



GAME-CHANGING INSIGHTS AT THE INTELLIGENT EDGE

Real-time AI, when and where you need it

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OVERVIEW

Artificial intelligence (AI) is a key driver for today's companies to improve and optimize how they run their businesses. Transmitting information back to a centralized data center can result in bandwidth, latency, and connectivity issues that cost valuable time and resources. Companies must run AI workloads right at the edge to enable groundbreaking results when and where they are needed most, providing reliable information rapidly for increased automation, prediction, and control. These capabilities deliver deep insights in real-time that lead to more revenue streams, create operational efficiencies, and modernize entire operations from end to end.

Bringing edge and AI together creates the intelligent edge an environment that gives enterprises the boost they need to gain competitive advantage now and in the future. Using AI to process and analyze data locally—at the source of data collection—means reaping the benefits of real-time actionable insight, autonomous responses, and predicting what's coming next. Companies that invest in intelligent edge technologies will have the ability to outperform their competitors in agility, performance, and innovation. It is a powerful foundation for any organization to disrupt and set the pace for their industries. Organizations that wait risk miss valuable business opportunities and ultimately, fall behind their competition.

Operating at the edge is not merely a way to run specific types of workloads for a single use case or to address isolated problems as they arise. Instead, the intelligent edge will become essential to run hundreds of applications for a growing number of use cases and revolutionize the way we think, work, collaborate, and evolve. AI is the key to unlock insights on demand with increased precision, improving organization-wide visibility into every operating location, system, and device. Many companies are dedicating time and resources to develop edge environments that are agile, smart, and scalable to tackle challenges faster. Data generated by edge devices is estimated to grow over 500% between 2019 and 2025. By that time, 175 zettabytes of data will have been created around the globe, and a projected 55 billion edge devices will assess more than 90 zettabytes of that data. By 2022, roughly 75% of all data will require analysis and action at the edge. With so much input at stake, the intelligent edge will redefine how we think about information technology (IT).





To manage these explosive data volumes, organizations must develop a strategy to bring operational technology (OT) and IT together. The convergence of these two worlds enables more direct control with seamless data analysis from anywhere. Through the power of AI, companies can leverage data at scale for revolutionary autonomy, operational control, and predictive analytics. These capabilities enable more informed, data-driven decisions to solve significant technology and business problems in real time. For example:

- In agriculture, global spending on smart, connected technologies is projected to triple in revenue by 2025. Smart tractors and agribots can run autonomously, communicating with nearby sensors to obtain necessary insights about their environment. In addition to tasks such as watering, weeding, or harvesting crops on autopilot, agriculture systems at the edge can immediately identify changes in weather or the environment to predict disasters and instantly notify the general control center to address the issue.
- In manufacturing, companies are combining edge computing with AI to make their operations safer and more efficient. The intelligent edge is applied to applications such as predictive maintenance and quality control, using data from cameras, sensors, and smart equipment on the factory floor to provide a 360° view of assembly lines. This allows manufacturers to quickly predict and resolve issues from any location to streamline entire operations, improve overall equipment effectiveness, and produce high-quality products faster to boost profits.
- In the financial sector, AI at the edge is helping institutions completely rethink how they serve customers, mitigate risk, and enhance data security. Instead of transferring data to the data center or cloud, sensitive information remains at the edge, where it can be processed rapidly to identify actionable insights. AI also works to optimize and automate routine tasks, so institutions can focus on their financial goals.
- In the healthcare industry, AI has made its way closer to patients and medical staff through smart equipment, patient monitoring tools, and personal devices. For instance, wearable health devices, such as electrocardiogram monitors and blood pressure monitors, can collect and analyze data locally, which a patient can share with their doctor for an instant health evaluation. These tools enable healthcare organizations to provide quality health services inside facilities and in remote rural regions. AI at the edge delivers immediate value from medical data while dramatically reducing the cost of data analysis to accelerate life-saving discoveries.

Despite the vast potential of the intelligent edge, many projects fail to reach production. Gartner analysts suggest that 80% of enterprises run into last mile problems with machine learning (ML). AI at the edge requires massive amounts of data streaming from countless devices, which makes these applications difficult to build and scale. As a result, companies are looking for a new strategy to operationalize AI applications at the edge. Today's organizations need to modernize their IT environments, deployment models, and business models from the ground up if they want to truly reap the benefits of digital transformation.

Companies that leverage the intelligent edge will be able to accelerate insight and strategic actions, which will give them an unprecedented advantage for the foreseeable future. A comprehensive approach to unite AI and edge computing is critical to extract deeper insights not previously possible for data. The right solutions will be future-proof, enabling faster results to address changing requirements and uncover new opportunities—with cost savings through higher utilization of shared information, so companies can avoid overspending.





THE FUTURE OF AI AT THE EDGE

The intelligent edge is the modern battleground to gain a major competitive advantage. Here, the purpose of AI is to uncover new ways of doing things and understand how critical processes can be enhanced. Greater visibility and increased throughput provide the ultimate advantage in this dynamic landscape—whether that is identifying defects on a circuit board, filling the gaps in medical imaging to map a tumor precisely for surgery, or performing predictive maintenance to avoid lost manufacturing productivity. By 2024, the number of applications at the edge will skyrocket to an astounding 800%, bringing new opportunities to every industry. Companies that prioritize innovation will be able to keep pace with industry growth and escalating demands as well as prepare for the challenges of tomorrow.

AI applications at the edge are driving dramatic improvements from clinics to labs and from warehouses to enterprises. AI powers the most impactful use cases today including video analytics, natural language processing, and monitoring customer sentiment to enhance the overall customer experience.

Video analytics is one of the most common applications for AI, with more instances being developed every day. Video surveillance systems are incredibly challenging to maintain without AI, particularly when managing feeds from numerous cameras and devices. Instead of missing events or relying on insights from post-processing, companies use complex algorithms to analyze content streams at the edge in real time. AI reviews every pixel to recognize humans, vehicles, objects, and events with almost nothing lost and then configures the system to generate alerts for specific triggers as they occur. This capability enables the most crucial applications of video analytics—designed to strengthen public safety across entire cities, shut down assembly lines automatically to prevent worker injuries, or identify shoppers in retail outlets to offer personalized service at the door.

Natural language processing (NLP) is a transformative communication where human and machine can engage in conversation. Applying this application at the edge fuels efficiency as NLP readily extracts meaning from dialogue and reacts appropriately in real time. Advancements in ML and speech recognition technology have progressed NLP to the point where 128 million people in the U.S. in 2020 regularly used a voice assistant. Companies are now training algorithms to process large volumes of text and audio data at the intelligent edge, so machines can understand human intent and desire. According to Alexander Wong, the Canadian Research Chair in AI, NLP will have a dramatic impact on edge operations, and companies across all industries are paying serious attention.



In addition to NLP, AI can extract emotion from diverse types of data to improve customer services. Through edge sources such as social media, contact center calls, emails, and surveys, AI-powered sentiment analysis detects positive, negative, or neutral interactions based on tone. By analyzing customer sentiment as events take place, intelligent edge technologies gain insight into human behavior to quickly determine the root cause of positive or negative emotions, intelligently route calls in the contact center by detecting frustration, and automatically flag conversations that meet criteria for effective or ineffective interactions.

BECOMING AN EDGE DISRUPTOR

Companies must transform now to make use of edge data for faster, smarter decision-making. Edge disruptors are at the forefront of edge computing trends and implement the latest AI tools and capabilities across all operations to shift their business objectives from planning to reality, fast. Companies that become disruptors expect lasting impacts from improved performance today to quicker responsiveness and modernization tomorrow.

To realize the full potential of the intelligent edge, disruptors are developing solutions to harness real-time AI analytics when, where, and how they need it. The analyst firm IDC reports that by 2023, more than half of new data center infrastructure will be deployed in edge locations rather than centralized data centers, up from less than 10% in 2020. Specific technology features will create edge environments that are expertly engineered for AI:

- **Robust edge infrastructure:** Resilient and performant, offering next-generation inference and control capabilities regardless of the environment. Rugged conditions demand equipment that can withstand dust, precipitation, explosive materials, and extreme temperatures while controlled-environment edge deployments may use infrastructure similar to a standard IT environment to run the most demanding AI workloads.
- **Edge to data center deployments:** Connected, unified infrastructure that orchestrates heterogeneous components to reduce complexity and maximize performance. As more compute components are rendered as a service (aaS), disruptors can gain visibility from edge to exascale, on-premises, and as a cloud service. Operationalizing insights from data at the edge is crucial to streamline edge to data center communication, leverage broader insight, and solve problems more effectively.
- **Automatic prediction and control:** Seamless communication, enabling integration of disparate data streams for real-time and predictive analytics. It's impossible to maintain constant connectivity to all edge devices. Therefore, AI is a vital tool to determine the tolerance for missed connections and design algorithms that expect lapses in communication, so companies can create automated workarounds and operate consistently. Disruptors leverage new AI applications that make it easier to make continuous adjustments to edge AI models to gain greater control in their environments and predict when events may happen. Without edge AI software that provides the ability to deploy, manage, and train models as well as handle massive data growth, companies will not succeed at the intelligent edge. Cutting-edge software developments such as swarm learning fundamentally change the possibilities of AI by bringing computing closer to data. With a completely decentralized architecture, swarm learning enables model training and inference at the edge with the proven security of the blockchain to enhance automatic prediction, information sharing, and collaboration and open up new revenue streams. This approach is a powerful tool to unlock the full value of distributed data to apply to the widest industries imaginable—from increasing urban mobility to support millions of people, to eliminating the transfer of raw patient data across healthcare organizations, to accelerating deep space exploration.

There's no question that AI at the edge will revolutionize how companies manage, process, and leverage their data. However, expanding the use of AI is not a delineated task. It encompasses a wide range of technologies, tools, capabilities, and use cases that are all key drivers for business impact, evolution, and increasingly better results. Companies need to consider the capabilities required to reach their goals at the intelligent edge.



In an age of massive transformation, leveraging trailblazing technologies and profound expertise is not simply a business strategy; it is essential to influence the marketplace and prepare for AI.

AI TECHNOLOGY LEADERSHIP AND INNOVATION

Together, HPE and NVIDIA® deliver unique, open, and intelligent solutions with a consistent experience across clouds and edges to help companies develop new business models, engage in new ways, and increase operational performance. HPE achieves this by acting as a solutions aggregator, combining powerful and comprehensive technologies with our decades of business expertise, advanced research, and experience to enable impactful and efficient use of AI at the edge. Now, you can benefit from our world-class offerings to realize value from your data faster and leverage limitless growth.

HPE and NVIDIA offer purpose-built solutions that are designed for AI and the edge. With a wide range of hardware and software, we unleash edge insights on demand to deliver one of the most precise, comprehensive views of your operations. High-density servers that are NVIDIA certified are your foundation for one of the most data-intensive workloads, designed to scale for a wide range of challenges and requirements. Combined with NVIDIA GPUs for AI acceleration and unmatched ML and deep learning capabilities, you can build an infrastructure that automates and extends intelligence from the core data center to the intelligent edge. HPE systems that are NVIDIA certified bring together HPE servers, NVIDIA GPUs, and NVIDIA networking in configurations that are validated for performance, manageability, security, and scalability.

We bring DevOps-like speed and agility to ML operations (MLOps) with support for every stage of the AI lifecycle. MLOps provide best practices for you to run AI successfully with help from an expanding selection of software and services. The software suite for AI includes the applications, frameworks, and tools used by today's AI researchers, data scientists, and developers enabling rapid deployment, management, and scaling of your AI workloads. These solutions are the ideal choice to power high-performance computing (HPC) and AI applications of every size and scope.

CONCLUSION

Soon, AI at the edge will be integral to the future of every industry. Today's companies are searching for a trusted partner to pioneer a changing world. HPE and NVIDIA are leaders in edge and AI innovation for empowering your transformation journey. We are committed to helping you find your place in AI and harness insights at the intelligent edge. By empowering better decision-making, you can increase your ROI and gain a strategic competitive advantage.

HPE and NVIDIA collaborate closely with companies across all sectors bringing together breakthrough technologies, extensive expertise, a broad partner ecosystem, and forward-looking strategies that are designed for your success.

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