LET'S BUILD SMARTER, SAFER FACTORIES WITH AI
Automation and monitoring of industrial assets, systems, processes, and environments are increasingly important across manufacturing. In order to implement safer and more efficient processes, companies are automating their manufacturing lines and factory floors with IoT sensors, like video cameras. These sensors generate vast amounts of data that, when combined with the power of AI, produce valuable insights that manufacturers can use to improve operational efficiency and workplace safety.

**NVIDIA Metropolis: Powering the World’s Smartest Factories**

NVIDIA Metropolis and its extensive partner ecosystem help bring powerful AI-based video analytics applications to market faster. In the pages that follow, we’ll explore real-world examples of how AI-enabled video analytics can solve complex operational and safety problems for factories with the NVIDIA Metropolis application framework running on the NVIDIA-Certified Systems.
IMPROVING FACTORY OPERATIONS AND MANUFACTURING PROCESSES

Manufacturing Inspection
- Quality Control
- Yield Optimization

Asset Maintenance
- Predictive Maintenance
- Equipment Effectiveness

Factory Management
- Factory Floor Optimization
- Worker Safety
- Factory Logistics
Defect detection is an essential part of the manufacturing process. Today’s manufacturers are meeting this growing challenge by automating defect inspection with AI and computer vision to achieve high-quality control standards in their production processes and optimize quality control measures. When running an assembly line where millions of products are made, factories need to identify and respond to anomalies in real time. Devices that use edge computing can make decisions in microseconds, catch defects instantly, and alert staff of issues. This capability provides a significant advantage to factories as it can reduce waste, negate downtime, and improve manufacturing efficiency.

The NVIDIA Metropolis platform lets developers, integrators, and solution partners develop vision AI applications that use GPU-accelerated, real-time AI vision inference and edge re-training capabilities to ensure manufacturers can maintain or improve product quality.

- Defect Detection
- Quality Inspection
- Irregularity Manufacturing Alert
- Production Process Compliance
YIELD OPTIMIZATION

In factories, such as food production plants, it’s critical to know the exact quantity and quality of the ingredients being used in the manufacturing process. By using visual sensor data, AI, and edge computing, machines can recalibrate instantly if any parameters need to be changed in order to produce better quality products. There’s no need for manual supervision or timely review cycles that rely on sending data to a central location for review. The sensors on-site are capable of making real-time decisions to improve yields.

With vision AI applications developed on the NVIDIA Metropolis platform using NVIDIA-Certified Systems, manufacturers can closely monitor the production process, all in real-time. The NVIDIA AI Enterprise platform dramatically speeds up the training of deep learning and machine learning models to deliver actionable insights that were never possible before. NVIDIA’s GPUs and software stack enable factories to work smarter, while also reducing spoilage.

- Raw Materials Monitoring
- Spoilage Monitoring
- Production Analytics
PREDICTIVE MAINTENANCE

In business, ensuring equipment uptime is critical and meeting safety and regulatory standards is non-negotiable. Using vision AI, sensors on equipment can now scan for flaws and alert management if a machine needs a repair so the issue can be swiftly addressed before it becomes severe, avoiding periods of downtime.

The combination of sensor data, AI, and edge computing accurately assesses equipment condition and allows the manufacturer to avoid costly unplanned outages. For example, sensor-equipped video cameras in chemical plants are used to detect corrosion in pipes and alert staff to fix or replace the pipes before they can cause any damage.

Using deep neural networks developed on the NVIDIA Metropolis platform using NVIDIA-Certified Systems, manufacturers can automate inspection services of their equipment. GPU-accelerated predictive maintenance solutions are also helping industrial companies drive down operational costs by more accurately predicting equipment failure than with traditional machine learning-based methods.

> Equipment Monitoring
> Corrosion Detection
> Equipment Inspection
EQUIPMENT EFFECTIVENESS

Manufacturers are continuously looking to improve processes. When combined with sensor data, edge computing can be used to assess overall equipment effectiveness. For example, in the automotive welding process, manufacturers need to meet many requirements to ensure that their welding is of the highest quality. Using sensor data and edge computing, companies can monitor the welding process in real time and catch defects or safety risks before products leave the factory.

Edge AI enables any device or computer to process data and manage AI-led decisions in real time with minimal latency. This industrial edge computing requires GPU-powered compute capabilities to monitor equipment, powered by NVIDIA-Certified Systems and NVIDIA Jetson™ solutions to accelerate systems for these applications, and more.

- Equipment Monitoring
- Equipment Analytics
FACTORY FLOOR OPTIMIZATION

Manufacturers must coordinate a complex series of processes to generate goods for consumers. To improve their efficiency, they have to first analyze and understand how their factory spaces are being used. For example, when workers walk between stations on the factory floor to complete a task in a car manufacturing plant, they’re creating a bottleneck that supervisors may be unaware of if the data isn’t available. Sensors help manufacturers analyze factory spaces by providing data on how the spaces are being used and who’s using them. They send visual data and critical edge AI-processed information to a central location for supervisors to review. With these insights in hand, supervisors can then make informed optimizations for factory improvements.

These vision AI applications that generate insights from hundreds of cameras and sensors are built on the NVIDIA Metropolis and NVIDIA-Certified Systems, helping manufacturers optimize their operations.

- People Counting
- Worker Density
- Process Logs
WORKER SAFETY

Industrial workers often operate heavy machinery and handle hazardous materials at manufacturing sites. Using a network of cameras and sensors equipped with AI-enabled video analytics, manufacturers can now identify individuals working in unsafe conditions and quickly intervene to prevent accidents.

The application uses cameras and sensors feeding into AI-powered video analytics algorithms based on the NVIDIA Metropolis software stack to locate workers in precarious situations and alert the supervising staff of the potential danger before an accident occurs. Industrial work areas like oil rigs don’t have Internet access and need systems to process data on the edge. Solutions based on the NVIDIA Jetson edge AI platform offer unbeatable real-time performance and energy efficiency in a small, reliable form factor.

In factory security, the cameras use software algorithms to detect specific activities and scan for suspicious behavior. Using behavioral recognition technology, cameras can be programmed to detect incidents such as abandoned objects, crowd congestion, and even weapons.

- Safety Enforcement
- Access Control
- Perimeter Protection
- Intrusion Detection
- Forensic Video Search

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FACTORY LOGISTICS

Manufacturers have to be proactive and prescriptive to realize their goals, and real-time, continuous monitoring of inventory is critical. To satisfy growing consumer demand for products, companies need to accurately understand inventory levels in their warehouses and distribution centers. Factory analytics are useful and allow manufacturers to track their processes. The NVIDIA Metropolis application frameworks that derive insights from vast streams of video feeds can be used to improve operational efficiency, logistics, safety, and quality assurance.

By automating these processes with AI, manufacturers can better predict and manage their supply chain. For example, an electronic manufacturing company with automated processes can detect supply shortages and immediately alert production facilities across the country to generate more of the needed raw material so production can continue smoothly and without interruption.

- Product Tracking/Counting
- Inventory Management
- Shipment Load Monitoring
- Supply Chain Logistics
- Automated Goods Counting
Learn more about NVIDIA Metropolis.

Contact us to learn more about how NVIDIA Metropolis is transforming factories around the world.

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