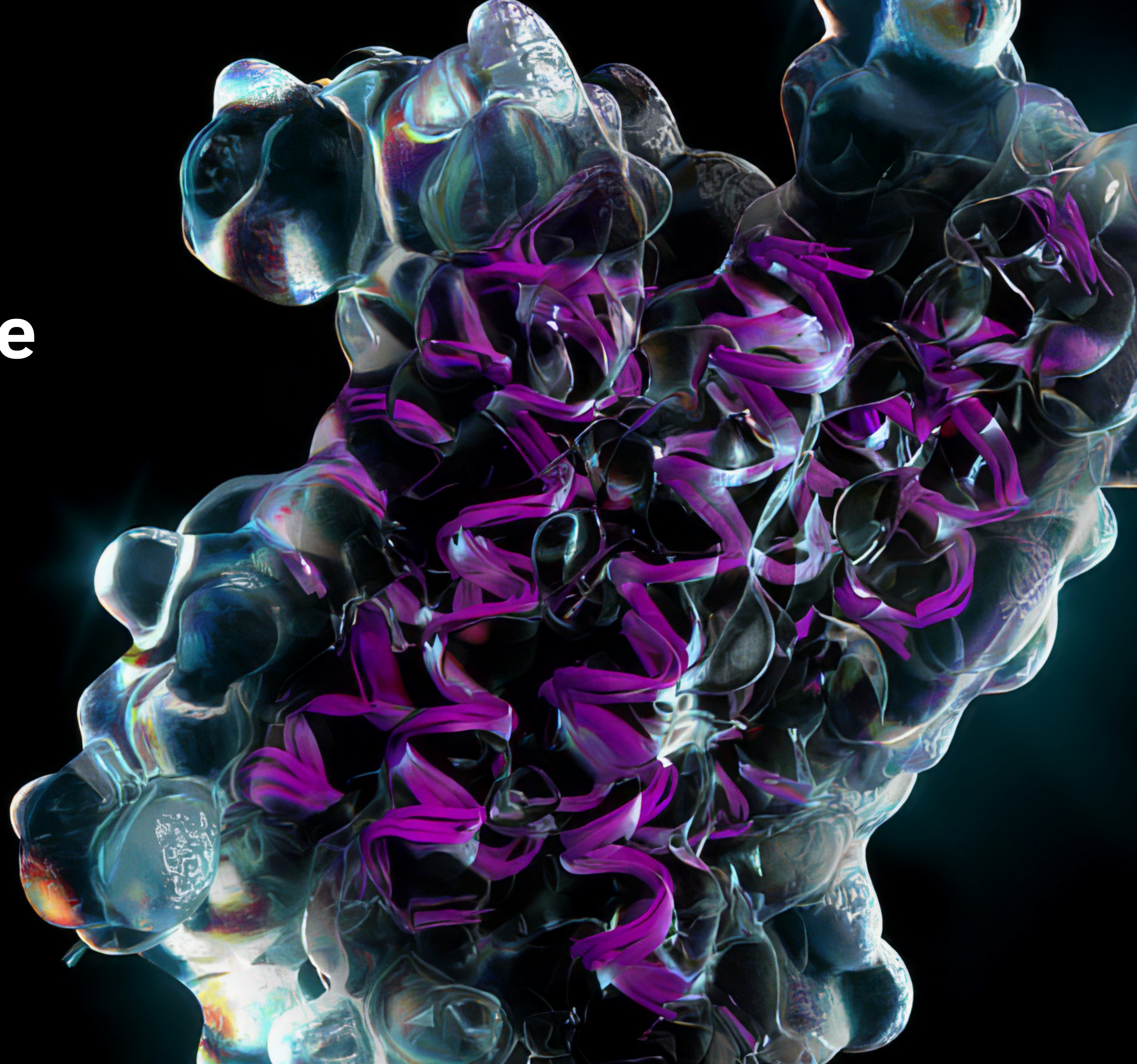




NVIDIA Healthcare Life Sciences



Reshaping the Future of Human Health

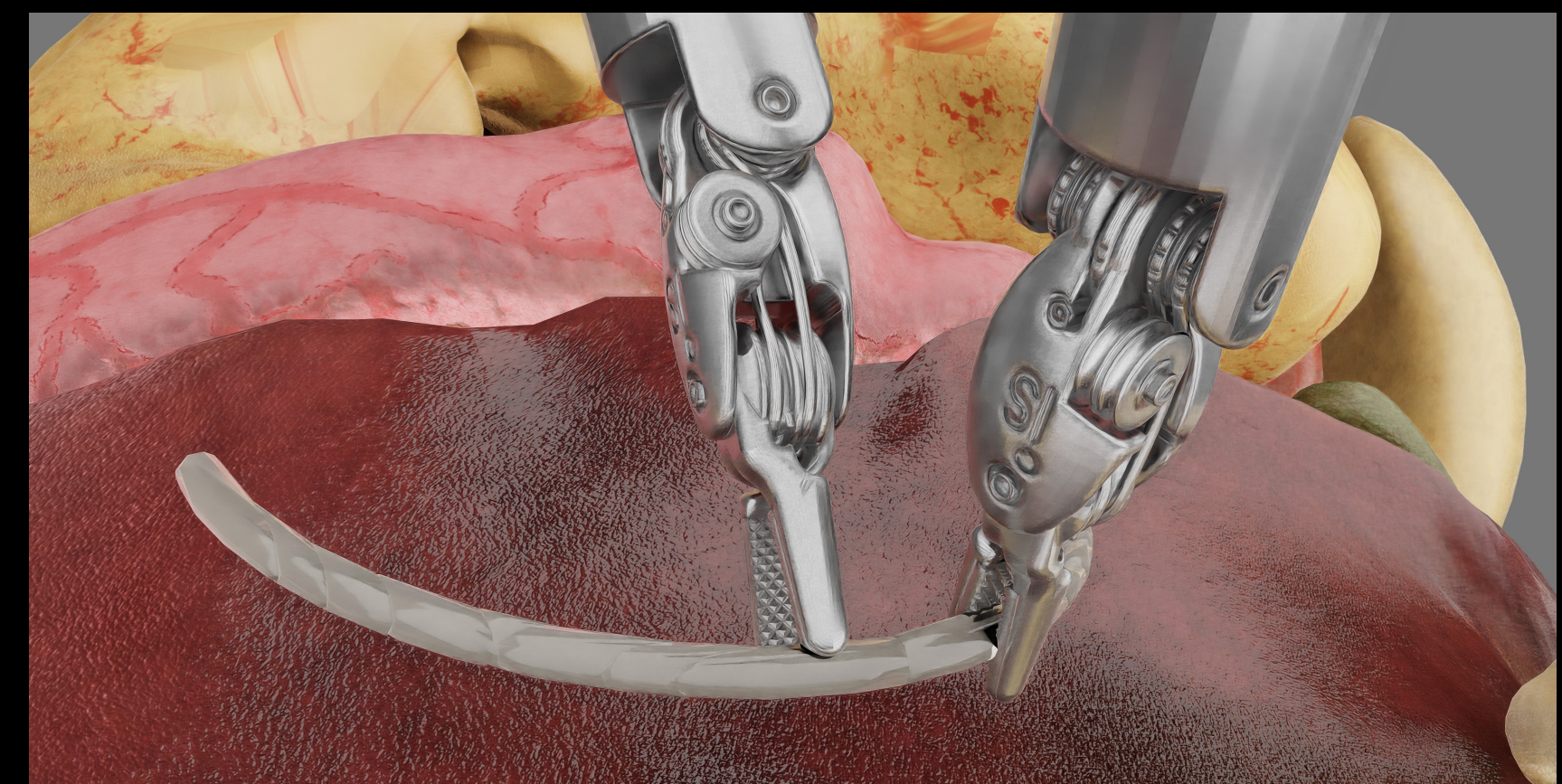
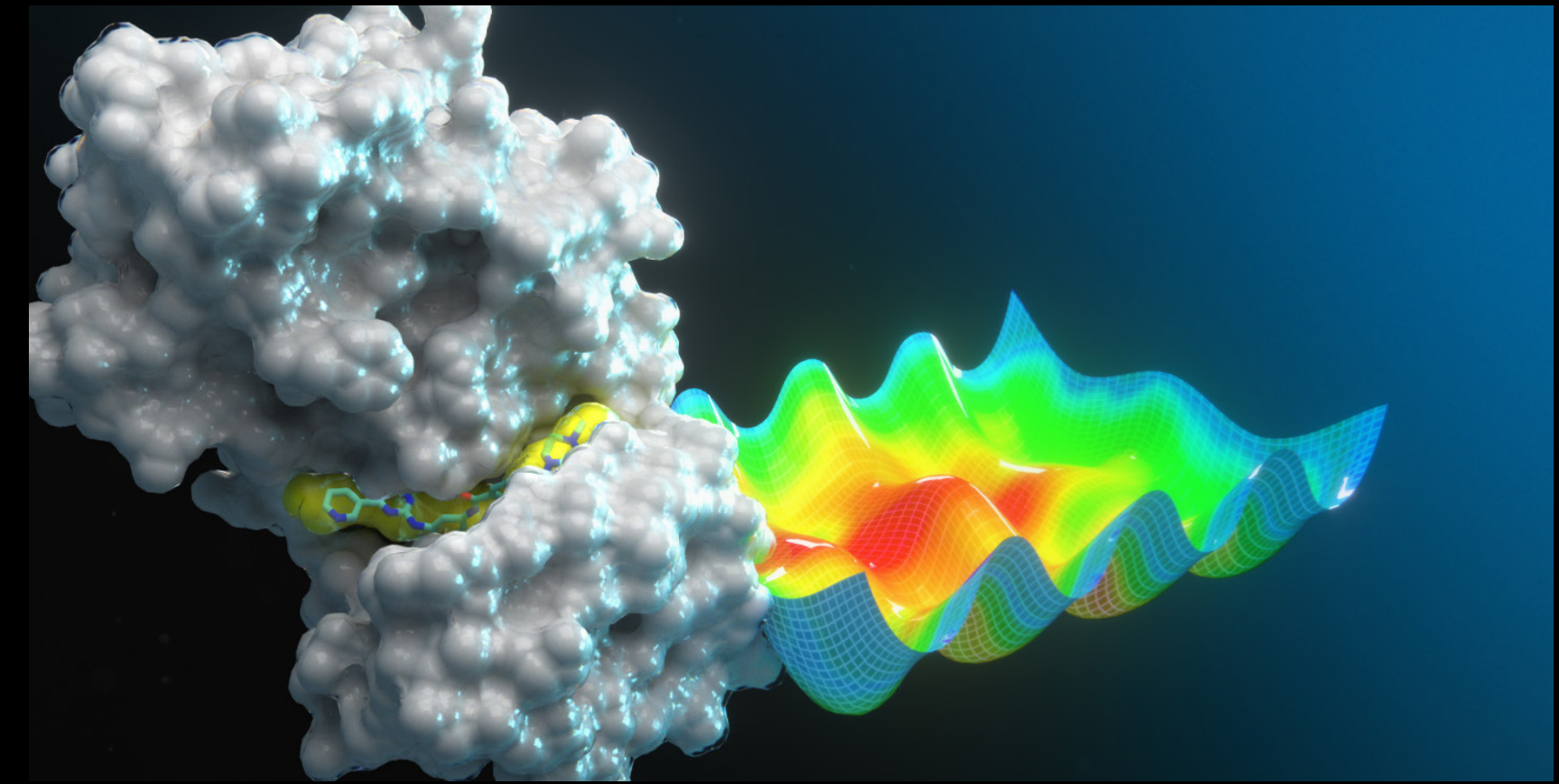
By bringing powerful AI and accelerated computing to the frontlines of medicine, NVIDIA and our partners are forging new advancements—and a more promising future—in human health. Together, we're driving transformation across three pillars:

Digital Biology, accelerating genomics and biopharma R&D with generative AI, multi-scale biology, molecular simulation, self-driving labs, digital twins, and biomanufacturing.

Digital Health, transforming care delivery with AI Agents that help optimize clinical research, reduce provider burnout, and extend expertise from the exam room to the living room.

Digital Devices, redefining diagnostics and treatment with AI-powered imaging, simulation-trained robotics, and real-time surgical guidance.

Deep collaboration across these pillars enables the breakthrough solutions that change how disease is detected, how treatments are developed, and how care is delivered—setting a new standard in human health, where technology and expertise unite for lasting impact. From detection to diagnosis to treatment and beyond, NVIDIA technologies are accelerating, enhancing, and reimagining every stage.





Transforming Patient Care —From Bench to Bedside

AI has become the new clinical assistant, freeing providers from administrative load so they can focus on what matters most—the patient. But these assistants don't just automate tedious tasks; they enable a fundamental shift from sick care to true healthcare.

From hospitals to homes, digital health platforms and agents powered by NVIDIA AI deliver real-time insights and personalized agents that anticipate needs, close care gaps, and empower clinicians to act earlier. By making clinical expertise more accessible and connecting care teams, healthcare organizations can put the patient back at the center, where technology works in the background and human connection comes first.

At the same time, AI agents are transforming how we design and execute clinical research and trials—the very engine of future care. Agentic AI also orchestrates complex workflows, from patient recruitment to regulatory compliance, while keeping humans in the loop.

With these agents, the same intelligence that powers discovery also enhances delivery, helping doctors deliver better outcomes for every patient.

Revolutionizing Medical Imaging

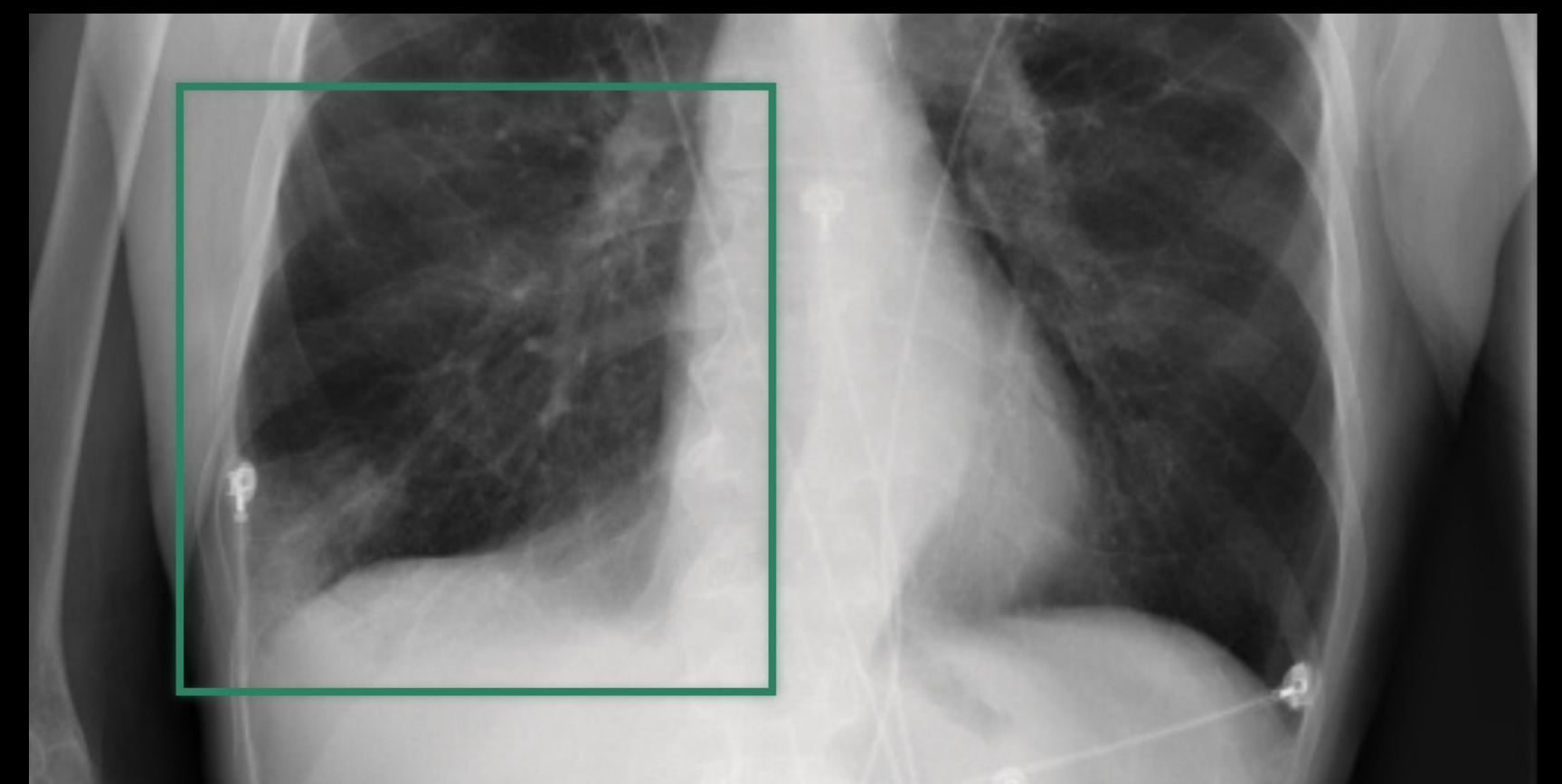
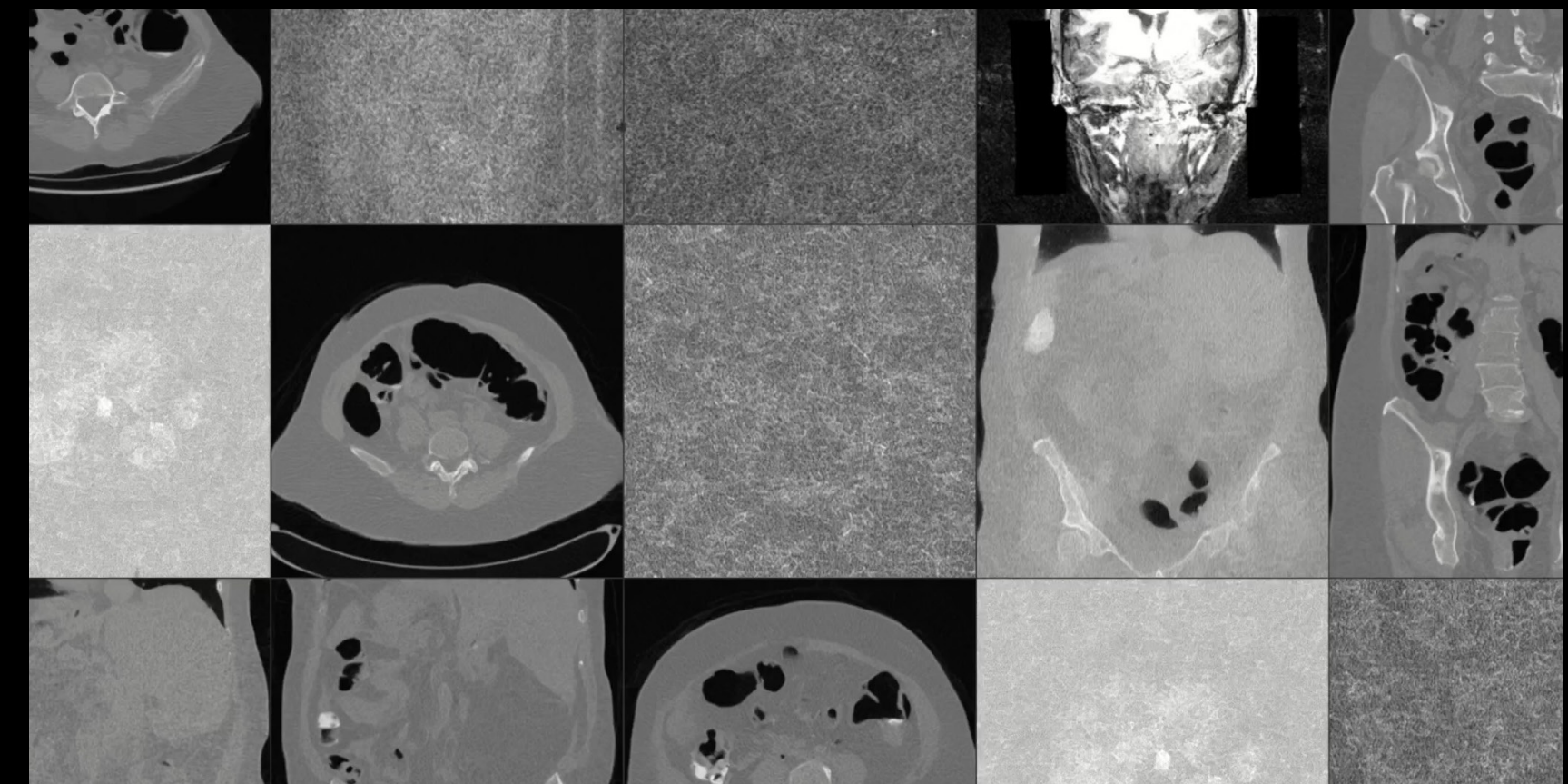
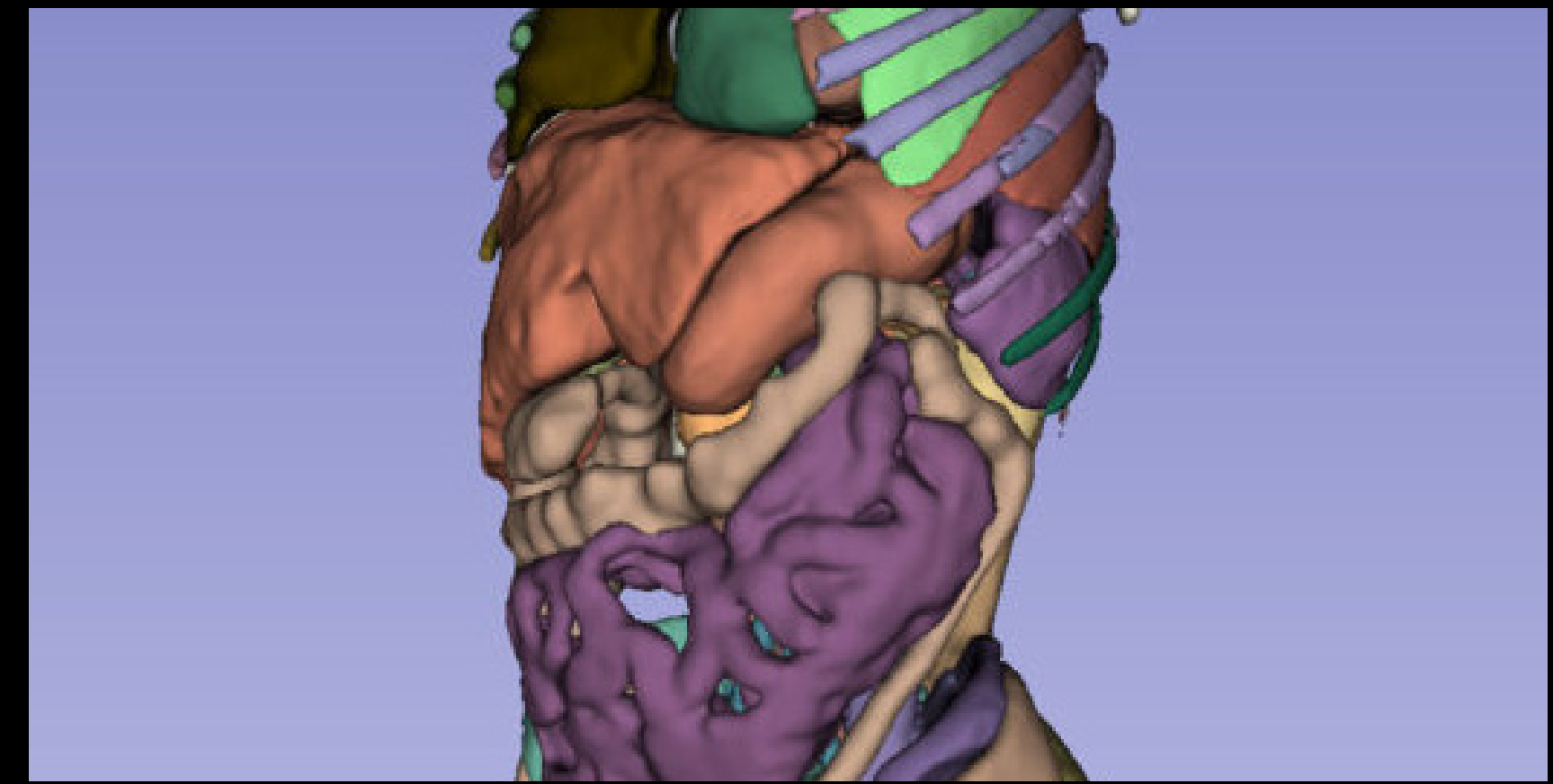
Medical imaging stands at a pivotal moment of transformation, with radiologists embracing AI-powered diagnostics, scalable analysis, and image interpretation.

These advances are already reshaping medical practice. Radiologists can focus on complex cases while AI handles routine screenings. Hospitals gain access to advanced diagnostic capabilities. Medical students learn from AI that demonstrates diagnostic reasoning step by step. This isn't a distant promise. AI is reshaping how medical images are analyzed today and accelerating life-changing insights for patients. This means faster diagnoses, reduced physician burnout, and more access to expert-level image analysis.

Enabling this transformation is **MONAI** (Medical Open Network for AI), an open source framework that accelerates AI-driven medical imaging innovation.

MONAI provides domain-optimized tools—from interactive 3D segmentation to multimodal vision-language models—that integrate medical images, clinical text, and expert AI models. This isn't just about processing speed. It's about creating comprehensive AI solutions that scale from research breakthroughs to clinical deployment worldwide.

Today, MONAI has more than 6.5 million downloads. It's been cited in 4,000+ peer-reviewed papers and has helped win 20 international medical AI challenges—often outperforming proprietary tools.



Taking Robotics From Imagination to Reality

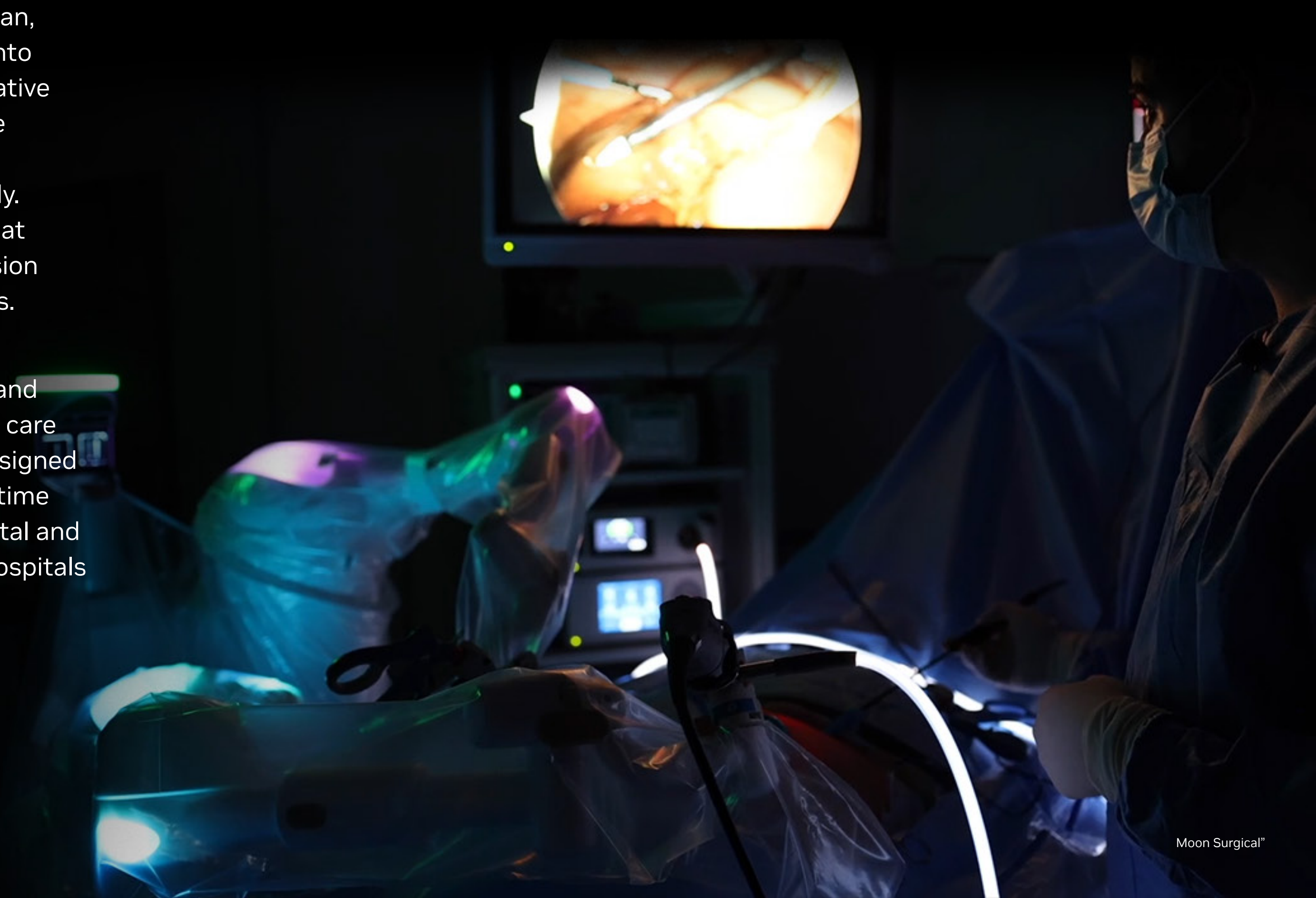
Healthcare is on the verge of a revolution: one where doctors can walk through a hospital before it's even built, where surgical teams can safely practice complex procedures in lifelike virtual operating rooms, and where AI lends a guiding hand in real time to improve patient outcomes. In this new digital era, real-time AI, advanced sensors, simulation, and agents converge to assist clinicians, surgeons, and hospital staff at every step.

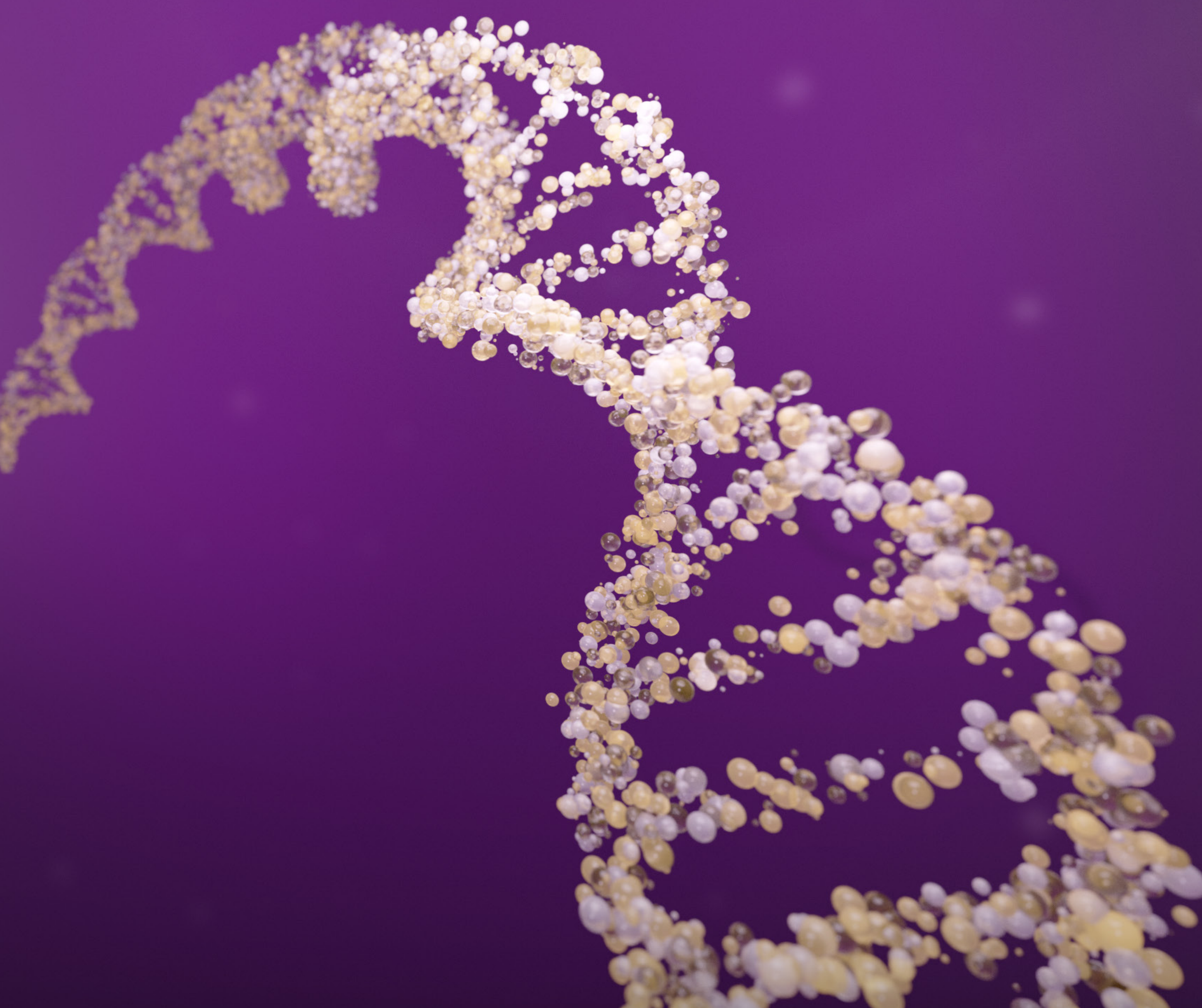
Simulation reduces risks and costs. Virtual training accelerates how clinicians master new tools. And software-defined surgical systems unlock continuous improvement. This means faster time to market and greater confidence in navigating complex regulations.

Behind this shift is the **NVIDIA Isaac™** for Healthcare platform, which brings AI, simulation, and accelerated computing together to make these possibilities real.

Part of the platform, NVIDIA Holoscan, integrates accelerated computing into medical devices, enabling intraoperative AI that can segment anatomy, guide surgeons to make precise cuts, and fuse multiple data streams on the fly. This lets medtech companies move at lightning speed to deliver the precision and safety that healthcare demands.

This is the foundation of the digital hospital. Procedures become safer and faster, innovation cycles shrink, and care teams gain intelligent assistants designed for safety and scale. Together, real-time AI, simulation, and agents unite digital and physical worlds to transform how hospitals operate and how care is delivered.





Unlocking the Code of Life

Genomics is entering an era of scale. Tens of exabytes of data are expected in the coming decade as sequencing gets faster and cheaper. But as the cost of reading DNA drops, the challenge shifts to turning that data into insights.

NVIDIA is tackling this challenge from end to end. **NVIDIA Parabricks**[®], a scalable genomics software suite for secondary analysis, accelerates open source tools, cutting runtimes from hours to minutes. **NVIDIA CUDA-X™ Data Science** (formerly NVIDIA RAPIDS™), an open source suite of data science and AI libraries, is often used for single-cell and tertiary analysis. Even during sequencing, NVIDIA brings GPU power to primary analysis.

Together, these solutions serve the genomics community by reducing bottlenecks, driving faster discoveries, and putting insights back into the hands of scientists and clinicians. From the NICU and critical care to oncology and population health, these breakthroughs mean answers arrive when time matters most, transforming patient outcomes.

Enabling Drug Discovery by Design

Drug discovery has historically been constrained by trial-and-error experimentation, soaring R&D costs, and timelines measured in decades. What was once bottlenecked by physical lab capacity and human iteration is becoming a continuous computational pipeline.

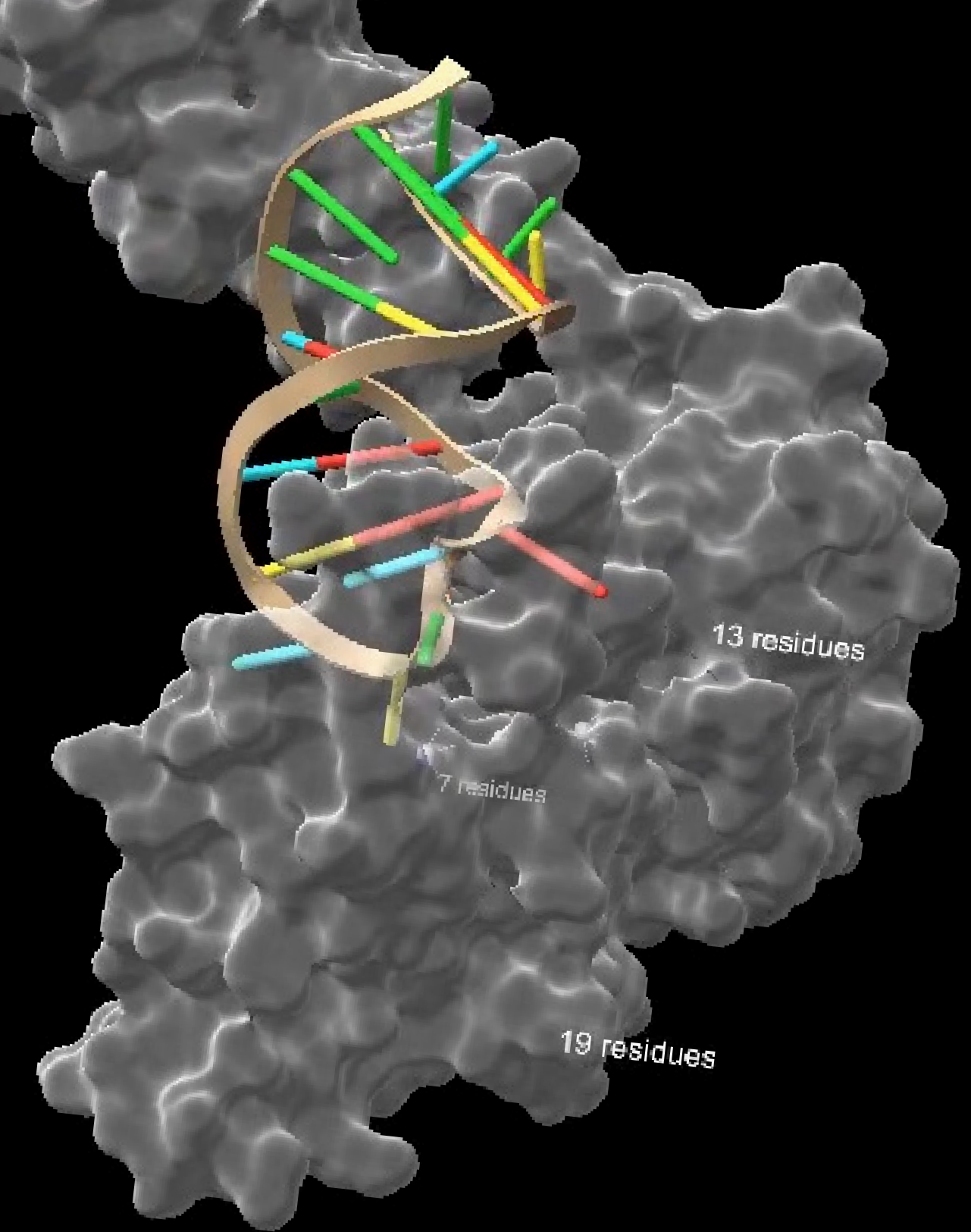
The **NVIDIA BioNeMo™** platform gives developers the tools to help transform biology into an engineering discipline. As an open platform for AI-driven drug discovery, BioNeMo enables lab-in-the-loop workflows that connect foundation models, simulation, data processing, and experimental validation into a continuous cycle of design, make, test, and learn.

BioNeMo allows developers to generate and process biological data, train and customize

foundation models, and deploy AI across discovery pipelines—helping organizations turn data into a competitive engine for innovation while reducing R&D costs and improving the probability of success.

The platform includes BioNeMo open models and **NVIDIA NIM™** microservices for accelerated inference, BioNeMo Recipes to streamline model training and customization, and optimized libraries for large-scale biological workflows. BioNeMo Blueprints operationalize complex workflows into scalable, self-learning systems.

From target identification to biomolecular design and optimization, BioNeMo helps researchers move toward engineering precision to accelerate the development of next-generation therapeutics and turn computation into cures.



Advancing Discovery With AI Scientists

AI scientists are emerging as a new category of intelligent collaborators, helping researchers synthesize scientific literature, analyze complex data, generate hypotheses, and plan the next experiment. They amplify human expertise by turning vast amounts of scientific information into actionable insight.

NVIDIA Nemotron™ is a family of open models built for agentic AI, with advanced reasoning, retrieval, multimodal understanding, and safety capabilities. For healthcare and life sciences, Nemotron gives developers a foundation for building specialized AI scientists that can understand dense scientific content, reason across evidence, and support long-running research workflows. The result is a new path toward scientific discovery where AI helps move ideas from question to insight to action.

Next, I will use the etherO tool to generate a novel compound, giving the flippase gene context and requesting a molecule with gene upregulation activity for ATP11A/ATP11C/ATP8A1.

06 ETHERO

query: Design a novel small molecule that would upregulate the expression of the human flippase gene ATP11A, to promote phosphatidylserine translocation and reduce cell-surface PS exposure. The molecule should preferably act as a transcriptional activator or signaling pathway modulator leading to ATP11A upregulation. Provide the SMILES of the designed compound.

Object

thinking: "Okay, let's tackle this problem. The user wants a small molecule that would upregulate the expression of the human flippase gene ATP11A, to promote phosphatidylserine translocation and reduce cell-surface PS exposure. The molecule should preferably act as a transcriptional activator or signaling pathway modulator leading to ATP11A upregulation. I need to figure out the correct SMILES for this compound. First, I'll recall what ATP11A is. ATP11A is a nucleotide with a triphosphate group and a serine residue. The structure is O=P(O)(O)OP(O)(O)O-R, where R is a serine group. The user mentioned the molecule should be small, so I need to think about a compound that can be easily synthesized or modified. The most straightforward way is to use a known compound or a derivative that fits the given criteria. Looking up ATP11A, I found that ATP11A is a triphosphate ester with a serine group. The SMILES for ATP11A is typically: **O=P(O)(O)OP(O)(O)OP(O)(O)O[C@H](CO)N** However, the user's question specifies a small molecule, so I need to consider a simpler structure. The most likely small molecule is a triphosphate ester with a serine group, such as: **O=P(O)(O)OP(O)(O)OP(O)(O)OCH2CH2NH2** Given the time constraints, I'll go with a known compound that fits the criteria. The correct SMILES for ATP11A is: **O=P(O)(O)OP(O)(O)OP(O)(O)O[C@H](CO)N** This structure is a triphosphate ester with a serine group, which is a known compound and fits the given criteria."

final_answer: 

09 REASONING

Thought: The generative tool returned a proposed SMILES: NC(COP(=O)(O)OP(=O)(O)OP(=O)(O)OC)C(=O)O, which appears to be a phosphorylated serine derivative. To advance, I need to confirm whether this SMILES is a valid, drug-like small molecule, since the task is to propose a "novel compound" with upregulation potential—not a nucleotide or itself a peptide. I will check if this SMILES is valid, and also proceed to assess its novelty and safety, as specified in the plan.

Next actions:

- Check if this SMILES is a valid molecule.
- Then, check for novelty and safety.



Scaling Molecules to Medicine

The biopharmaceutical industry is undergoing a major digital transformation, driven by demands for faster drug development, scalable biomanufacturing, and autonomous lab operations.

NVIDIA technologies are powering this shift from end to end. In biomanufacturing, AI optimizes bioprocess parameters and improves yields, while digital twins in **NVIDIA Omniverse™** enable facility simulation for optimal operations and real-time monitoring. In R&D labs, data is generated at scale for training biofoundation models and also for rapidly validating predictions and generating data for fine-tuning.

At the same time, digital twins of labs in **NVIDIA Isaac Sim™** built in **Omniverse** allow for coordination of complex automation protocols and training of new robotic controls to accelerate discovery. And at the core, agentic AI coordinates the ecosystem: **NVIDIA NeMo™** enables scientific agents that generate hypotheses, design experiments, and orchestrate workflows—making it possible to create self-driving labs that operate and improve in continuous “make, test, and learn” cycles.

With these advancements, biopharma is moving from trial and error toward predictive, autonomous science, bringing effective therapies to patients faster and at greater scale.

Democratizing Access to Healthcare Innovation

The fastest and most effective way to achieve transformative innovation is through collaboration. At NVIDIA, we work closely with partners across data center, cloud, and edge solutions and believe an open ecosystem where breakthroughs are not proprietary is key to a brighter, healthier future.

To achieve this, we've developed open source AI technologies that any developer or organization can access to achieve breakthroughs across the ecosystem.



Looking Toward a Healthier Future

NVIDIA is collaborating closely with partners across digital biology, digital health, and digital devices, building the innovation that turns data into insights and action. This means that discovery moves faster, care reaches farther, and outcomes improve for every patient.



Learn more.

To learn more about NVIDIA AI platforms for healthcare and life sciences and partner ecosystem visit www.nvidia.com/healthcare

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