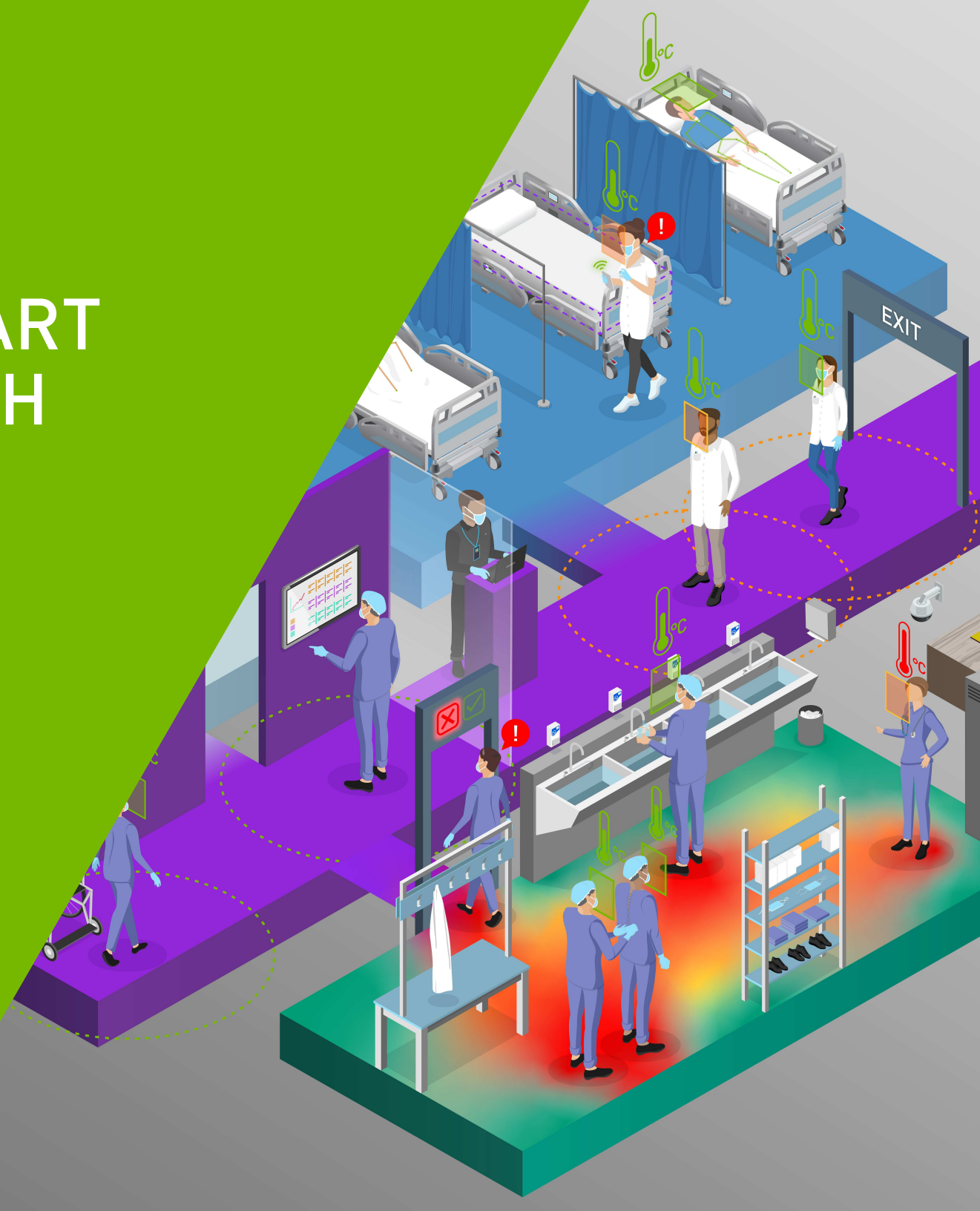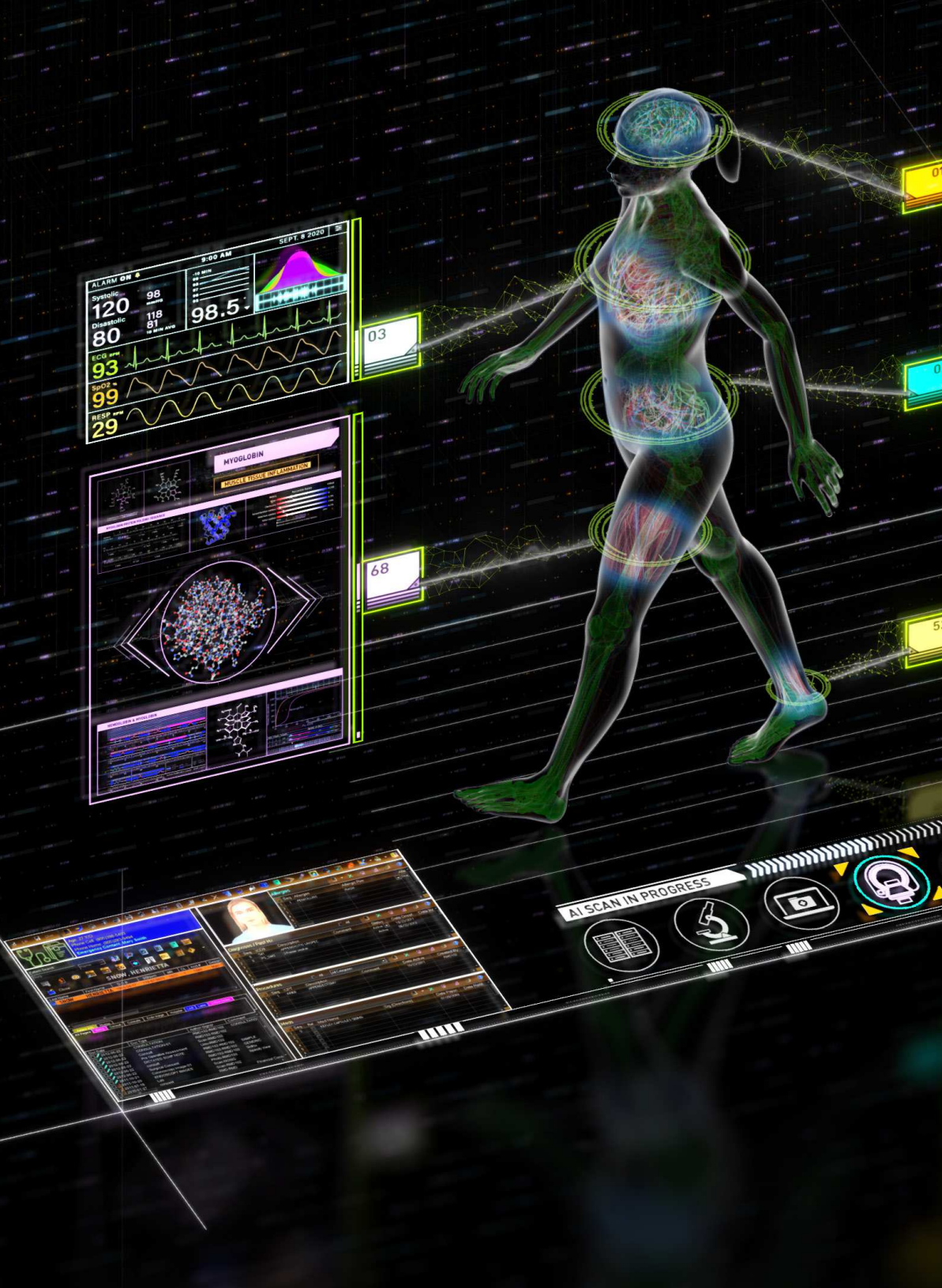# POWERING SMART HOSPITALS WITH NVIDIA CLARA GUARDIAN

Contents

Artificial intelligence lays the foundation for making smart hospitals a reality. With smart sensors such as AI-enabled cameras and microphones, physicians can improve public safety, patient care, and operational efficiency.

THE PROMISE OF EDGE AI IN HEALTHCARE

The need for smart hospitals is rapidly increasing—to improve patient care and to address numerous IT challenges. More than ever, patients are looking for healthcare services to be delivered more efficiently in a convenient and comfortable setting. For these reasons, healthcare facilities are seeking new ways to incorporate intelligent solutions that can improve their productivity, efficiency, and patient care. But they don't always have the resources to do so.

Artificial intelligence lays the foundation for making smart hospitals a reality. With smart sensors such as AI-enabled cameras and microphones, physicians can improve patient care, increase data security, and advance operational efficiency. AI-powered tools and applications help healthcare facilities strengthen communication, streamline clinical workflows, and create a seamless patient experience.

NVIDIA CLARA GUARDIAN— ACCELERATING EDGE AI FOR SMART HOSPITALS

The delivery of healthcare services is becoming more challenging, with providers, staff, and IT all having to do more with less resources.

Smart sensors can aid in these challenges by acting as eyes and ears, ensuring safety and operational excellence as well as advancing care for patients. In fact, with smart sensors, it's possible to measure for fever or absence of protective gear, monitor crowds to ensure safe social distancing, and interact with high-risk patients to keep both patients and staff safe and informed.

NVIDIA Clara™ Guardian is an application framework and partner ecosystem that accelerates the development and deployment of smart sensors and sensor fusion anywhere in a hospital or health system. Clara Guardian comes with a collection of healthcare-specific pre-trained models and reference applications that are powered by GPU-accelerated application frameworks, toolkits, and reference architecture for intelligent video analytics (IVA) and conversational AI. This makes it easy for ecosystem partners to add AI capabilities to common sensors.

NVIDIA Clara Guardian-Powered Solutions

Improve Patient Outcomes

Clara Guardian's partners offer turnkey solutions that streamline patient care.

Reduce TCO

Clara Guardian-powered AI solutions increase efficiency and productivity.

Trusted, Powerful AI

Clara Guardian-powered AI solutions are reliable, tested, and scalable.

BENEFITS AT A GLANCE

Healthcare facilities that deploy Clara Guardian-powered solutions can speed their path to becoming a smart hospital. The proof is in the numbers. After rolling out Clara Guardian, hospitals experienced an impressive range of benefits.

THERMAL SENSING

$3M
savings per year using an automated thermal-sensing solution

(IntelliSite)

2 hrs
only to install an end-to-end thermal sensing and people-counting solution

(IntelliSite)

FALL DETECTION

$4M
savings per year using AI-powered fall detection

(Ouva)

40%
fewer falls

(SafelyYou)

70%
fewer ER visits from falls

(SafelyYou)

PATIENT MONITORING

54%
reduction in nurses' needing to enter ICU rooms with automated IVA solutions

(Whiteboard Coordinator)

$11M
savings per year for a 100-bed facility with automated patient flow

(Ouva)

OPERATING ROOM COORDINATION

16%
productivity gain within six months with AI-powered IVA solutions coordinating operating room schedules

(Whiteboard Coordinator)

INFECTION CONTROL

$500K
savings per year for a 100-bed facility with AI-powered infection control solutions

(Ouva)

USE CASES AND SUCCESS STORIES

In the complex world of healthcare, AI can give healthcare organizations the tools to provide better, faster, and more personalized patient care. When saving minutes can mean saving lives, healthcare AI can be transformative for the life of an individual patient and for the healthcare industry at large.

Many independent software vendors (ISVs) leverage NVIDIA Clara Guardian components to accelerate their application development in diverse use cases.

Critical use cases include public safety, patient care, and operational efficiency. AI models are used to automate body temperature screening, protective masks detection, safe social distancing, and remote monitoring.
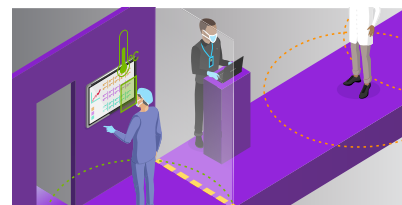
PUBLIC SAFETY

Temperature Screening

Personal Protective Equipment (PPE) Detection

Social Distancing
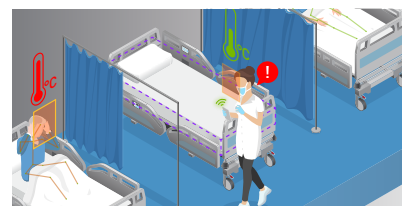
PATIENT CARE

Patient Monitoring

Fall Prevention

Patient Engagement

OPERATIONAL EFFICIENCY

Operating Room Workflow Automation

Surgery Analytics

Contactless Control

PUBLIC SAFETY

As of August 2020, the pandemic of respiratory illness COVID-19 that's caused by novel coronavirus SARS-CoV-2 is spreading in all regions, with reported cases in more than 200 countries and territories. Intelligent video analytics is a critical tool that can enable security, ensure public safety, and help slow the rapid spread of coronavirus.

Temperature Screening

The traditional method of checking temperatures with thermometers is labor intensive and error prone. When patients and staff need to be checked as they enter healthcare facilities, it also creates bottlenecks at access locations. Clara Guardian-powered solutions detect elevated body temperatures in real time and without physical contact, identifying high-risk individuals and creating actionable outcomes.

Mask Detection

The Centers of Disease Control and Prevention recommends wearing masks in public to prevent transmission of the virus from asymptomatic, infectious patients. Clara Guardian-powered solutions detect in real time when individuals are wearing face masks and transmit an alert when they're not. Clara Guardian can also understand face mask compliance over time and location, generating alerts as needed.

Social Distancing

COVID-19 spreads among people who are in close contact—within about six feet—for a prolonged period of time. Maintaining social distancing can help slow the spread. Clara Guardian-powered solutions quantify and analyze distance between individuals and locations over time to identify non-compliance with physical and social distancing mandates.
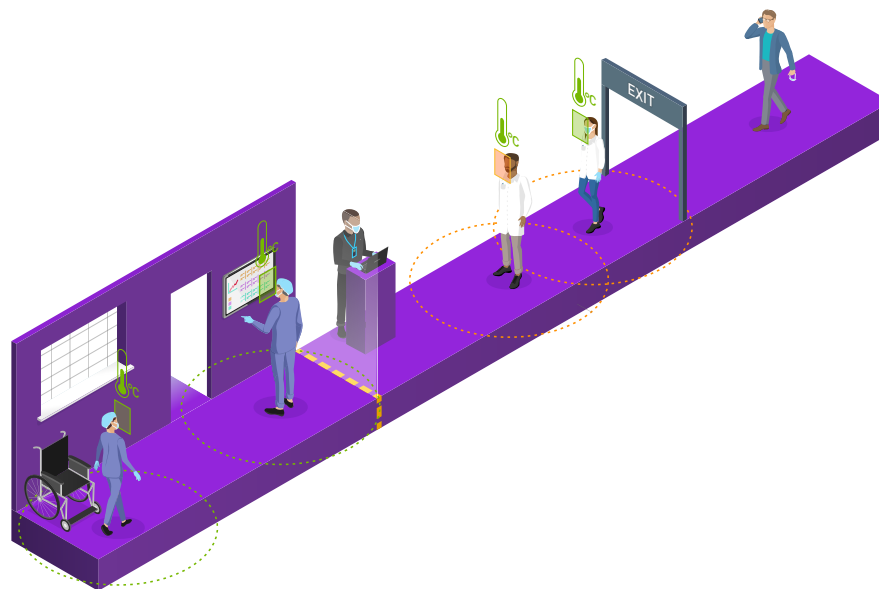
TEMPERATURE SENSING WITH INTELLISITE

IntelliSite's All-in-One Heuristic-Based Monitoring (hBM) system captures elevated body temperatures and provides real-time identification of high-risk individuals.

hBM, powered by NVIDIA Clara Guardian, uses the NVIDIA® Quadro RTX™ 4000 GPU for real-time inference on thermal data from live camera views. The solution reduces manual scanning time for healthcare customers by 80 percent and drops the total cost of temperature scans by 70 percent. The temperature screening tool has been deployed in healthcare, public spaces, and other facilities in the U.S. and is being tested at U.S. airports, amusement parks, and education facilities.

"We've been working closely with NVIDIA teams since 2016 to push the boundaries of what's possible today in the AI-based video analytics space. NVIDIA Clara Guardian and NVIDIA Metropolis have been important for us to make a business impact, driving opportunities together. Being Metropolis-certified and deploying through the NVIDIA NGC™ has helped our customers and partners in the way this technology is delivered today."

– Agustin Caverzasi, President of AI
  IntelliSite powered by Deep Vision AI

MASK DETECTION WITH MALONG

Organizations across all industries need multiple sensing capabilities to ensure safety and compliance during times of pandemic like COVID-19.

Malong's ThermalNet, powered by NVIDIA Clara Guardian, NVIDIA Metropolis, and NVIDIA GPUs is a single solution that detects masks, body temperature, number of people, PPE, social distancing, and more.

ThermalNet can process up to 150 visitors per minute per camera. It has built-in privacy protection and an easy-to-use dashboard with mobile alerts.

"We developed ThermalNet to address one of the most pressing challenges being faced in healthcare today. NVIDIA Clara Guardian enables our solution to attain state-of-the-art performance, aiding us in our goal of helping people and organizations stay safer."

– Matt Scott, CEO and Co-founder, Malong Technologies, NVIDIA Inception Partner
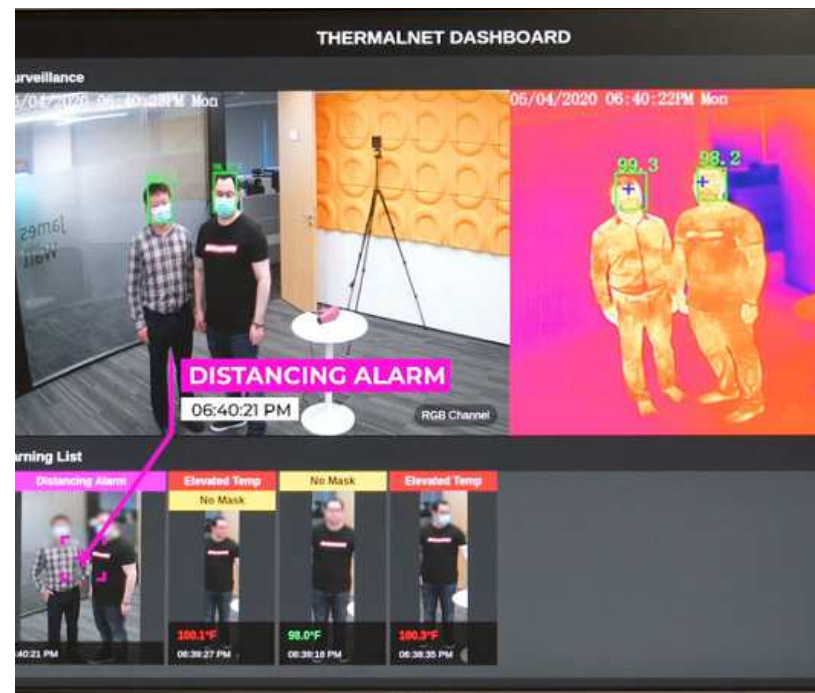
SOCIAL DISTANCING WITH SMARTCOW

NVIDIA Inception partner SmartCow built an AI-powered healthcare assistant named Edgar that supports six types of AI models: social distancing estimation, face mask detection, gloves detection, medical apron detection, full-medical-body-suit detection, and safe-sneeze-action classification.

Edgar, powered by NVIDIA Clara Guardian, creates a safe environment in times of medical emergencies, assisting the front-line medical staff in preventing respiratory disease. Their social distancing detection can combine with a policy network and keep track of social distancing between two people. These platforms can be deployed in under 10 minutes with little to no configuration.

SmartCow's Edgar is currently in use in private clinics, pharmacies, and hospitals in Switzerland, France, and Germany, offering capabilities that enhance patient care, hygiene environment, and contactless access.
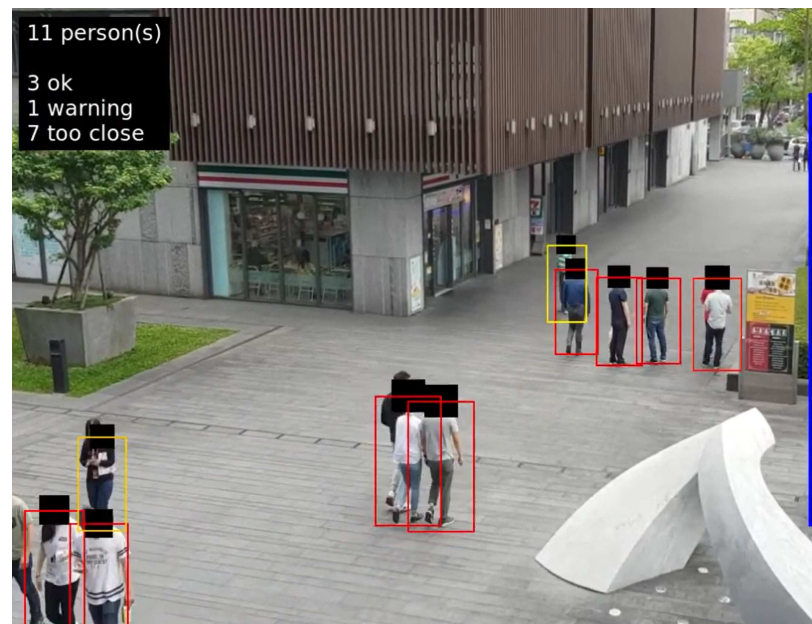
PATIENT CARE

In the United States, federal healthcare spending is rapidly approaching 20 percent of the gross domestic product (GDP). Furthermore, chronic disease is highly prevalent, accounting for nearly 90 percent of all healthcare spending in the United States. It costs 3.5 times more to treat chronic diseases than other conditions, and they account for 80 percent of all hospital admissions.[1]

AI-powered solutions like IVA and conversational AI can enhance patient care by providing a holistic view of a patient's health over time, increasing visibility into a patient's adherence to treatment, and enabling timely intervention before a costly care episode.

Patient Monitoring

Nurse fatigue and burnout are on the raise. Such conditions increase the risk of patient harm. Clara Guardian-powered solutions can keep track of patient activity and vital signs, enabling healthcare providers to deliver higher-quality care to more patients with a lower risk of burnout and cost

Fall Prevention

The average cost to a hospital for a fall injury is $35,000. Medicare estimated that $43,000 is added to the hospital's cost from pressure injuries like bedsores. Amid COVID-19 distancing measures, falls in memory care have increased by 20 percent. Clara Guardian-powered solutions can detect patient posture and activity that may lead to a fall and deliver real-time emergency alerts to help prevent them.

Patient Engagement

Recent data suggests that only 35 percent of patients feel valued by their physician's office. Of those surveyed, only 50 percent believe their physicians are readily available, with one-fifth either disagreeing or strongly disagreeing that their physicians are easily accessible.[2] Clara Guardian-powered solutions enable multimodal conversational AI so healthcare providers can seamlessly interact with patients, improving outcomes and overall satisfaction without adding to their already busy workloads.
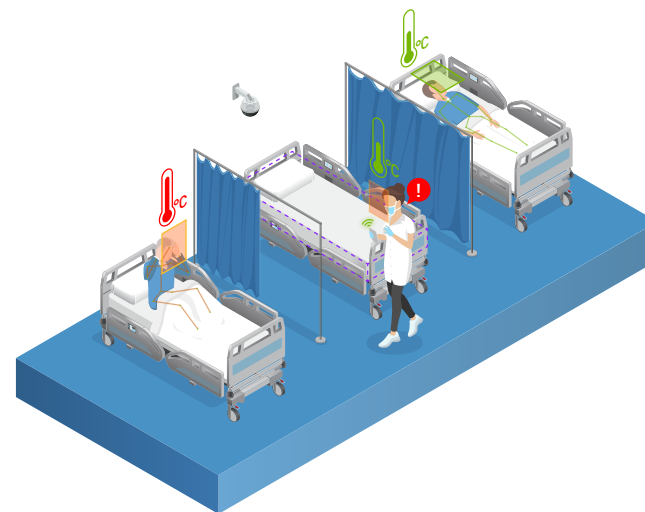
[1] American Heart Association
[2] Becker's Health IT

PATIENT MONITORING WITH TEIACARE

One in six people in the world will be 65 years or older by 2050. Globally, there are 10 million nursing homes beds with 7 million healthcare workers and nurses and an estimated staff shortage of over 2 million units. Care homes often lack transparency in their care processes, which leads to increased costs, resident injuries, and family complaints.

NVIDIA Inception partner TeiaCare created Ancelia, the first contactless, AI-capable, and computer vision-based operating system for care homes. Ancelia, powered by NVIDIA Clara Guardian, improves the daily routine of professional caregivers, making care home facilities safer and more efficient environments for elderly patients. Using an optical sensor positioned on the ceiling above a bed, the solution can monitor and track a patient's movements and conditions, as well as the care received by caregivers. The data collected is used to anticipate and prevent injury and deterioration of health. Each NVIDIA GPU at the edge can monitor 50 beds at once, and Ancelia is active in more than 10 facilities across Italy and Spain.
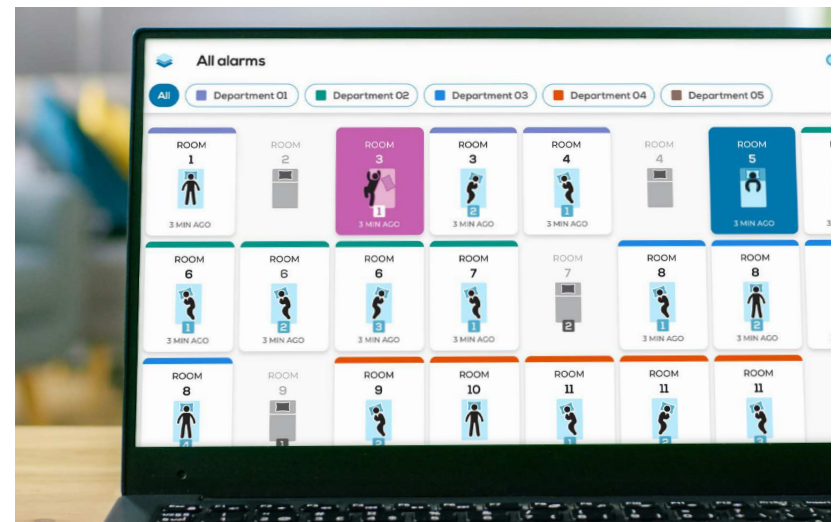
FALL PREVENTION WITH SAFELYYOU

Falls are the leading cause of fatal and non-fatal injuries for the elderly in America. Those living with Alzheimer's or other related dementias have twice the risk of falling than those without dementia.[3]

Since social distancing and shelter-in-place have gone into effect to flatten the curve of COVID-19, there has been a staggering 20 percent increase in falls for residents in memory care communities. Falls often lead to emergency room (ER) visits, where patients are most likely to encounter a person suffering from COVID-19.

NVIDIA Inception partner SafelyYou spun out of the UC Berkeley Artificial Intelligence Research Lab and develops AI to empower care staff within America's nursing homes. Designed for those living with Alzheimer's disease, SafelyYou is powered by NVIDIA Clara Guardian and utilizes AI to detect and prevent patient falls.

For communities currently using the system, SafelyYou's peer-reviewed results show up to 80 percent fewer falls, with an average of 40 percent fewer falls and 70 percent fewer ER visits from falls.
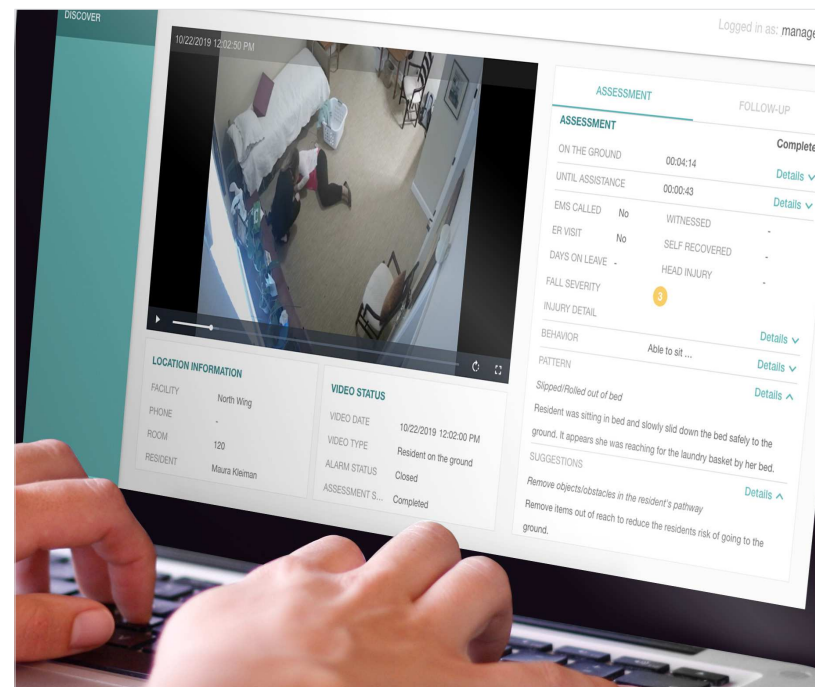
PATIENT ENGAGEMENT WITH OUVA

By 2035, the older population in the U.S. will, for the first time, exceed the young. Aging patients, combined with growing staff shortages and COVID-19, is accelerating the already urgent need to deliver care, at scale, with minimal contact.

NVIDIA Inception partner Ouva offers a care monitoring platform for nurses and doctors. It brings the latest AI technologies in one end-to-end solution to allow hospitals to engage and care for more patients with less resources. Running on NVIDIA Jetson™ and Clara Guardian, Ouva manages patient safety, guidance, workflows, and more. Ouva has customers in the U.S., Europe, and Australia.

Ouva installed in-room sensors at Radboud University Medical Center in the Netherlands and plans to cover hundreds of beds in the coming year in neurology wards, infection units, and more. Their customers can save $4 million per year per 100 beds covered.

"We have worked with NVIDIA from day one, because the amount of knowledge and open-source contributions tested and validated on NVIDIA hardware are incomparable to any other GPU suite. Our team is able to try out nearly any cutting-edge machine learning and computer vision method available for quick prototyping. And by using frameworks such as NVIDIA Clara Guardian, along with the powerhouse Inception program, we're able to develop a production-ready system in no time."

– Dogan Demir, CEO and Co-founder, Ouva
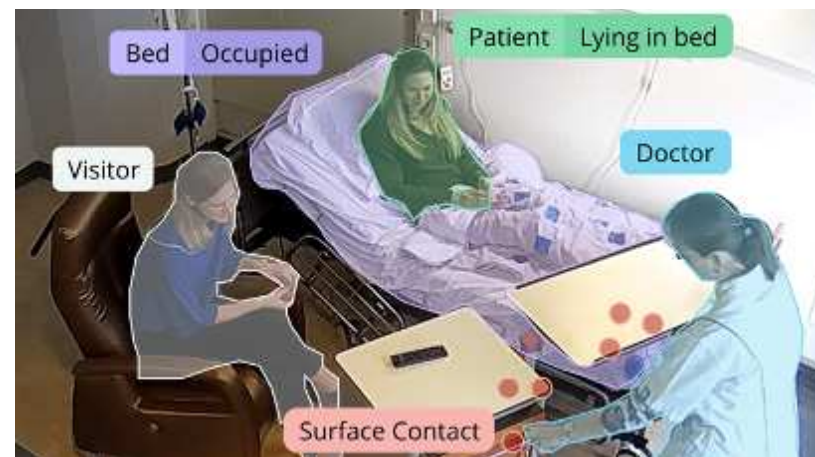
OPERATIONAL EFFICIENCY

Healthcare costs in the U.S. account for 17 percent of the country's GDP and are rapidly increasing.[5] Research shows that wasteful spending makes up about 30 percent of the total[6] and is estimated to range from $760 billion to $935 billion a year.[7] Complex behind-the-scenes administrative and operational workflows cause inefficiencies, physician frustration and burnout, increased costs, and a diminished patient experience. AI-powered solutions for healthcare have proven to improve workflows, cut waste, reduce errors, and shift human employees' focus from manual data entry to improved patient experiences.

Operating Room (OR) Workflow Automation

Reports estimate that delays occur in 40 to 96 percent of OR visits. Because ORs are cost centers where every minute counts, this inefficiency hurts the hospitals bottom line. In a recent study, the average delay reported was 28.2 minutes, which resulted in an extra $1,034 expense per delay. Clara Guardian-powered solutions enhance OR efficiency and utilization, optimizing OR throughput.

Surgery Analytics

The Global Surgery 2030 report shares that AI-assisted health applications may result in a $150 billion annual savings for the U.S. healthcare economy in 2026.[9] Clara Guardian-powered solutions can extract and annotate key moments during surgical procedures to gain insights and support the surgical team with routine tasks, safety monitoring, and coaching.

Contactless Control

The U.S. Centers for Disease Control and Prevention estimated that the direct medical costs of healthcare-associated infections in U.S. hospitals was around $45 billion a year.[10] A contactless control solution is essential for the safe reopening and operation of healthcare facilities post-pandemic. Clara Guardian-powered solutions enable contactless entry to hospitals' access points, control and navigation of medical images with speech and hand gestures, increased productivity, and reduced costs.

[5] Centers for Medicare and Medicaid Services
[6] Semantic Scholar
[7] Health Leaders Media
[8] RevCycle Intelligence
[9] OR Manager
[10] US National Library of Medicine National Institutes of Health

OR COORDINATION WITH WHITEBOARD COORDINATOR

During the COVID-19 surge in Chicago, a single 462-bed academic medical center reported 260 COVID-19 cases and four deaths among its staff. During the same period,[11] an 894-bed academic medical center where Whiteboard Coordinator's COVID-19 solutions were deployed saw only 19 staff COVID-19 cases and zero deaths.

Whiteboard Coordinator's suite of products was designed to be rapidly deployed into a variety of clinical settings and use cases, such as thermal sensing, ICU capacity enhancement, OR coordination, cancer center coordination, inventory management, intelligent telesitting, and virtual nurse assistance.

Powered by Clara Guardian, Whiteboard Coordinator's solutions optimize OR operations in multiple dimensions (time, instrument utilization, staffing, documentation, etc.) to reduce the hospital's cost structure and increase profitability. Their OR coordination solution leverages intelligent sensors to capture and document critical workflow events, enhances OR profitability and utilization through workflow optimization, and provides industry-standard privacy protections with independently validated de-identification protocols. More importantly, the platform allows clinicians to focus on safe and efficient OR throughput.

SURGERY ANALYTICS WITH THEATOR

The aging population will result in an increased demand in surgical services, reaching 2.2 billion procedures annually by 2023.[12] By 2030, the world will need 1.3 million new surgical workforce providers to meet a reasonable surgical workforce density. And 143 million additional surgical procedures will be needed in low- and middle-income countries each year to save lives and prevent disability.[13] Well-trained surgeons are needed more than ever.

NVIDIA Inception partner Theator, a surgical intelligence platform powered by Clara Guardian, leverages AI and computer vision to improve surgeon performance. Theator's smart annotation and video analytics technology enables surgeons to review and learn from their own past surgeries, so that they enter the next operating room as better surgeons.

Surgeons today have limited time to teach trainees, leaving them with limited performance feedback, which is subjective at best and usually confined to the OR. Without access to objective, scientific insight into their own performance, surgeons are less likely to widen or deepen their expertise beyond what they personally experience along their career paths.

By extracting and annotating every key moment from real-world surgical procedures, the platform improves surgeon performance from every angle—pre-operative preparation and post-operative analysis—and enables deeper department-wide visibility: raising standards and performance across surgical departments and improving efficiency.
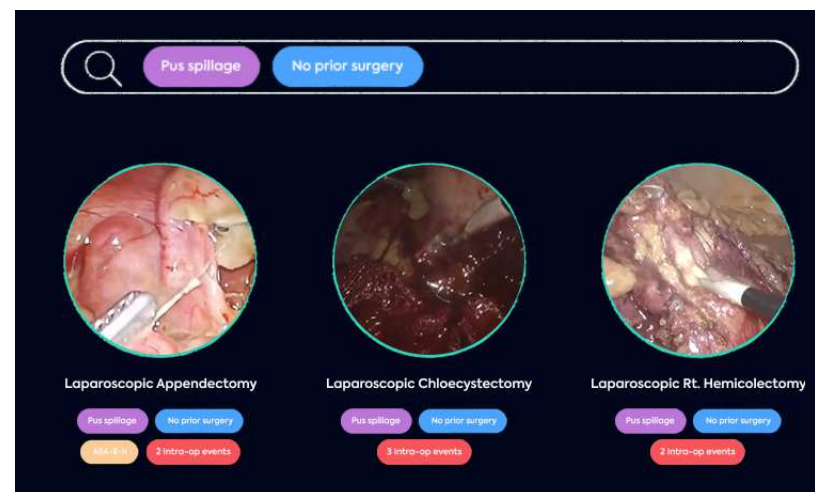
CONTACTLESS CONTROL WITH ANYVISION

As admittance numbers spike, facilities face increased safety and operational risks that intelligent computer vision can help mitigate for providers.

NVIDIA Inception partner AnyVision's visual AI solutions, powered by Clara Guardian, identify and distinguish between people—even while wearing masks—to control access of physical spaces and digital services. AnyVision's touchless access control capability initiates an authentication process when an individual is three meters away from an access point, such as a door. The door will open as soon as the person's identity is verified, allowing them to enter a building (or other space) without slowing down or interacting with doorknobs, terminals, or other shared touchpoints.

With AnyVision, organizations can optimize existing access control systems and hardware to enable visitors to access facilities smoothly, preventing delays and reducing health risks associated with crowding and surface contact.

AnyVision's technology is currently deployed in the Sheba Medical Center in Israel, which is the ninth-ranked hospital in the world, for advanced contact tracing and mask awareness.

Running on NVIDIA T4 Tensor Core GPUs and NVIDIA DGX™ systems, AnyVision improves operational performance, reduces risk, and optimizes customer experience. The NVIDIA TensorRT™ SDK has enabled AnyVision to boost productivity by over 300 percent.
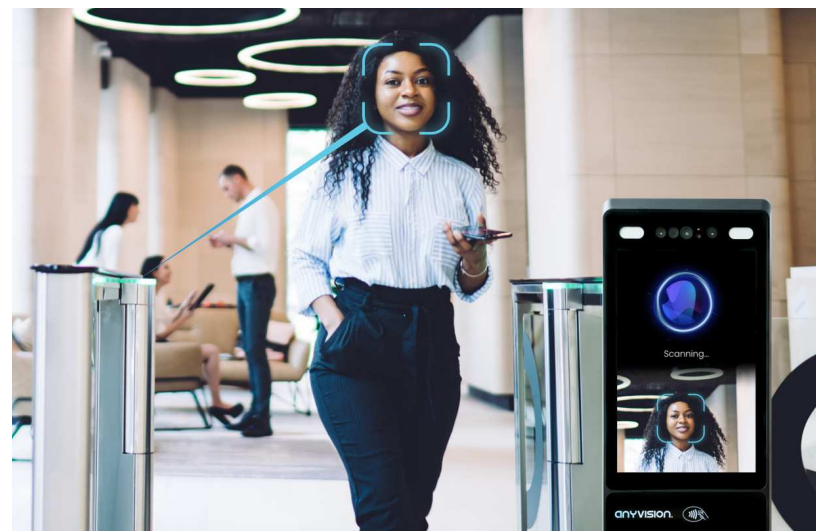
TRANSFORM HEALTHCARE WITH EDGE AI

Hospitals and healthcare systems are under siege from every angle, between COVID-19, the pandemic's toll on resources, unprecedented financial strain, and a drop off of in-person visits.

Keeping patients and caregivers safe is the priority. Healthcare facilities are accelerating their adoption of AI technology to optimize operations, improve patient outcomes, and critically assist frontline workers. But being able to rapidly develop and deploy real-time, secure, and scalable solutions is the key to fully realizing the benefits of edge AI in healthcare.

With solutions for public safety, patient care, and operational efficiency, NVIDIA is uniquely positioned to power end-to-end AI in healthcare, from data center to cloud to edge.

To learn more about how NVIDIA is reinventing healthcare, visit:
https://www.nvidia.com/healthcare
https://www.nvidia.com/clara-guardian