

AI-Enabled Health Screening Tools at the Edge

Intel® Core™ processors feature integrated accelerators for AI-enabled automation on a range of health screening and monitoring systems at the edge



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Abstract

Modern health screening systems and analyzers can incorporate AI inferencing tasks that provide improved monitoring and screening results. For example, a portable, multi-camera vision system can use AI to characterize sample test tubes and automatically drive routing, prioritization, and exception handling of these tubes. This preserves sample integrity and streamlines laboratory workflows.

But computer vision and other AI models are hungry for processing power and need the performance of CPUs and integrated GPUs (iGPUs) to enable advanced laboratory diagnostics.

This paper highlights how Intel® Core™ processors with integrated accelerators can support edge AI inferencing for high throughput screening tools automation, improving throughput, reliability, and operational efficiency.

The Growth of AI in Lab Diagnostics

The global market for artificial intelligence (AI) in diagnostics is experiencing significant growth, driven by advancements in machine learning, increased adoption of AI technologies, and the need for more efficient and accurate diagnostic tools. The global AI in diagnostics market was valued at approximately \$1.61 billion in 2024 and is projected to reach \$10.28 billion by 2034, growing at a compound annual growth rate (CAGR) of 20.37% during the forecast period¹. North America dominates the market with a revenue share of 58% in 2024¹, attributed to the high adoption of healthcare IT solutions and substantial investments in AI-based diagnostic software.

This growth is driven by numerous factors, including advancements in AI technologies that have enhanced diagnostic accuracy and efficiency, leading to reduced human errors and improved patient outcomes. The rising incidences of chronic disorders and burdened healthcare systems that are fueling the demand for AI-driven solutions, as well as increase in research and development activities in AI and diagnostics is contributing to the innovative solutions and expanding the market's potential.

Edge AI for Screening Tools Automation Powered by Intel® Core™ Processors

In high throughput screening tools, embedded compute must support real-time image processing and on-device inferencing within tight power, space, and cost constraints. Intel Core processors with integrated graphics and acceleration can help enable these requirements while maintaining a software-friendly, scalable platform for deployment at the edge.

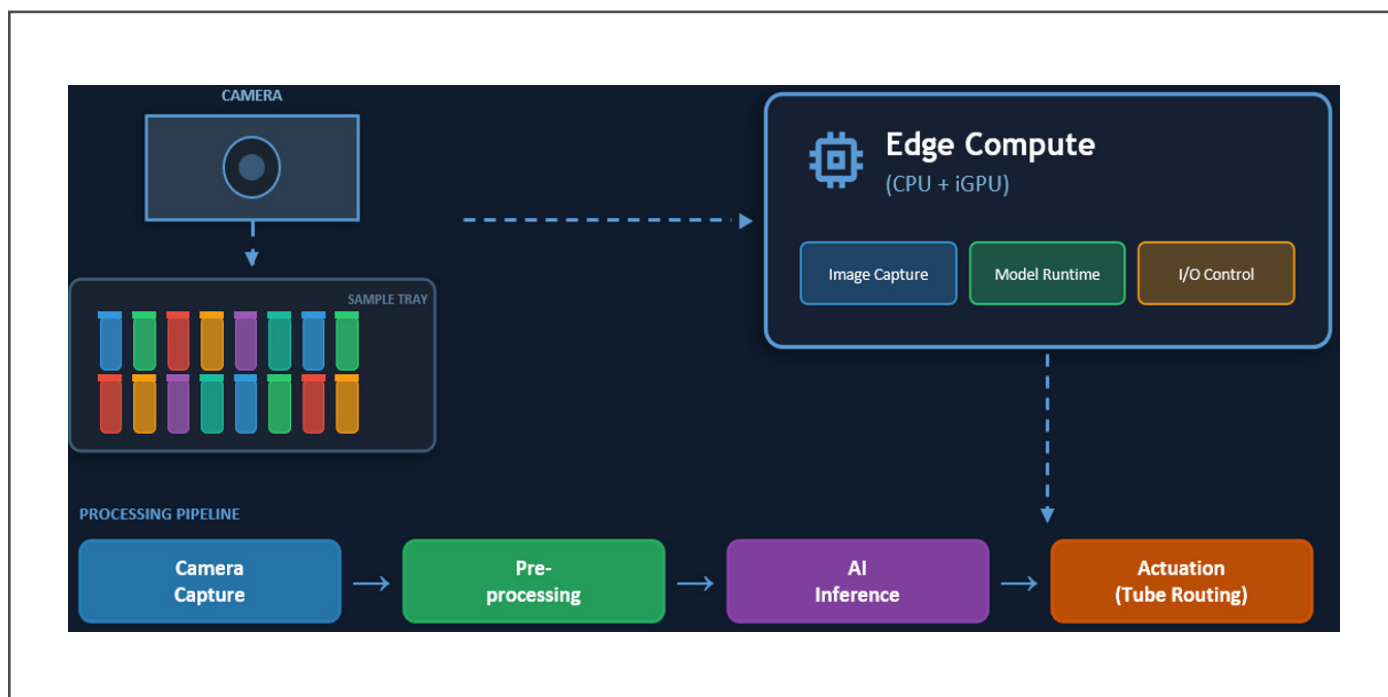


Figure 1. Example screening tool automation using cameras embedded in the module.

One application for these high performing processors is automating test tube screening. Inside the modules for screening tools, cameras are focused on a tray of test tubes as shown in Figure 1.

Once the image of these tubes is captured the screening tool puts it through several image processing algorithms including computer vision-based AI models to detect various tube properties and characteristics.

When the screening tool uses an Intel Core processor, these models can run on an integrated GPU in the system. This provides inferred results for the next set of operations to take place. These operations could be, for example, moving tubes to respective stations.

The inclusion of these AI models with real-time edge inferencing helps automate the large volume of lab test tubes that need to be analyzed every day, as well as adds robustness to the whole system.

When these screening tools use a combination of Intel Core processors with iGPUs, and the Intel® Distribution of OpenVINO™ toolkit they have the performance to run common computer vision models to achieve substantially lower inference latency at the edge.

To demonstrate this performance advantage, we conducted performance tests comparing a screening system based on the Intel® Core™ 5 Processor 221E with Intel® UHD Graphics, and a system using the Intel® Core™ Ultra 5 335 Processor with Intel® Arc™ Graphics. Both systems used the Intel Distribution of OpenVINO™ Toolkit 2025.2. The results of these tests are summarized in Table 1:

- 1.41x with batch size of 1 on iGPU
- 2.18x with batch size of 8 on iGPU

	Mobilenet-v2	Intel Core 5 221E (fps)	Intel Core Ultra 5 335 (fps)	Speed-up
iGPU	BS1	807	1141	1.41
iGPU	BS8	1225	2680	2.18
NPU	BS1	N/A	2409	

Table 1. Summary of performance results measured on the Intel Core 5 221E processor and Intel Core Ultra 5 335 processor. Please see notes for configuration details.

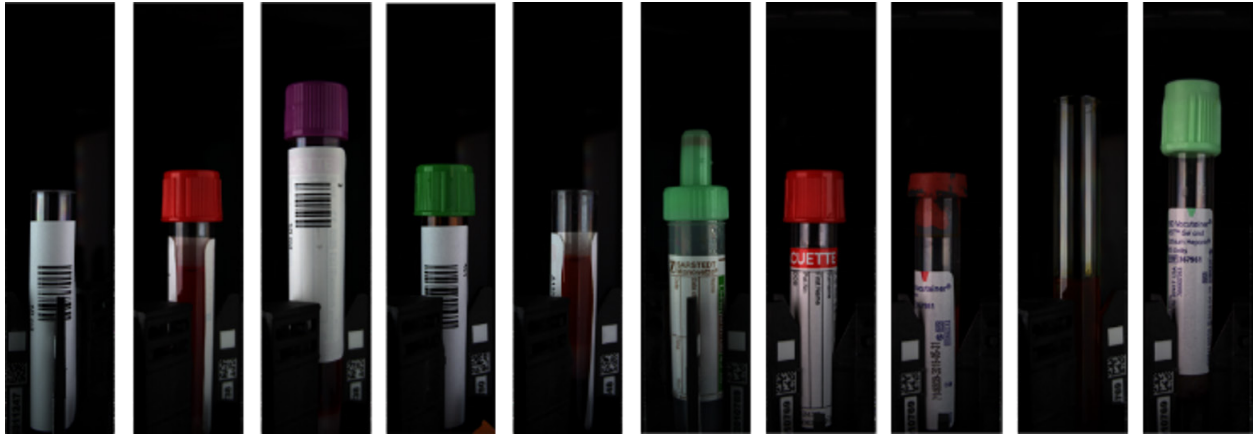


Figure 2. Representative tube types supported by the computer vision AI models (illustrative).

Solution: Integrated AI Accelerators on Intel Core Processors

In screening tools, computer vision-based AI models can improve workflow efficiency and increase robustness by automatically detecting tube properties, validating sample readiness, and triggering downstream handling decisions².

A representative edge screening system can use an Intel® Core™ i3 processor (14th Gen) with integrated graphics to run these vision models. The vision system scans tubes in a tray and classifies them based on shape, size, cap type, color, fill level, and label orientation³, as shown in Figure 2.

This screening process ensures that even non-standard or misaligned samples are correctly identified and processed. The vision models running on Intel Core processors help the system automatically classify and prioritize samples, without manual intervention, thus enabling faster turnaround time and better lab efficiency. One of the primary benefits of AI integration is error reduction and improved system reliability.

The AI models help detect improperly capped tubes or damaged containers, minimizing the risk of sample contamination, spills, or equipment jams⁴. As a result of this there are reduced sample retake requests, which in pediatric or emergency cases have a huge impact on patient care.

Enabling AI models to run directly on-device at the edge with near real-time latency enhances diagnostic solutions by leveraging built-in AI acceleration without the need for additional compute. This approach supports a compact form factor, improves thermal efficiency, and delivers a cost-effective solution ideal for deployment in end-user lab environments.

Intel Core Processors

Intel Core processors are a family of high-performance CPUs designed for a range of computing needs—from mobile devices to desktops and workstations. The devices offer varying levels of multi-core performance, AI acceleration, integrated graphics, and power efficiency.

Key features include:

- Hybrid architecture (in recent generations) combining Performance-cores (P-cores) and Efficient-cores (E-cores) for optimized multitasking and power scaling.
- Intel® Thread Director for intelligent workload distribution across cores.
- Integrated Intel® Iris® Xe or Intel® UHD Graphics, with optional discrete GPU support.
- AI capabilities via Intel's integrated AI engines in newer Intel® Core™ Ultra processors.
- Compatibility with DDR4/DDR5 memory and PCIe Gen 5.0, supporting modern workloads and connectivity needs.

These processors are widely used in healthcare, industrial, and AI edge applications due to their reliability, broad ecosystem support, and performance scalability.

Integrated GPUs on Intel Core processors provide a scalable and energy-efficient graphics solution for mainstream computing, embedded systems, and AI-enabled applications—without the thermal and space demands of discrete GPUs.

The Value of Intel Expertise

Intel is instrumental in architecting integrated AI diagnostic solutions tailored to evolving customer needs. Our team has deep platform expertise with a collaborative, hands-on engagement that accelerates key design decisions across hardware, software, and system integration, helping de-risk implementation and streamline the path to deployment. Intel strengthens overall partnership solution readiness, scalability, and time to value for next-generation diagnostic automation.

Conclusion

AI-powered integrated accelerators delivering cost-effective, power efficient, and high-performance automation for a wide range of health diagnostic and screening tools.

With the global rise in patient volume and the growing complexity of medical diagnostics, edge AI can help laboratories scale automation while maintaining reliability and cost efficiency. Intel Core processors and integrated accelerators enable AI-powered computer vision workloads to run locally with low latency, supporting compact system designs, improved throughput, and robust sample handling in screening tools and automation workflows.

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References

1. https://www.precedenceresearch.com/artificial-intelligence-diagnostics-market?utm_source=chatgpt.com
2. [An automated test tube identification and sorting system based on machine vision](#)
3. [System and Methods for Test Tube and Cap Identification](#)
4. [STAT and Critical Tests](#)



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Test configuration details:
Intel Core 5 221E, TDP:65W, Memory:32GB (2x16GB DDR5 4800MT/s [4800MT/s])
Intel Core Ultra 5 245, TDP: 65W, Memory:64GB (2x32GB DDR5 6400MT/s [6400MT/s])

Configuration	Intel Core 5 221E	Intel Core Ultra 5 335
Test Date	Oct. 2025	March 2026
CPU	Intel Core 5 221E	Intel® Core™ Ultra 5 335
Cores / Threads	14	8
L3 Cache	24 MB	12 MB
TDP	65 W	15W
Turbo Boost	Enabled	Enabled
Base Frequency	2.8 GHz	2.2GHz
Max Frequency	5.2 GHz	4.5GHz
Memory	32 GB DDR5-4800	64GB (2x32GB DDR5 6400 MT/s)
Storage	WD_BLACK SN770 250 GB	1x 465.8GB Sabrent SB-RKT4P-500
NIC	2x Intel I210 GbE	1x Intel Corporation, 2x Ethernet interface
OS	Ubuntu 24.04.3 LTS	Ubuntu 24.04.3 LTS
BIOS	RPLISFI.R00.631A	PTLPFWII.R00.3514. D60.2601090934
Microcode	0x131	0x115
Kernel	6.16.0-60160606-generic	6.17-intel
Power Plan	Balanced / Performance / powersave	Normal (6)
Scaling Governor	powersave	performance
Scaling Driver	intel_pstate	intel_pstate
Graphics Driver	25.35.35096.9	26.01.36711.4
NPU Driver	1.24.0	1.33.0.20260320 2335408679
OpenVINO	2025.3.0.0	2026.0.0
DLStreamer	2025.1.2	2026.0.0

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