

## White Paper

# Accelerate and Elevate Manufacturing Operations with AI and Machine Vision



AI Drives Growth  
93% of companies believe AI will be a crucial technology to drive growth and innovation in manufacturing, according to Deloitte's survey on AI adoption in manufacturing

## Digital Transformation Across Industry 4.0 Sector

Automation, leveraging artificial intelligence (AI), and other technologies bring new possibilities to the industrial sector, and in recent years, the speed of adoption has been swift. Companies all around the world are leveraging automation to drive value. According to Deloitte's survey on AI adoption in manufacturing, 93% of companies believe AI will be an essential technology to drive growth and innovation in the sector. The leading technologies driving digital transformation are machine learning, computer vision, chatbots, and edge AI (Deloitte China, 2020).

## AI Use Cases in Manufacturing Operations

Manufacturing companies are turning to AI to modernize the way they do business and increase efficiency. There are numerous possible AI use cases around all manufacturing processes. Some of these include the adoption of smart robots, AI, and predictive maintenance to improve production processes; automated quality inspection to ensure products of the highest quality levels; inventory management; and worker safety.

### AI-enhanced predictive maintenance

allows for better prediction and avoidance of machine failure by combining data from advanced Internet of Things (IoT) sensors and maintenance logs as well as external sources. Asset productivity increases of up to 20% are possible, and overall maintenance costs may be reduced by up to 10% (McKinsey & Company, 2017).

**Quality control** can benefit from AI, where the use of smart cameras and related AI-enabled software will help manufacturers achieve improved quality inspection at speeds, latency, and costs beyond the capabilities of human inspectors.

**Inventory management** with AI can predict consumer demand, manage supplier backorders, and optimize inventory stock levels. Using AI for inventory management can help inform decisions as well as provide information for new investments.

**Worker safety** solutions combine IoT and AI, resulting in AI-trained analysts that detect and prevent workplace hazards and take real-time action to significantly improve safety. These systems not only enhance safety but also boost productivity. Gartner has predicted that, by 2021, AI augmentation will create \$2.9 trillion of business value and recover 6.2 billion hours of worker productivity (Gartner, 2019).

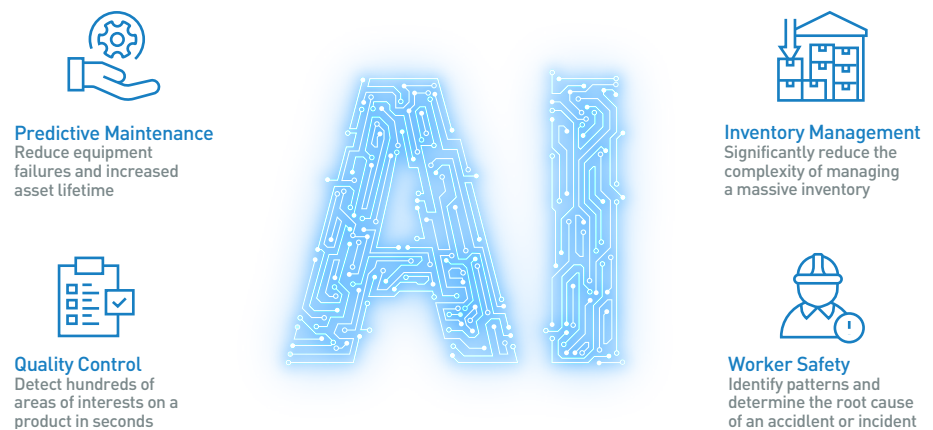


Figure 1. AI applications in industrial automation.



With NexAloT solutions, manufacturers can quickly deploy an integrated solution that automates the DevOps of Digital Factory and provides real-time production insights.

## NexAloT Edge AI Solutions – Driving Performance, Integration, and Versatility

Manufacturers all over the world are under pressure to maintain a competitive advantage. Early interest in IoT and AI technologies is making way for more mature and permanent digital transformation programs. NexAloT has worked with Intel® to bring AI enhancements to the existing iAT2000 Cloud SCADA system and Enterprise War Room to provide a bulletproof IoT solution. With these solutions, manufacturers can quickly deploy an integrated solution that automates the DevOps of digital factories and provides real-time production insights.

NexAloT takes "Industry 4.0 and AIoT" as its corporate vision and builds its R&D core competency on the innovative R&D concept of software-defined machines. Industrial 4.0 applications such as SoftPLC, HMI/SCADA, EtherCAT Motion & Robot Control, IoT Studio, and OPC Unified Architecture, One-Click to Cloud Dashboard, Diagnostics and ML Platform developed on a unified PC-based architecture, and accelerated by the embedded AI inference technology.

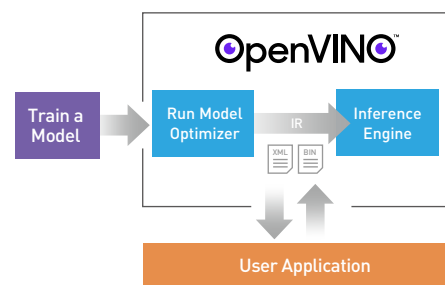
NexAloT is committed to assisting manufacturers in digital transformation and providing one-stop smart manufacturing services, including IIoT gateways, automation products, industrial computers, and Industry 4.0 customer system integration projects. NexAloT is building OT/IT integration with ecosystem partners to co-create IIoT SaaS and alliance.

## Simplify Development

In cooperation with Intel, NexAloT is

developing next-generation solutions for embedded applications supported by all modern operating systems, including high-level and real-time OSES, and Intel's OpenVINO toolkit along with Media SDK.

The Intel® Distribution of OpenVINO toolkit enables users to optimize, tune, and run comprehensive AI inference using the included model optimizer and runtime and development tools. It is the all-in-one solution to develop and test computer vision applications, compare hardware performance, and choose the right platforms for various applications.



(Overview of the Intel® Distribution of OpenVINO™ Toolkit, 2021)

## NISE 53 - Next Generation Fanless Embedded System for Industrial IoT

To support the next generation of IoT edge devices, NexAloT has developed a brand new NISE 53 fanless industrial PC powered by Intel® processors enhanced for IoT the 1.8 GHz Intel® Celeron® J6413, and Intel® Atom® x6211E processors. These processors achieve new levels of CPU and graphics performance with integrated IoT features, real-time performance, manageability, security, and functional safety.

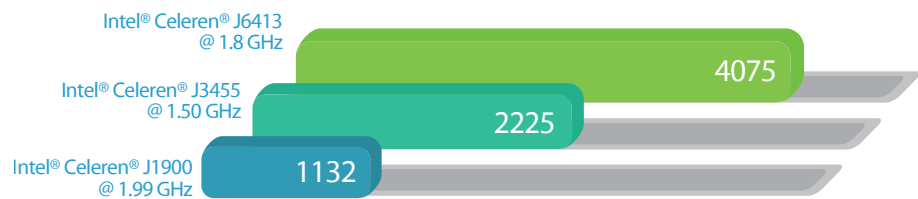
Intel® UHD Graphics can support up to three independent HDMI displays. NISE 53 features in-band ECC DDR4 memory up to 16 GB, GbE Ethernet, Time-Sensitive Networking (TSN).

NISE 53 compact fanless PC powered by Intel® Celeron® J6413, 1.8 GHz, offers up to 40% better CPU performance and improved graphics compared to the previous generation.

## NISE 53 - HIGHLIGHTS

### Intel® Celeron® Processor J6413 Quad Core Fanless System

- Robust and reliable industrial-grade fanless system to survive tough environments
- Low profile and slim design
- Power-efficient Intel® Celeron® J and Atom® x6000 Series processors
- Intel® UHD Graphics 16 EUs, and up to three independent and simultaneous HDMI display outputs
- One DDR4 2133 SO-DIMM socket with up to 16 GB memory capacity
- Front accessible 1 x M.2 Key B for storage
- Expansion capabilities: 1 x internal M.2 Key B and 1 x full-size mini-PCIe for wireless connectivity
- Long-term availability (10+ years)
- 1300W 1 + 1 CRPS redundant power supply
- Supports OCP NIC 3.0
- Supports IPMI 2.0 RunBMC (optional)
- Supports Intel® QAT (NSA 7150A)
- Supports Intel® Optane™ Persistent Memory



(PassMark Software, 2021)

## Power-efficient Platform

Industrial IoT applications require a combination of a high-performance, low-power processor, robust real-time operation, wireless connectivity, and real-time hypervisor technologies. The NISE 53 is suitable for a wide range of low-power applications, including automation, smart robotics, PLC, and CNC controls for discrete manufacturing.

## Superior Graphics

The NISE 53 takes a huge leap in graphics capabilities with Intel® UHD graphics 16EUs, and supports up to three simultaneous displays. The integrated GPU is ideal for 3D graphics and a wide range of GPGPU-driven applications as

it supports major acceleration APIs such as DirectX 12, OpenGL 4.5, Vulkan 1.1, OpenCL 1.1, and metal.

## Real-Time Connectivity

The NISE 53 is designed for industrial real-time applications and supports TSN – standards and capabilities based on standard Ethernet networks to support time-sensitive applications and supports time synchronization, timeliness for ultra-reliable low-latency communication, as well as traffic scheduling

## Security at the Edge

NISE 53 Intel® Atom® and Intel® Celeron® based fanless embedded system features integrated security functions. Intel® AES

NISE 53 Intel® Atom® and Intel® Celeron® based fanless embedded system is the right combination of high-performance, low-power processor, robust real-time operation, wireless connectivity, and real-time hypervisor technologies designed for Industrial IoT applications.

New Instructions for wireless security, processor security, file encryption, and SSL/TLS. Intel® Secure Key is useful for generating high-quality keys for cryptographic protocols. In addition, Execute Disable Bit, Intel® OS Guard, and Intel® Boot Guard security features can reduce exposure to viruses and malicious-code attacks, and prevent harmful software.

## Peripheral Connectivity and Expansion

NISE 53 offers expansion through PCIe Gen. 3, and supports efficient, scalable networks and storage configurations with an internal 1x M.2 slot (Key B) for 4G LTE, 1 x full-size mini-PCIe slot for Wi-Fi and Bluetooth, and front-accessible 1 x M.2 slot (Key B) for storage. I/O ports include 3 x HDMI, 3 x Gbe LAN, 2 x USB 3.0, 2 x USB 2.0, 2 x COM.

## AI and Machine Vision Solutions

The NISE 53 supports Intel® Media SDK and OpenVINO™ toolkit to enable customers to build high-performance, intelligent vision solutions. Emulate human vision with the OpenVINO™ toolkit that provides a library of pre-made inference algorithms for character and Image recognition. Hardware-accelerated codecs can be used to offload media decode and encode workloads.

## Extended Product Availability

The NISE 53 is designed for high reliability and long service life. Intel® processors offer ten years of continuous 24/7 operation (100% in sleep state S0), and currently, the standard availability of NexAloT products is ten years.

## Use Case: Production Data Analysis and Quality Inspection

For the long-term success of products and services, ensuring their quality through production quality assurance is of critical importance.

Automated quality assurance systems typically require intense upfront investment and extensive testing and calibration. One example is the visual quality inspection systems often used to check the quality of products on production lines, e.g., printed circuit boards or car bodies.

Current automated approaches for visual inspection perform a pixel-wise comparison of the product for testing against an ideal reference image. Such a methodology is sensitive to even the slightest non-critical variations, so is only feasible if task-and environment-related preconditions are met. Ideally, perfect mounting of the product within the inspection tool is given, lighting conditions are the same across all inspections and types of defects are known in advance. Another crucial consideration is the operator's trust in the results of the automated inspection process. A large number of false positives may reduce this trust, thereby eroding any benefits gained from automation.

Now, visual inspection methodologies based on computer vision and machine learning hold the promise of overcoming the challenges of comparison variations and false positives.

The recent advancements in AI-based quality assurance promise productivity increases of up to 50%. For AI-powered visual inspection, detection accuracy of defects increases while simultaneously flexibility is enhanced

According to Deloitte's survey on AI adoption in manufacturing, 93% of companies believe AI will be a pivotal technology to drive growth and innovation in the sector.

## Conclusion

NexAloT together with Intel® is developing a next-generation of industrial automation edge solutions for a wide range

of applications and devices in factory automation, transportation, telecommunications and many other vertical markets.

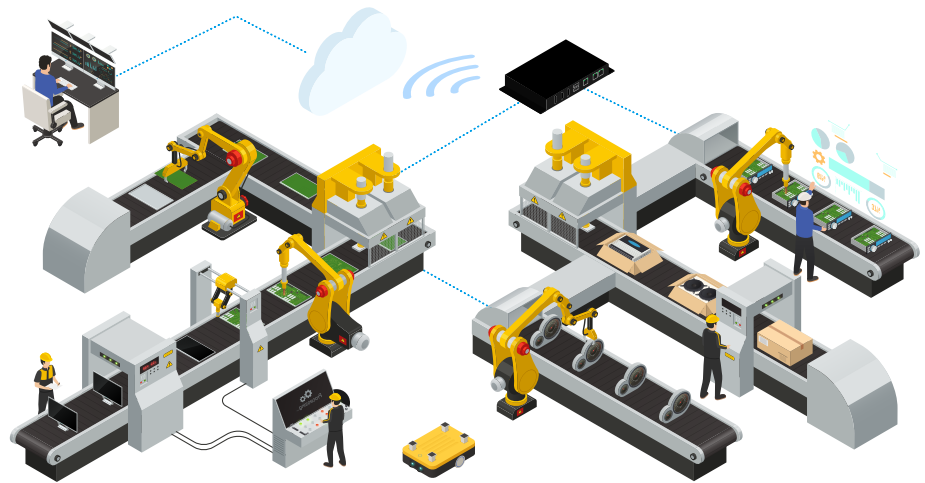


Figure 2. Machine Learning in Production Data Analysis

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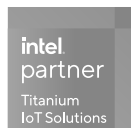
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NexAIoT is a Limited Liability Company, incorporated in Taiwan in 2014 and is a subsidiary of NEXCOM (TWSE: 8234).

NexAIoT has established its position in Asia and China as a market leader in providing I4.0 solutions including Industrial PC, Factory Automation, Robotics, and AIoT. Its mission is to become the global leader in industrial IoT and the preferred partner to accelerate the digital transformation in industry 4.0.

NexAIoT operation is supported by solution engineering, product engineering (R&D, project management, technical support), sales & business development (local, overseas, and ODM), and backend operation (finance, HR, IT, procurement) divisions, with regional business operation in Asia, Europe, and USA.

[www.nexaiot.com](http://www.nexaiot.com)



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NEXCOM is a Titanium member of the Intel® Partner Alliance, as a top tier of the Alliance. Intel and more than 500 global IoT partners of the Intel® Partner Alliance provide scalable, interoperable Intel®-based technologies and solutions that accelerate deployment of intelligent devices and end-to-end analytics. Close collaboration with Intel and each other enables Alliance members to innovate with the latest technologies, helping developers deliver first-in-market solutions.

Learn more at: <https://www.intel.com/content/www/us/en/partner-alliance/overview.html>

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