NVIDIA

EXPANDING HEALTHCARE POSSIBILITIES WITH SOFTWARE-DEFINED MEDICAL DEVICES

WORKFLOW AND OPERATIONS OPTIMIZATION

PHILIPS

Advancing Precision Diagnosis

With the goal of improving 2.5 billion lives every year by 2030, Philips is advancing precision diagnosis with AI by focusing on the human experience. NVIDIA technologies are making it possible, enabling them to augment clinicians and staff, accelerate workflows to improve efficiency, and advise on clinical and operational optimization. Utilizing a number of clusters equipped with different GPUs, including NVIDIA DGX™ A100, NVIDIA software, NVIDIA® TensorRT™, and optimized CUDA® cores across use cases, Philips can scale with demand, delivering performance improvements for their customers despite increasing complexity of workloads. Their AI-powered solutions are deployed throughout the patient journey, from scheduling and preparation to interpretation and reporting, clinical decisions, and follow-up. Replacing MRI respiratory belts, conducting patients' CT positioning and scan planning with AI and computer vision, and using AI models to compensate for scatter radiation in x-rays are just a few of the ways that Philips is delivering higher accuracy and improving outcomes.

Learn more about Philips' approaches, use cases, and challenges for advancing precision diagnosis with AI.

PERFORMANCE-GUIDED SURGERY

ASENSUS SURGICAL

Reimagining Surgery with AI, Machine Learning, and Robotics

Using Asensus Surgical's digital laparoscopy system, Senhance, surgeons can—for the first time—perform minimally invasive surgery with real-time digital tools that help reduce surgical variability complications. Their 3-millimeter instruments, eye-sensing, haptic feedback, and machine vision capabilities are used in over 5,500 procedures around the world. Their mission is to unlock clinical intelligence, predict outcomes, optimize resources, and help hospitals innovate in performance-guided surgery.

The Senhance system with the NVIDIA RTX™ 6000 GPU allows the ICU to perform a wide variety of tasks, including streaming real-time video to the surgeon, analyzing specific sessions for training feedback, and performing 2D and 3D video-processing tasks. The NVIDIA GPUs with NVIDIA NVLink® allow tasks to be executed in parallel with the low inference needed for real-time performance and high video quality. They also utilize CUDA cores, Tensor Cores, and NVIDIA RT Cores for deep learning and scalability.

All of this allows Asensus to provide surgeons with technology that gives them greater insights and control to improve the surgical experience.

Learn how, through optimized NVIDIA hardware and software, Asensus Surgical is delivering real-time digital capabilities in surgery.

The Senhance Intelligent Surgical Unit (ISU) with state-of-the-art computer vision capabilities

The Senhance Surgical System with digital laparoscopy

GASTROINTESTINAL ENDOSCOPIC VIDEOS

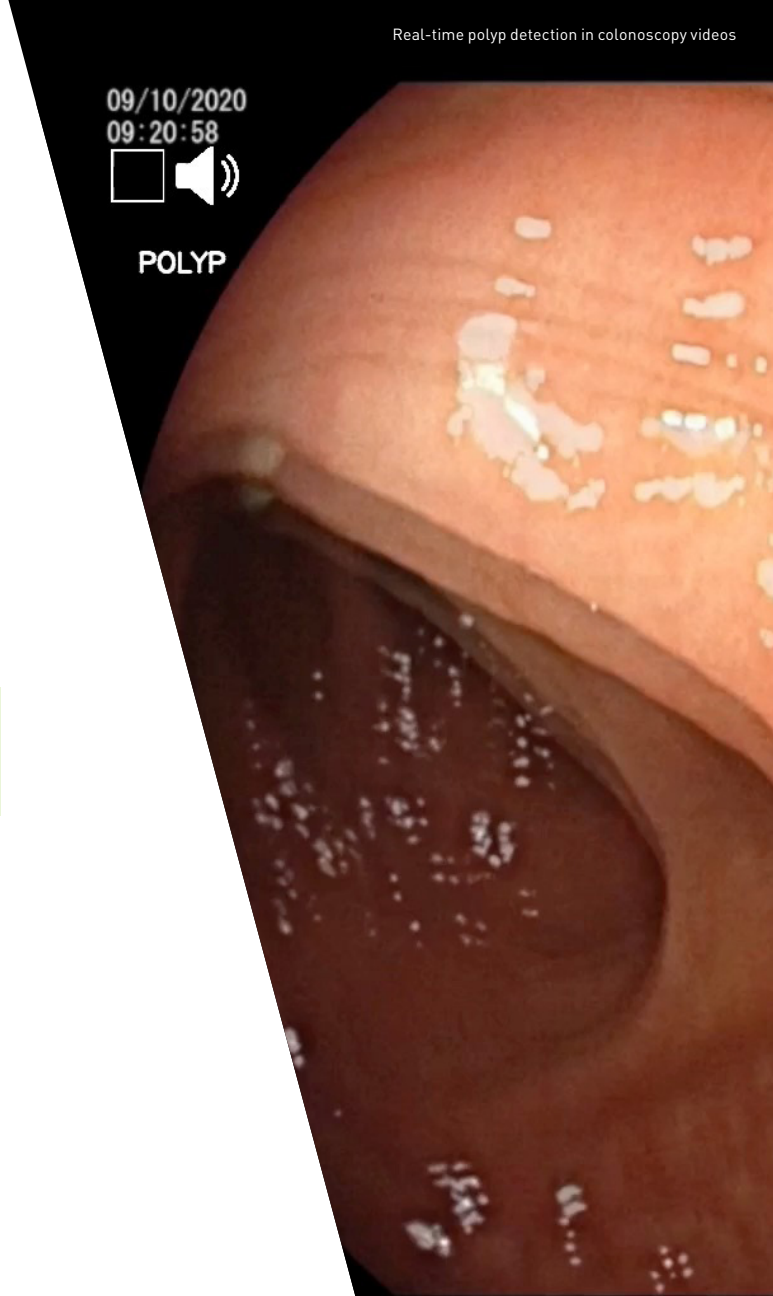
CHULALONGKORN UNIVERSITY

Real-Time, AI-Assisted Medical Diagnosis

The Department of Computer Engineering at Chulalongkorn University, in collaboration with ESM Solutions, is implementing a deep learning model to help doctors diagnose in real time during endoscopy operations. They're able to apply their AI models across various procedures and regions, for real-time polyp detection, real-time semantic segmentation on the gastric intestinal metaplasia (GIM) area in gastroscopy, and dysplasia segmentation in capsule endoscopy.

Leveraging the NVIDIA V100 Tensor Core GPU and DGX A100, they're transforming colonoscopy and gastroscopy with AI-powered video for early detection of colorectal cancer and deployment of their semantic GIM segmentation model for early detection of gastric cancer. Their GPU-powered platform enables them to run their AI model in real time for feature matching and few-shot learning, resulting in 94 percent accuracy with 44 frames per second.

Learn how Chulalongkorn University is improving real-time diagnosis by combining data, doctors, AI models, and NVIDIA GPUs.



Real-time polyp detection in colonoscopy videos

COVID DETECTION

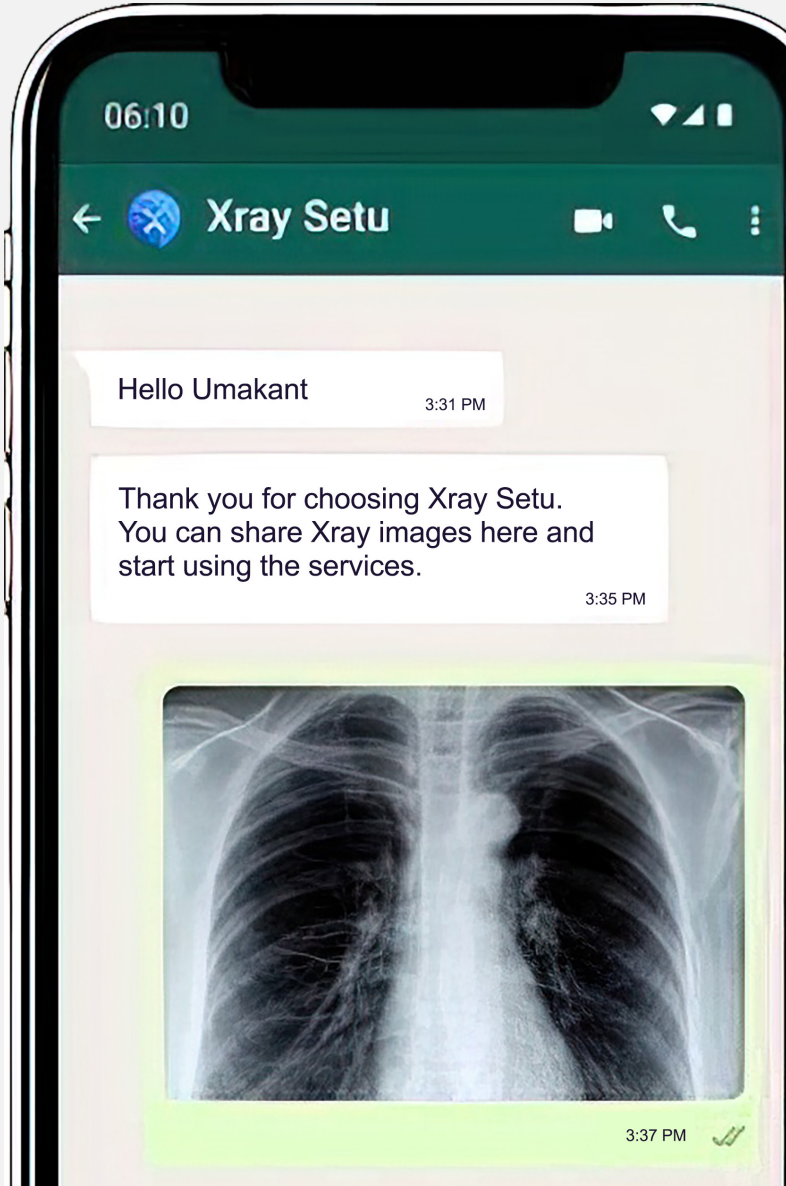
ARTPARK

Interpreting Chest X-ray Images with Mobile Phones and WhatsApp

AI researchers from ARTPARK, in partnership with Niramai Health Analytix and the Indian Institute of Science, have developed a way to rapidly identify COVID-positive cases from WhatsApp messages containing patient chest x-ray images. They use an NVIDIA DGX system to train their deep neural networks, which are then deployed on an NVIDIA A100 Tensor Core GPU cluster that runs inference in under two seconds. Their build-and-deployment architecture has met the exacting accuracy requirements of COVID-positive identification, and the rapid diagnosis has helped triage potential COVID-positive cases during the peak of the pandemic in India.

Learn how ARTPARK is seeking to scale their solution for future use cases.

AI-based chest x-ray interpretation via WhatsApp



PERICARDIUM AND AORTA SEGMENTATION

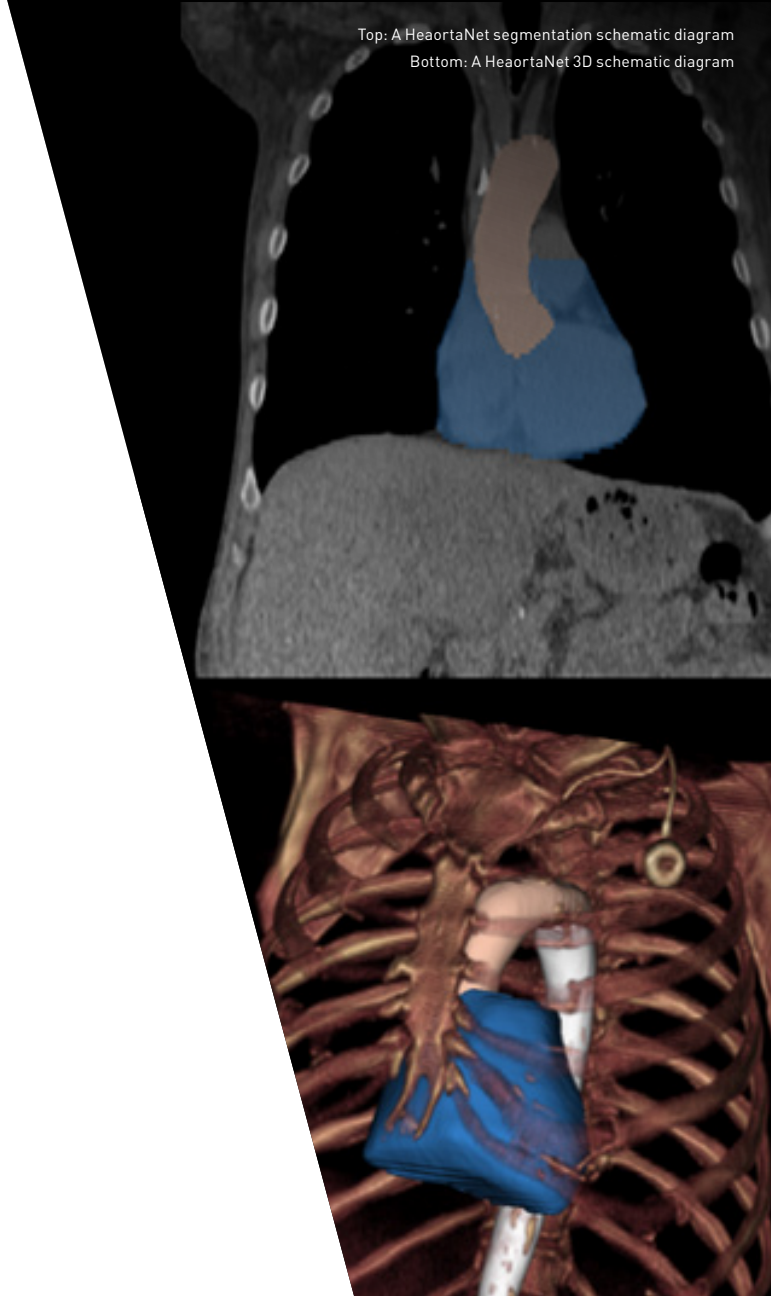
THE NATIONAL TAIWAN UNIVERSITY HOSPITAL

AI Modeling and its Implications

HeaortaNet, a pericardium and aorta segmentation and cardiovascular risk prediction AI model that helps predict cardiovascular risk, was developed by the Taiwan-Cardiovascular Artificial Intelligence (CVAI) team. Utilizing NVIDIA GPUs and TensorRT, HeaortaNet is a deep learning model that was trained on over 70,000 axial images from 200 patients with verified annotations of the pericardium and aorta. It shortens the time for data processing from 60 minutes to 0.4 seconds by manual segmentation of both the pericardium and aorta. The segmentation accuracy is 94.8 percent for the pericardium and 92.5 percent for the aorta.

Using this AI model to construct an image mask, combined with image post-processing procedures, HeaortaNet can quickly quantify cardiac ascending and descending aortic calcification and pericardial and epicardial adipose tissue.

Learn more about how HeaortaNet uses AI to calculate cardiovascular risk.



Top: A HeaortaNet segmentation schematic diagram
Bottom: A HeaortaNet 3D schematic diagram

MEDICAL DEVICES FOR HEALTHCARE ACCESSIBILITY

NOUL

Noul has consolidated all the components of a lab into a single decentralized hematology platform—miLab. An all-in-one platform, miLab transforms clinics anywhere in the world into a local lab in just 20 minutes with solid staining and embedded AI. A user can drop 5 microliters of blood onto a cartridge that's inserted into the device. The device automatically smears, stains, and takes microscopic images of the blood cells, which are then analyzed by an AI algorithm to generate rapid results.

Noul is a member of NVIDIA Inception and has used NVIDIA's accelerator program and AI solutions to accelerate development, leveraging framework support, high computing power, easy deployment, and scalability as they create a new path in diagnostics with their miLab platform.

Learn more about Noul and other startups accelerating medical technology in emerging markets.

HYPERFINE

Hyperfine is making AI and MRI in healthcare accessible with Swoop, a portable MRI machine. The portable, low-field MRI uses AI-based image reconstruction and noise cancellation to enable clinical-grade images that can expedite time to diagnosis and treatment. NVIDIA Jetson delivers the required edge computing power for 3D volume rendering, deep learning image reconstruction, and AI applications running on Swoop.

Learn more about Hyperfine and other healthcare startups making AI in healthcare accessible.

miLab, an all-in-one hematology platform

Swoop, a portable, low-field MRI machine

BRINGING AI AND REAL-TIME SENSING TO MEDICAL DEVICES

AI-enabled medical devices are giving healthcare professionals better decision-making tools to deliver care in robot-assisted surgery, interventional radiology, radiation therapy planning, and more. NVIDIA's AI solutions deliver the accelerated pipeline needed to process, predict, and visualize data for AI-supported medical devices in real time, helping device makers scale up from device to data center.

NVIDIA Clara Holoscan is the AI computing platform for medical devices that combines hardware systems for low-latency sensor and network connectivity, optimized libraries for data processing and AI, and core microservices to run streaming, imaging, and other applications from embedded to edge to cloud. Clara Holoscan enables medical device developers to create and take to market the next generation of AI-enabled medical devices.

"Healthcare, generating the largest data sizes of any industry, demands a new computing platform to speed therapy discovery and improve care delivery. NVIDIA Clara, the computational platform for healthcare, is accelerating breakthroughs to get innovative products to doctors and patients sooner."

– Kimberly Powell, Vice President of Healthcare, NVIDIA

Ready to Get Started?

Find out more about NVIDIA Clara Holoscan at **www.nvidia.com/clara-holoscan**

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