and be creative. It has formed the main business sectors including vehicle logistics, component logistics, port logistics, shipping logistics, commercial vehicles, equipment logistics, express logistics, international logistics, and information technology, with its distribution network covering 562 cities throughout the country, providing logistics and supply chain financial services to major automobile manufacturers and parts suppliers at home and abroad as well as about 6000 sales and service providers. SAIC Anji Logistics ranks 10th in China's logistics enterprises and 1st in the automotive logistics industry. It is the first batch of 5A-class logistics enterprises in China, vice-chairman unit of China Federation of Logistics Purchasing, and rotating chairman unit of China Automobile Logistics Association of CFLP. Learn more at https://anji-logistics.e-ciie.com/index.html

1. Dr. Craig Donald, "How many monitors should a CCTV operator view,?", December 2004, http://www.securitysa.com/article.aspx?pklarticleid=3313.
2. Galfand Berger, LLP, What Hazards Do Workers Face on Loading Docks,?" March 5, 2021, https://www.galfandberger.com/2021/03/05/workers-loading-docks.

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