



AI DELIVERS ADVANCEMENTS IN MEDICAL DEVICES

The Expanding Role of Artificial Intelligence Revolutionizes Medical Device Capabilities

TODAY'S WORLD OF AI IN MEDICINE

Artificial intelligence (AI) is infusing medical devices with unprecedented capabilities and efficiency. Between 1995 and May 2024, the FDA authorized 882 AI- and machine learning (ML)-enabled medical devices. Developers are increasingly embedding AI into new and existing medical devices, unlocking previously unimaginable potential.

From enhancing imaging techniques to improving diagnostic accuracy, the AI-driven capabilities of modern medical devices are enabling better patient outcomes and more efficient medical practices. Wind River® provides the software development tools and services to help medical device developers design and enable new, or update existing, medical technology with AI/ML-driven devices.

Advancing MRI Machines

Magnetic resonance imaging (MRI) machines are a cornerstone of diagnostic imaging, offering detailed views of internal anatomy and physiological processes. AI has brought significant upgrades to MRI functionality and performance, enhancing image quality, reducing noise, and improving the speed of image acquisition.

One primary application of AI in MRI machines is accelerating scan times. Traditional MRI scans often take 30 to 60 minutes, but AI-powered techniques reduce time by optimizing the data acquisition process. AI can predict missing data points, allowing quicker image construction without compromising quality. AI is also improving the accuracy of MRI image interpretation, detecting anomalies that might be missed by the human eye and providing a second level of analysis.

AI INTEGRATED INTO MEDICAL IMAGING DEVICES



MRI Machines



CT Scanners



PET Scans



Image Reconstruction Tools



Ultrasound Machines



Enhancing Imagery in CT Scanners

Computed tomography (CT) scanners provide cross-sectional body images. AI integration into CT scanners denoises images and produces clarity at lower radiation doses, better safeguarding patient health.

AI also is revolutionizing the speed and accuracy of image reconstruction in CT scanners. Traditional processes can be time-consuming and computationally intensive. AI-driven algorithms, on the other hand, process data rapidly enough to provide near-instantaneous results and enhance workflow efficiency to ensure timely diagnosis and treatment planning.

Providing Strong Analysis for PET Scans

Positron emission tomography (PET) scans are essential for detecting and monitoring various diseases, including cancer and neurological disorders. AI-enabled image enhancement and quantification improve the clarity and resolution of PET scan images. This enables better visualization of metabolic processes and disease markers, improving accuracy in disease detection and treatment monitoring.

AI also refines the quantification of PET scan data. Quantitative analysis of PET scan images is crucial in assessing disease progression and response to therapy, and AI models can automate this analysis. The result is reduced time and effort while ensuring more consistent and reliable results.

Expanding Image Reconstruction Tools

Image reconstruction is a fundamental aspect of many medical imaging modalities. AI-driven image reconstruction tools offer numerous benefits in terms of speed, accuracy, and quality.

Device developers are creating sophisticated AI algorithms that can reconstruct images from raw data with remarkable precision. These tools are particularly effective in reducing artifacts and noise, which can obscure critical details in medical images. Not only do these AI-powered tools enhance the diagnostic capabilities of such imaging modalities as MRI, CT, and PET scans but they also support the development of deep learning-based reconstruction techniques. They can leverage large datasets to train models to predict high-quality images from incomplete or noisy data, and they speed the reconstruction process and improve overall image quality to support better patient diagnosis and treatment planning.

Improving Imagery and Measurements for Ultrasound Machines

Ultrasound imaging is widely used for its noninvasive and real-time capabilities. AI enhances ultrasound machines by improving image quality, automating measurements, and aiding in interpreting complex images. It also automates image measurement and analysis: Tasks such as measuring fetal growth, assessing cardiac function, and evaluating tissue elasticity are performed more quickly and accurately with AI.

By providing real-time guidance and decision support, AI helps interpret ultrasound images by highlighting areas of concern, suggesting possible diagnoses, and recommending further imaging or tests. This is especially useful in busy clinical settings.

WIND RIVER SOLUTIONS FOR AI AND MEDICAL DEVICE DEVELOPERS

Wind River® has been delivering safe, secure, and reliable software solutions and services to medical device developers for more than 40 years. It supports medical technology companies in developing products that utilize the intelligent edge, 5G wireless, AI, and more with:

- A cloud platform to help developers empower medical devices with robust AI capabilities to accelerate innovation and improve patient outcomes
- A developer platform with modern development tools and services to design medical systems
- A Linux operating system (OS) that allows flexible containerization and services for AI applications
- The leading commercial real-time operating system (RTOS) with safety certification evidence for rapid operations

[>> Learn More About Wind River Solutions for Medical Devices](#)

Wind River Studio Cloud Platform

Studio Cloud Platform is an open source, production-grade distributed Kubernetes solution for managing cloud infrastructure that can provide developers with the cloud resources to empower medical devices with robust AI capabilities. The cloud data infrastructure can host AI/ML systems that power robust AI capabilities in medical equipment and devices by providing data storage, computational resources, collaboration tools, and security features. This allows medical device companies to build AI capabilities into their devices to accelerate healthcare innovation; improve speedy diagnosis; and support imagery, automation, and patient monitoring for better patient outcomes.

[>> Learn More About Studio Cloud Platform](#)

Wind River Studio Developer

Studio Developer is a modern DevSecOps platform that accelerates development, deployment, and operation of robust mission-critical systems such as medical devices with AI capabilities. It has five main components: Wind River Studio Pipelines, Wind River Studio Virtual Labs, Wind River Studio Test Automation, Wind River Studio Over-the-Air Updates, and Wind River Studio Digital Feedback Loop. Flexible installation options provide control over security and compliance, both in the public cloud and in on-premises infrastructure.

[>> Learn More About Studio Developer](#)

Wind River Studio Linux Services

Studio Linux Services delivers embedded Linux platform services that assist in bringing AI features to devices. It provides the services medical technology developers need to assist and support solution design, safety and certification, security, and lifecycle management capabilities. Reduce open source project risk while accelerating time-to-application-deployment so you can lower your total cost of ownership and focus your valuable resources on medical device innovation.

[>> Learn More About Studio Linux Services](#)

Wind River Linux

Wind River Linux is the industry-leading open source operating system. Medical device developers can take advantage of a comprehensive suite of products, tools, and lifecycle services, along with support for complex embedded medical systems.

[>> Learn More About Wind River Linux](#)

VxWorks

VxWorks® is an RTOS that meets hard real-time requirements for precision-based devices, such as surgical devices. It provides strict certification standards for safety, security, and performance and is IEC 62304 certified for medical. VxWorks is the first and only RTOS to support application deployment through OCI-compliant containers.

[>> Learn More About VxWorks](#)

The integration of AI into medical devices is delivering transformative benefits across imaging modalities. From MRI machines to ultrasound devices, AI is enhancing image quality, reducing scan times, minimizing radiation exposure, and improving diagnostic accuracy. These advancements are not only revolutionizing the capabilities of medical devices but also significantly enhancing patient care and outcomes. As AI continues to evolve and mature, its impact on medical devices will undoubtedly expand, ushering in a new era of precision medicine and efficient healthcare delivery.

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