



# The 5G Innovators

Entrepreneurs Leveraging the 5G Platform





**The U.S. wireless industry has invested tens of billions of dollars in new 5G networks—** and the licensed spectrum that powers them.

We are excited to see innovation grow day by day as entrepreneurs from coast to coast leverage 5G's remarkable capabilities.

New services and applications built on the secure and reliable 5G platform are already transforming communities, industries and America's economy.

More licensed spectrum is needed to secure network performance in the face of ever-increasing data demand, support the development of these new 5G-powered devices, and enable the speeds and capacity necessary to fuel future 5G innovation. We can't wait to see what's next for the 5G Economy.

**Read on for a glimpse of how innovators are using 5G right now in:**

Agriculture • Education • Entertainment and Gaming • Healthcare  
• Manufacturing • Office and Retail • Public Safety • Sports •  
Smart Cities, Buildings and Energy • Transportation and Logistics

# Agriculture

5G's fast speeds, high capacity and low latency are helping reimagine and enhance food production from farm to fork. Check out some of the next generation of applications enabling farmers to feed more people on fewer acres using less resources.



How long would it take you to measure a plant's height, leaf-area index and other indicators of health? EarthSense's **TerraSentia** autonomous robot can scan up to 10 plants per second. 5G, with fast speeds and low latency, enables data to be sent in real time—allowing farmers to manage crops more efficiently.



Managing irrigation, pests and diseases too often involves time- and fuel-intensive trips back and forth from the field to process data. **Chiawana Orchards** has discovered a different way of doing things. It's using 5G-powered sensors from **innov8.ag** to process instant information on their trees' density, as well as the moisture in the soil and weather conditions, to improve tree health and increase yields.



**Andrews Hay** is harnessing 5G's power to read and interpret huge amounts of data from soil sensors in the field. It's a more efficient way of gathering data, frees up employees for other tasks and gives farmers real-time insights about soil temperature and moisture so they can decide how to best plant, irrigate and fertilize the fields.



## 5G Connecting Growers to Real-Time Data from the Field

5G connectivity is bringing agriculture innovation to life at **Swans Trail Farm**, an apple orchard in Snohomish County, Washington. Nate Krause, who farms alongside his family, has highlighted how cutting-edge 5G technology improves efficiency, crop quality, sustainability and food security. 5G's high bandwidth, low latency and edge compute capabilities enable Nate and other farmers to tap into an ecosystem of connected soil and water sensors throughout the orchard, which relay real-time water and nutrient data from 4,000 trees directly back to a smartphone.



*"We're not going to be able to feed the world unless we can produce more food on less ground. 5G and connectivity will really help farmers get more out of their fields, more production with better quality."*

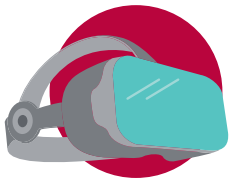
**– Nate Krause**  
Swans Trail Farm

# Education

Now more than ever, education is essential to build thriving communities and fostering equitable opportunities. 5G is helping America's teachers and students stay ahead of the curve, increasing engagement, leveraging real-time data and sparking imaginations.



How can kids get excited about learning and practicing math skills? **Boddle's** 5G-powered education app is one solution, wowing students with immersive, 3D learning experiences while using AI to deliver individualized lesson plans based on progress and needs.



**Prisms VR** is exploring how 5G can deliver immersive learning experiences, in this case to close the gaps in STEM education that are often a result of limited resources. 5G's fast speeds and low latency support interactive 3D lesson plans and seamless, hands-on VR experiences that bring science and math concepts to life and help students build their proficiency.



At the university level, **Arizona State University's** 5G Innovation Hub offers students a VR career "arcade" where they can experience a day in the life of professionals in different fields. They can also collaborate with researchers, faculty and university partners on new ways to use 5G connectivity and immersive learning to make education more inclusive, equitable and accessible.

**Use cases to watch:** At the **University of Connecticut Stamford**, 5G connectivity is creating opportunities for new cutting-edge research and providing students with pathways to new career opportunities. At the **University of Missouri**, a 5G-connected campus innovation lab is encouraging students to think through new ways to solve problems and improve campus life using 5G's enhanced capabilities.



## 5G Puts New Adventures and Worlds within Reach

With 5G, kids don't have to get on a bus to take a field trip. Start-up **Kai XR** in Oakland, California, has developed an inclusive, accessible 360-degree platform that delivers virtual adventures, enabling kids to immerse themselves in new worlds and opportunities through their phones.



*"Using 5G, we have faster experiences and lower latency, making it so kids can explore more than 100 field trips in the highest quality. We're showing them careers and new ideas, and that really changes their outlook on life. 5G helps us connect kids."*

**- Kai Frazier**  
Founder and CEO of Kai XR

# Entertainment & Gaming

Consumers today expect more and more from their entertainment experiences. 5G is helping companies deliver in new and creative ways, supporting holograms, VR, AR, next-level animation and more.



How can a smartphone be a gateway into a new world? **Helios** uses volumetric video, modern 3D holograms, AR, VR and more, powered by 5G, to deliver a fully interactive narrative gaming experience. The high speed and low latency of 5G enables game developers to do more with graphics and interactive design and provide a better overall experience.

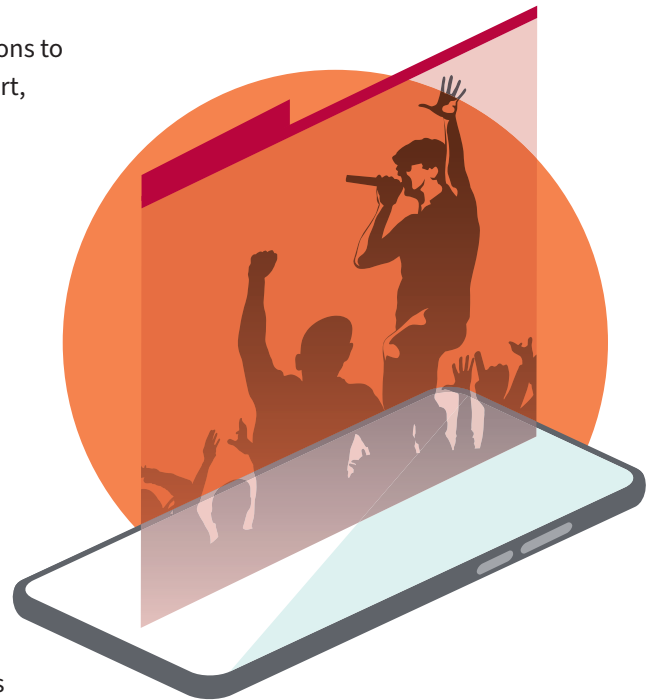


**Dignitas** launched the nation's first 5G esports training facility in Los Angeles. 5G connectivity enables players with Dignitas' League of Legends to stream high-quality games in real time, stay connected with fans on the go and experience console-quality multiplayer gaming on their phones.

**Live Nation** is using 5G-powered applications to put music fans at the center of every concert, at home, at the event venue and from their phone. This includes augmented reality filters tied to Live Nation venues and events, multi-cam features for livestreamed shows, exclusive NFTs concert-goers can redeem for benefits and more.

---

**Use cases to watch:** **Chaos at Hogwarts** in New York City is transporting Harry Potter fans into a virtual world of wizardry thanks to 5G-enabled VR technology and edge computing. **The Pepsi Super Bowl Halftime Show ULTRA PASS** used 5G and 8K-capable, 360-degree cameras to provide fans with an exclusive Super Bowl Halftime viewing experience. NVIDIA's **GeForce NOW** 5G cloud-based platform uses 5G connectivity to deliver gamers nearly 100 games with state-of-the-art graphics and cutting-edge artificial intelligence.



# Healthcare

When more patients, care providers and researchers can connect to the information they need—and each other—faster, the world becomes a healthier place. By powering innovative healthcare applications, 5G is redefining what’s possible in the field: making organizations more efficient, complex procedures more precise and life-enhancing care available in real time, from anywhere.

Cancer research relies on data, and cancer treatment is enhanced by a more personalized approach. The **Lawrence J. Ellison Institute for Transformative Medicine** in Los Angeles is leveraging 5G’s power for both, using 5G to connect an ecosystem of medical IoT devices and sensors like wearable patient monitors, AI patient rooms and 3D medical imaging machines. This near-instant access to data means doctors can make decisions immediately and patients can leverage wearable sensors to customize their experience and comfort at the Institute.



Out in the field, emergency medical practitioners need to be prepared for a variety of care scenarios. **SimX**, the first comprehensive cloud-based medical simulator, brings the training to them via virtual and augmented reality and low-latency, high-throughput 5G networks.



Meanwhile, at healthcare facilities nationwide medical teams on the go are using 5G’s faster speeds, high capacity and low latency to access large, complex data files, such as imaging results and medical charts, without being tethered to a computer. **The VA Miami Healthcare System** is leveraging 5G connectivity to support medical staff and patients and connect hundreds of devices.



**Use cases to watch:** With 5G, **Artisight Remote Patient Monitoring** is providing a “digital window” into patients’ rooms to reduce the risk of falls. **VITAS** is using 5G-powered virtual reality and augmented reality to reduce chronic pain and anxiety for hospice patients. **GE Research** is leveraging 5G to accelerate the development of wearable sensors and medical devices that will allow patients to recover safely and comfortably at home.



## Taking Surgery to New Dimensions of Visibility and Precision

By transforming traditional 2D imaging data into near real-time 3D holographic visualizations, doctors have the ability to visualize a patient’s anatomy, enhancing surgical practices and the precision of care. **The VA Palo Alto Health Care System**, the nation’s first 5G-connected veterans’ hospital, is exploring ways to use 5G-connected augmented reality to enhance surgical navigation systems and medical training across the United States.



*“5G allows us to do things with mixed reality and augmented reality systems to advance healthcare that we couldn’t do otherwise. We’re sort of bringing science fiction to life, and it’s really exciting to see that happen.”*

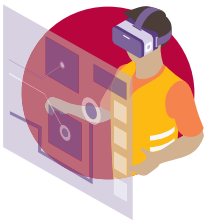
**– Dr. Thomas Osborne**

Director of the National Center for Collaborative Healthcare Innovation,  
Department of Veterans Affairs



# Manufacturing

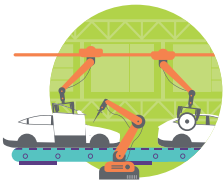
Advanced manufacturing is critical to our nation’s competitiveness, economic growth and quality of life. 5G is helping American factories springboard into the future in terms of safety, sustainability and innovation. Here are a few ways factories nationwide are putting 5G’s power to work for the manufacture of semiconductors, electric vehicles and even 5G equipment.



In Austin, **Samsung** is leveraging 5G to test and evaluate industrial use cases like AR and VR for employee training, 4K video-as-a-sensor to improve plant security and enhanced location services for plant safety. For example, when an industrial IoT platform monitors equipment and resources for production crews, a plant can increase productivity and reduce energy use by over 15%.



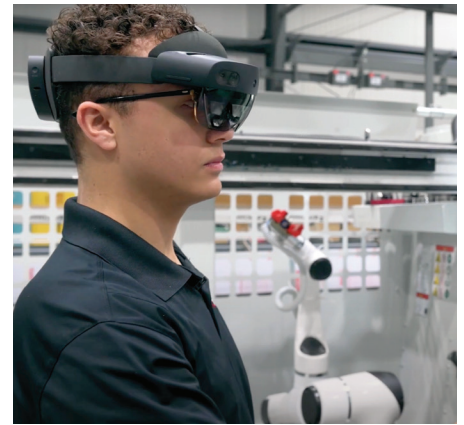
Meanwhile in Lewisville, Texas, **Ericsson’s USA 5G Smart Factory** is exploring the future of manufacturing for 5G radios and other network elements. This 5G-connected production facility is demonstrating capabilities like augmented reality for remote support, digital materials tracking, automated plant procedures and environmental monitoring.



In Detroit, **General Motors Factory ZERO** is the first car manufacturing facility in the U.S. to deploy 5G fixed wireless technology. 5G, with its exponential increases in bandwidth and speed, is supporting the ongoing transformation of the plant for producing electric vehicles. Once fully operational, the plant will create more than 2,200 U.S. manufacturing jobs.

---

**Use cases to watch:** **Corning** is using 5G to implement factory automation, quality assurance and factory-of-the-future innovations. **Ford’s F-150 Production Facility** is using 5G with multi-access edge computing technology to support production of the 2022 all-electric Ford F-150 Lightning. Food warehousing and distribution company **Lineage** used 5G sensors to collect actionable data about energy use at its warehouses to reduce its carbon footprint.



## Transforming Frontline Work with Realistic, Real-Time Visualizations

Augmented reality (AR) headsets can be a game-changer for frontline workers, enabling them to remotely perform tasks like cell site upgrades and machine maintenance, virtually view service checklists and more. 5G powers the fast responses necessary for a realistic experience.

Seattle-based **Taqtile** is leveraging 5G’s advanced capabilities in its Manifest software—a cutting-edge AR and mixed reality work-instruction platform designed to transform frontline and deskless work in areas such as manufacturing, energy and defense.



*“5G presents a number of great opportunities to provide more data visualization in real time and overlay that information on the equipment or machinery so the operator is more informed on the job.”*

**– Kelly Malone**  
Chief Customer Officer, Taqtile



# Office & Retail

The past two years of shutdowns tested offices and retailers like never before. Now businesses are using 5G to not only bounce back but reimagine the future with virtual experiences, real-time data and anytime, anywhere convenience.



Imagine a conference call that's the best of both worlds: real-life interaction without the commute. Seattle-based **Forma Vision** is using 5G to deliver such an experience by enabling holographic video calls, moving holograms from film and television screens to everyday life. Multiple cameras capture an image from all angles to create a 3D video that can be viewed in 360 degrees in real time on 5G-enabled mobile devices.



Now picture a shopping experience that takes convenience to the next level. You enter a store by scanning an app, have the items you want tracked seamlessly via computer vision technology and sensors and pay through the same app as well. The customizable, fully autonomous **NanoStore** by AiFi is using 5G connectivity to deliver these capabilities and more. At the Indianapolis 500, for example, fans, volunteers, staff and drivers used the Indy Express Shop app, a branded NanoStore, to buy snacks, beverages and Indy 500 merchandise in a contactless shopping environment.

5G is revolutionizing operations for companies behind the scenes, too. **Badger Technologies'** autonomous robots are testing the power of 5G to help retailers improve operational efficiencies and customer experiences. These advanced mobile data collection systems identify out-of-stock, mispriced or misplaced inventory and store hazards, filling major gaps in the collecting and sharing of vital in-store data.

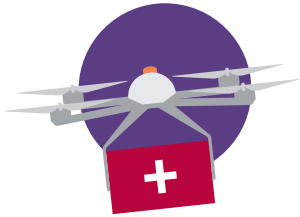


# Public Safety

When it comes to keeping people safe, knowledge is power and speed is everything. 5G delivers both, exponentially increasing our access to video, data and virtual worlds and accelerating our ability to respond.



For example, firefighters need to find people quickly while protecting their own safety, often in zero-visibility environments. **Qwake's C-THRU** augmented reality face shield, powered by 5G, sharpens their view. 5G's low latency and ability to support enhanced edge compute capabilities enables safer, more efficient tactical response.



Improved emergency response also depends on data. For **Asylon's** autonomous threat detection drones, high-bandwidth 5G enhances the quality of the drone's video streams, improves video download times and increases the capability of the drone's video analytics. System operators and first responders benefit from more video streams, greater drone density, faster sharing of critical information and improved decision-making in the field.

5G also makes it possible for first responders to cost-effectively train on complex operations and high-risk scenarios—all at the same time, from wherever they are and as many times as they need. The 5G-enabled **PIXO** virtual reality training environment is one example. Faster edge computing reduces lag times, and low latency results in a more realistic simulation.

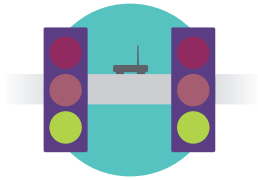


---

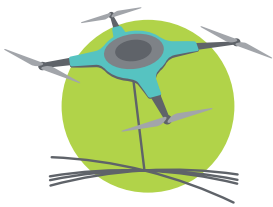
**Use case to watch:** The **NSENA** training simulator for law enforcement is using 5G, VR and high-speed edge compute technology to support more complex training while delivering lifelike experiences and easily repeated scenarios.

# Smart Cities, Buildings & Energy

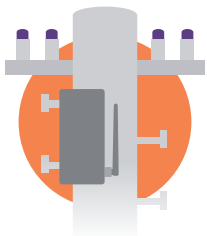
The cities of the future will be smart cities: growing and thriving while offering residents and visitors a convenient, enjoyable and safe place to work and play. 5G is the engine of smart cities innovation, connecting people, data and new ideas in creative ways.



How can vehicles spend less time idling at traffic lights and emergency vehicles get where they need to go faster? **Applied Information** and **Temple Inc.'s** 5G-connected traffic lights are one solution. They gather data from vehicles and pedestrian devices and leverage 5G's high bandwidth and low latency to improve traffic flow and crosswalk safety. Signals can be synchronized during rush hour to streamline traffic patterns or set to give emergency vehicles priority access and faster routes.



New buildings, bridges and parking structures are signs of a thriving community—and too often prone to delays, safety risks and budget overruns. Drone creator **SkyMul** is creatively using 5G's capabilities to address these challenges. High-speed, low-latency 5G networks are supporting drones with the capacity to tie rebar almost two and a half times faster and 32 percent cheaper than manual processes, without compromising the structural integrity of the build.



5G is also in use keeping critical utility services up and running, a task that's particularly difficult in remote or inaccessible areas. **Advanced Renewable Power** and the **Indiana 5G Zone** are partnering to develop 5G-enabled mobile grid technology, for real-time monitoring that keeps energy flowing to where it's needed.

---

**Use cases to watch:** **StreamCam 5G**, the first 5G construction camera by EarthCam, uses 5G's capabilities to transform the cameras into a communications hub for site telemetry. **The National Landing innovation district** in Arlington, VA, will use 5G, AI, cloud and edge technologies for mobility, immersive retail and entertainment, building automation and environmental sustainability.



## A Living Laboratory for Smart Cities Innovation

**Curiosity Lab at Peachtree Corners** is a 5G-connected, smart cities innovation lab located in the heart of a suburban city, where 5G smart cities and connected vehicle-to-everything applications are operating in a real city environment. The lab's main feature is the "City Street of the Future," a three-mile connected roadway running adjacent to the city's main drive. Several smart cities applications are deployed throughout Curiosity Lab, and all the data generated from the connected infrastructure environment feeds in real time to the lab's first-of-its-kind 5G IoT city control room.



*"5G is really allowing cities to go to places they've never been able to before."*

**– Brandon Branham**  
CTO, City of Peachtree Corners

# Sports

From professional leagues to wearables innovators, sports leaders are leveraging 5G's faster speed, high capacity and low latency to reimagine performance, the fan experience and even the nature of sports itself.



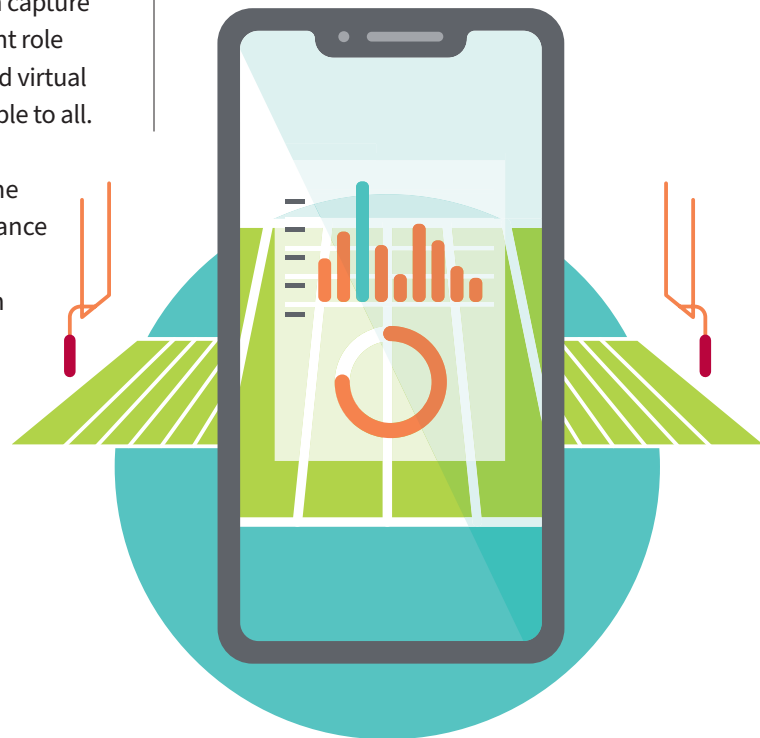
5G is helping sports leagues find creative ways to make fans even more a part of the game, in arenas and at home. The **NBA** and **WNBA** are using 5G immersive technology to provide more unique camera angles for broadcast; 5G HoloVision, which makes holographic telepresence interviews possible; augmented reality that brings player bios and stats to life; and 5G network connectivity in arenas across the country.

By supporting sensor networks, smart wearables and virtual worlds, 5G offers individuals unprecedented ability to learn from data and increase their participation in sports activities. The Valor 4D motion capture suit by **Brave Virtual Worlds** uses attachable sensors embedded in athletic wear to capture bodily movement and relay the data directly to a smartphone app, for a seamless motion capture experience. It's also playing an important role in the "Athletaverse," where physical and virtual worlds combine to make sports accessible to all.



The **NFL** is using 5G to both enhance the fan experience and take team performance to the next level, with applications for management, scouting, training, health and safety and game day operations. In the future, 5G will deliver coaches and players real-time analytics and visualizations, enhancing their ability to learn from the last play and prepare for the next one.

**Use cases to watch:** The **NHL** is exploring how 5G and mobile edge computing can deliver real-time player stats and AR video highlights to fans' phones. The **MLB** used 5G to upgrade the fan experience during the 2021 Home Run Derby of MLB All-Star Week, and **Fox Sports** used 5G to stream 4K video from the 118th U.S. Open Championship. The **Drone Racing League** brought fans closer to the action with the world's first 5G-enabled racing drone, and the **Indianapolis 500** delivered an interactive race day experience through 5G-enabled, 360-degree cameras and an AR smartphone app. In basketball, 5G is able to connect multiple **JSleeve** wearables to a virtual clipboard platform, capturing data for every player and diagramming offensive plays based on shot performance.



# Transportation & Logistics

What if cars and scooters were available on demand, whenever and wherever you needed them? How can vehicles use the information around them to operate more efficiently and “smartly”? Innovators nationwide are using 5G to answer these questions—and redefine how people and products get from one place to another.



In suburban Atlanta, all-electric autonomous public shuttles by **Beep** transport residents to popular restaurants, retail shops and hotels—moving safely and efficiently around bikes, pedestrians and other vehicles. 5G’s low latency, high bandwidth and high-speed connectivity support the “vehicle to everything” technology that makes it possible.



In busy downtowns, a fleet of self-driving electric scooters by **Tortoise** and **Go X** are similarly getting people where they need to go in a creative way. Supported by 5G’s high speed and low latency, the scooters use remote teleoperators to travel to a customer’s location after a request comes in via mobile app, then remotely reposition back to a safe parking spot after the customer completes the ride, keeping sidewalks accessible for pedestrians.



On America’s highways, **BMW** and **Audi of America** are bringing 5G connectivity to cars, giving customers unlimited 5G data for personal and in-car applications and enhancing safety and the driving experience through vehicle-to-everything communications.

**Use cases to watch:** 5G capabilities are enabling **Waycare** connected vehicle technology to improve traffic flow and emergency vehicle routings, the University of Michigan’s **Mcity** innovation lab to imagine a new world of 5G-connected and automated vehicles and **UPS** to explore how 5G connectivity and drones can address final mile delivery challenges with increased demand.



## Halo.Car: 5G-Powered Driving On Demand

Imagine swiping a mobile app to bring a car to you when you need one, from anywhere in the city. **Halo.Car**, a remote pilot, electric vehicle rideshare company, is bringing this vision to life through a solution that reduces carbon emissions from the transportation sector, without negatively impacting mobility.

5G’s faster speeds, higher capacity and lower latency make Halo.Car’s operations possible—enabling data from on-vehicle cameras to be transmitted in real time to remote pilots, supporting overall car deployment and more.

For drivers, Halo.Car delivers electric mobility on demand without car ownership. For communities and climate impact, the use of each vehicle by multiple drivers throughout the day, instead of just one, means fewer vehicles on the roads and in parking lots and reduced carbon emissions.



*“We use 5G to bring an all-electric, driverless car to wherever you are, and then we just let you drive the car once it gets there.”*

**– Anand Nandakumar**  
Founder and CEO, Halo.Car





ctia™

