BEYOND AUTOMATION: HOW AIOT IS REVOLUTIONIZING INDUSTRIES WITH AUTONOMOUS INTELLIGENCE
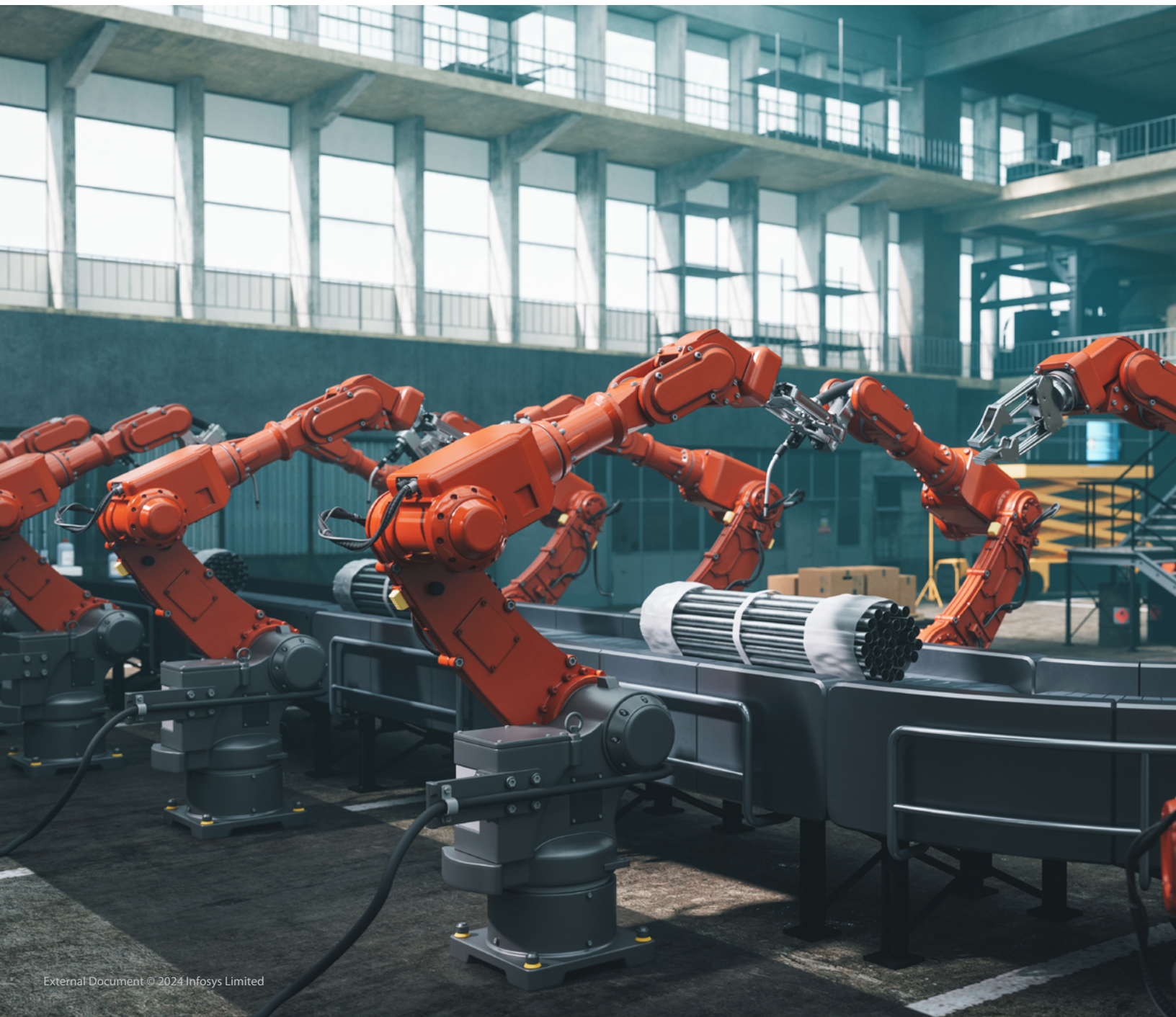
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What Is AIoT?

To fully understand AIoT, it's essential to begin with the Internet of Things (IoT). IoT refers to a network of interconnected gadgets, wearables, digital assistants, refrigerators, sensors, and other equipment that can be identified by other devices to gather, analyze, share data, and so on. A system is said to possess artificial intelligence if it can learn from data or finish a set of tasks in a plausible manner. The devices can function without human intervention when artificial intelligence is integrated into IoT. This allows the devices to evaluate data, make judgments, and act based on the data. Artificial Intelligence

of Things (AIoT) is the result of combining Artificial Intelligence (AI) technology with Internet of Things (IoT) infrastructure. AIoT enhances data management and analytics to enable more efficient IoT operations. This is a meaningful change and win-win situation for both technologies: IoT provides value through improved connectivity, signaling, and data exchange, while AI enhances data analytics and decision-making capabilities through machine learning.

How AI and IoT Converge to Change the Way You Do Business

The main goal of AIoT is to utilize artificial intelligence to interpret the massive amounts of unprocessed data produced by the internet of things. Wearables, industrial equipment, smart cities, and smart homes are just a few of the rapidly expanding categories of IoT devices. These devices produce massive volumes of data, and analyzing this data can lead to significant operational improvements. However, without AI, managing such vast amount of data can be daunting and challenging.

AI + IoT = AIoT

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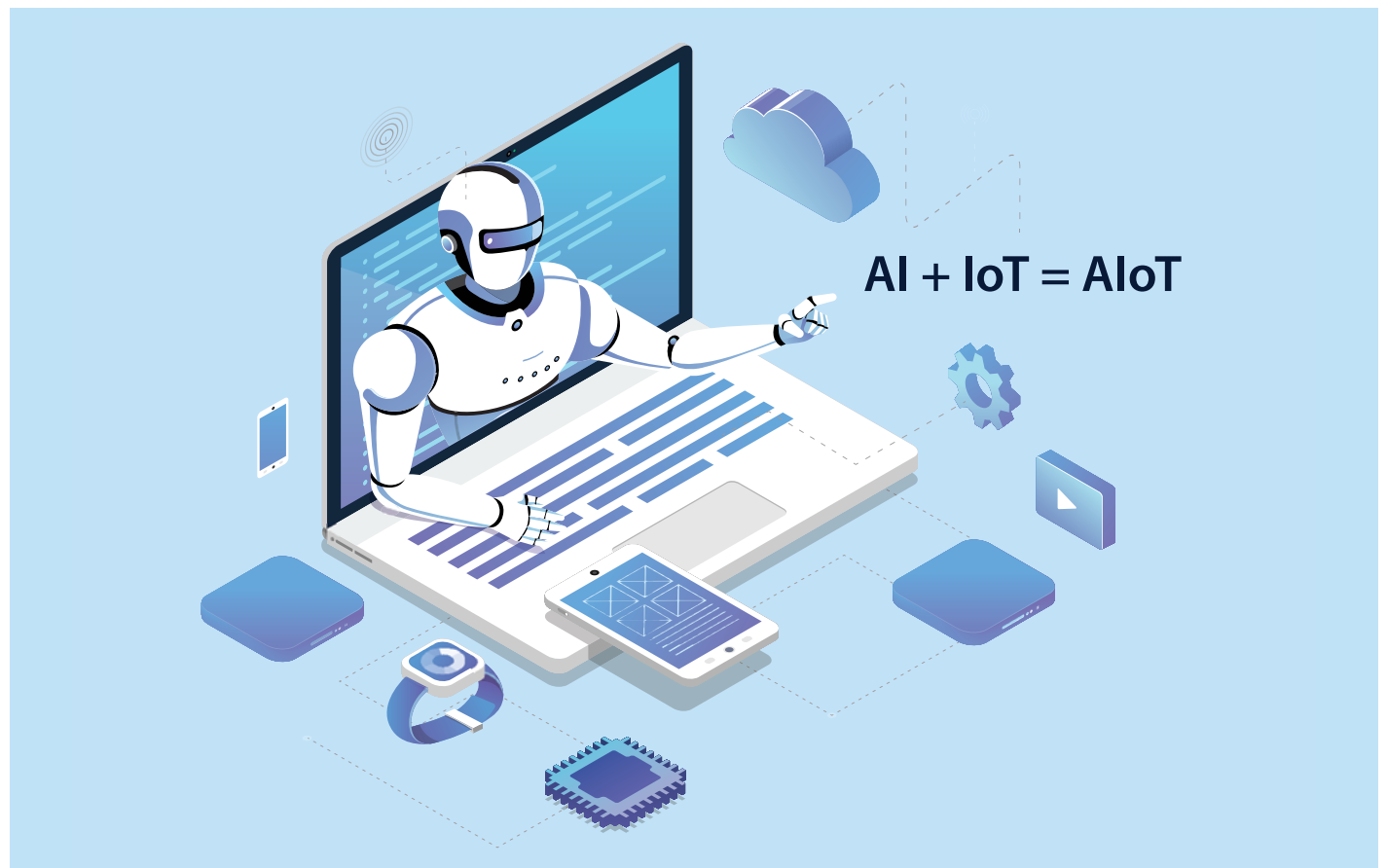
Organizations may enhance consumer experiences, streamline workflows, and obtain real-time operational insights by utilizing IoT data with machine learning and other AI technologies. For instance, companies can proactively schedule maintenance and identify potential problems before they occur by monitoring sensor data from production equipment. This can result in significant savings of millions of dollars in lost productivity and repair costs.
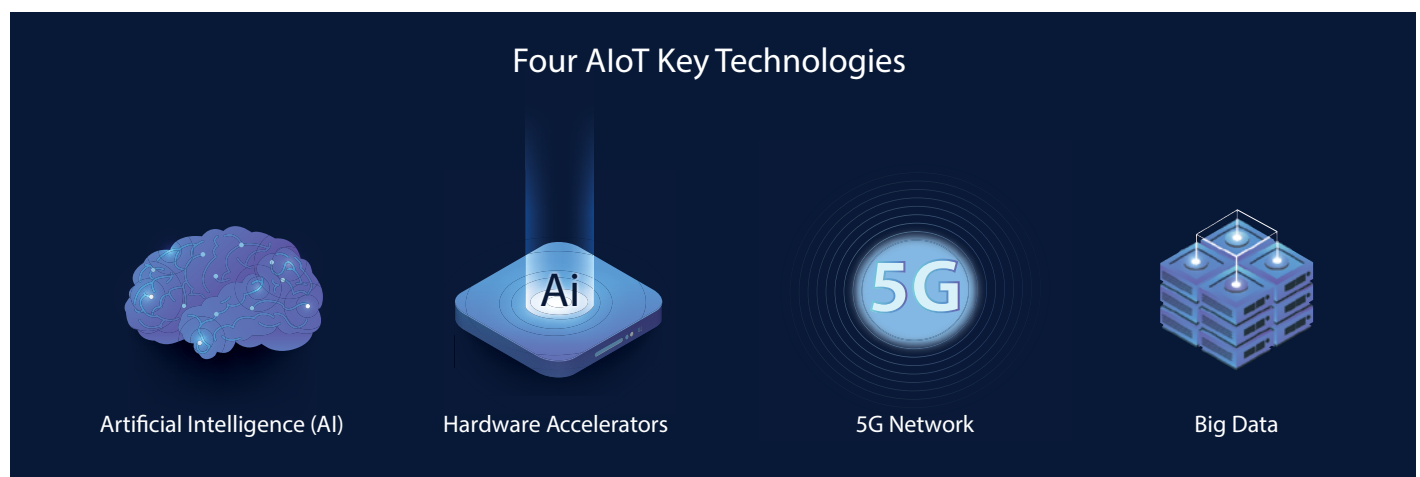
Why AIoT Is Important?

AIoT provides analytics capabilities to IoT devices, and as more of these devices are deployed along with the data they process, the potential market impact of AIoT grows as well. Although estimates from analysts vary, it is expected that the number of IoT-connected devices will rise significantly. Statista projects that they will reach 75 billion by 2025, whereas Business Wire predicts that by the same year, they will reach 41.6 billion and generate 79.4 zettabytes of data. The fundamental challenge in IoT will be to use this data meaningfully as the number of devices and the data they produce continue to grow. A Gartner survey indicates that 87% of companies have a low maturity level for analytics and business intelligence. As a result, most businesses not leveraging their data effectively, missing out on potential profit from it. Better data management and analytics capabilities can be attained by enterprises through the integration of AI-based solutions in Internet of Things initiatives.

Market Statistics of AIoT

According to a recent estimate by Transparency Market Research, the Artificial Intelligence of Things (AIoT) market is predicted to grow at a robust rate of 24.6% from 2023 to reach a whopping USD 58.4 billion by the end of 2031. Transparency Market Research reports that this notable increase highlights the growing uptake of AIoT solutions in a variety of industries. This expansion is being fueled by developments in edge computing infrastructure, IoT devices, and AI algorithms.

Four AIoT Key Technologies

Artificial Intelligence (AI)   Hardware Accelerators   5G Network   Big Data

Source: https://premioinc.com/blogs/blog/aiot-and-the-future-of-industrial-4-0

Artificial Intelligence

Deep learning models are becoming increasingly accurate and efficient even in scenarios where they require less resources to run. IoT devices benefit from AI in two ways. Firstly, the use of IoT devices and intelligent sensors has increased the efficiency of the telemetry data process. AI facilitates both batch (Big Data) and stream (real-time) processing at the edge for sophisticated and mission-critical applications. For example, when a security camera is not enhanced with intelligence, it will send each frame to the Internet of Things framework, which will then examine the feed to look for unusual activity. With AI implementation, the security camera system only delivers a frame when suspicious activity is detected. From a software and hardware standpoint, this significantly increases the IoT application's efficiency.

Hardware Accelerators

The ability of IoT devices to quickly run AI, Deep Learning, and Machine Learning models is being pushed ahead by powerful computer processors, such as CPUs and GPUs (Graphics Processing Units) from Intel, AMD, NVIDIA, and Qualcomm. Additionally, more AI-focused processors are being developed by technology companies. Examples of these processors are Google's TPUs and Intel's Movidius VPUs, which are able to run AI models very quickly and effectively. As machine learning technology advances, manufacturers will be able to produce AIoT devices that are both more powerful and compact.
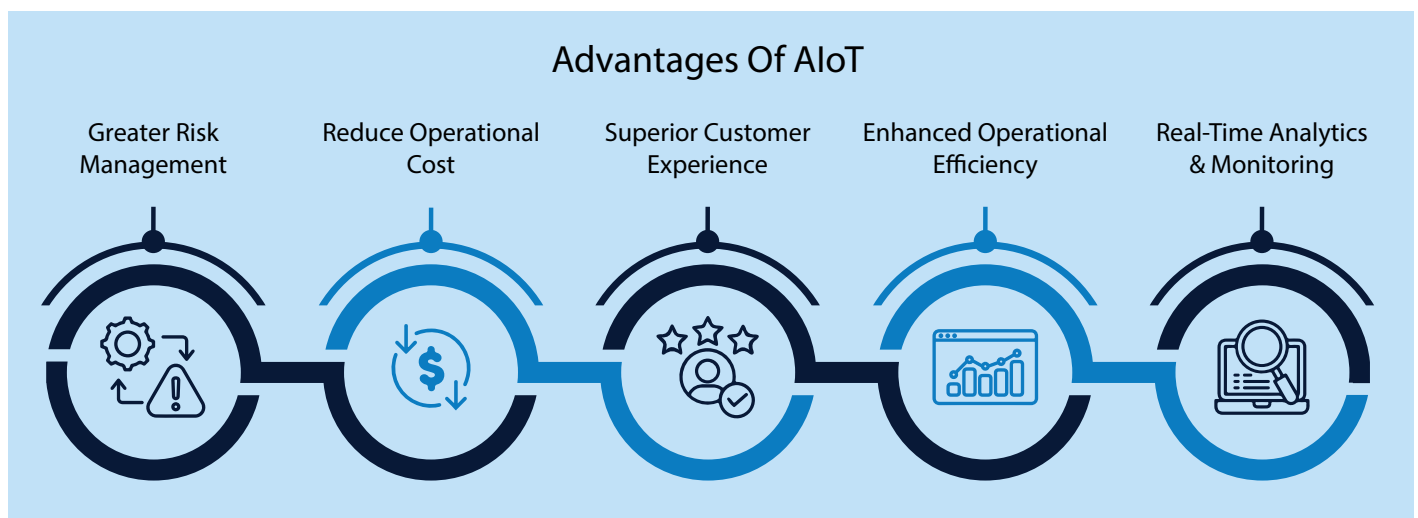
5G Networks

The next generation of wireless communication, known as 5G, offers 100 times faster speed than 4G/LTE and a 100-fold increase in connected devices. AIoT applications will be much more powerful, mobile, dependable, and efficient due to 5G networks. For example, Healthcare providers will have a greater advantage in adopting predictive analytics to further reduce costs and provide better treatment because of the increased number of patient monitoring devices needed to train AI models for predictive analytics brought about by 5G and the IoT. The industry's present efforts to deliver remote care and almost real-time health monitoring will be significantly enhanced by 5G and AIoT. Physicians may make the most of their time by caring for more patients and addressing urgent problems more quickly, while patients will have better access to treatment and live longer lives.

Big Data

Over a million new IoT devices connect to the internet every day, bringing the total number of connected gadgets to an estimated 7 billion. By 2025, experts predict that there will be 30 billion IoT devices worldwide. The amount of Big Data collected as it moves between devices and networks has increased dramatically due to the spread of connected IoT. Because IoT devices create so much data, AI experts are developing increasingly sophisticated Deep Learning models to be integrated into AIoT devices. Furthermore, by collecting, filtering, processing, and analyzing data at the edge before delivering the most crucial information to the cloud, AIoT devices reduce workloads at the cloud.

Advantages of AIoT

AI and IoT technologies are gaining widespread adoption due to their versatility. Actionable alternatives are promoted and provided by AIoT. IoT can provide you with device-specific information, but machine learning algorithms, a subset of artificial intelligence allow you to forecast choices and results. Top advantages of AIoT use are as follows:

Advantages Of AIoT

| Greater Risk Management | Reduce Operational Cost | Superior Customer Experience | Enhanced Operational Efficiency | Real-Time Analytics & Monitoring |

Source: https://www.intuz.com/blog/use-cases-and-advantages-of-aiot

Greater Risk Management

Risk management is essential for businesses in all sectors. With the ability to anticipate potential threats and take proactive measures, distributed intelligent systems can reduce repair and maintenance costs. Analyses of crowds in public areas, worker safety on manufacturing floors, and water levels in Smart Cities are a few examples. With the help of AIoT technologies, organizations may remain ahead of the curve in terms of anticipating and addressing any future threats. These applications have recently been used by insurers to manage insurance risks for both individual machines and entire factories.

Reduced Operational Costs

Utilizing high-quality technology can lead to significant long-term reduction in cost savings. For example, creating intelligent systems enables more effective use of resources. Smart building applications that adjust lighting and temperature settings according to occupancy are

one such example. When utilizing smart factory applications in smart factories, AIoT devices are crucial for machinery analysis and preventive maintenance. Thanks to sensors and cameras that identify and track the condition of machine parts, you can avoid expensive business disruptions and equipment failure.

Superior Customer Experience

AIoT can help you gain a deeper understanding of your customers' challenges and their changing preferences and behaviors. For example, in the retail industry, AIoT collects inventory data to identify which aisles require immediate replenishment, which products are selling like hotcakes, and which galleries have not had a single customer visit.

Enhanced Operational Efficiency

Businesses can use intelligent automation to reorganize their operational processes. For example, smart environmental sensors can communicate to the central data hub or an Internet of Things device the number of people who are safe within

office buildings. Using human face recognition software and other biometric access devices enables remote monitoring of an office building's physical security procedures. AIoT enables businesses to achieve optimal operational efficiency. AIoT-enabled devices can create, analyze, and discover patterns in data using machine learning techniques. It may therefore provide operational insights quickly, recognize and fix problems, and automate labor-intensive processes.

Real Time Analytics and Monitoring

Real-time system monitoring can help you cut down on expensive business disruptions and save time. It involves continuous machine monitoring to detect anomalies and forecast or determine the course of action based on them. It generates results more quickly and accurately while requiring less human intervention. The use of sensors for leak detection is one application of AIoT technology in the oil and gas industry. It makes inventory control and monitoring possible from a distance.
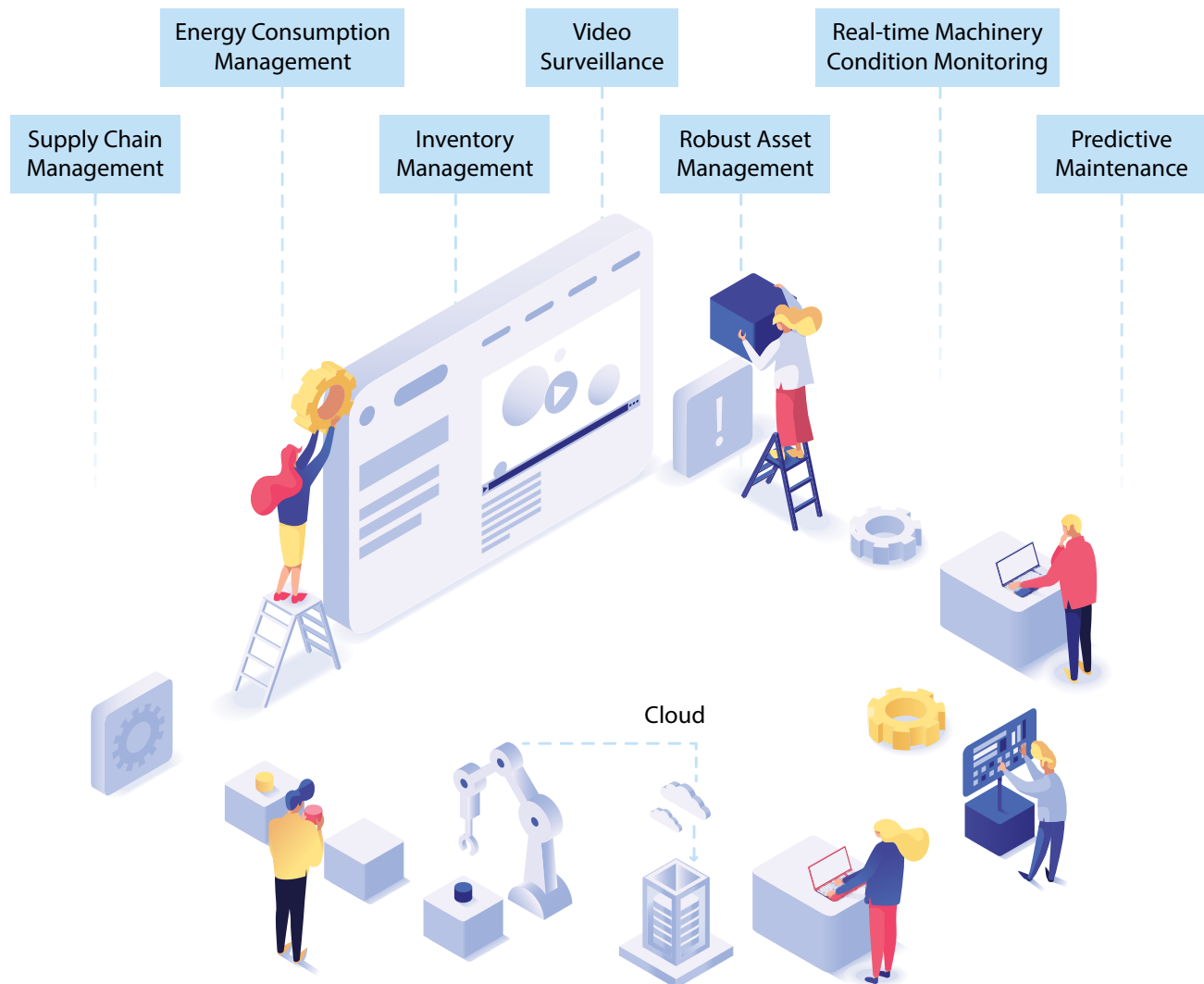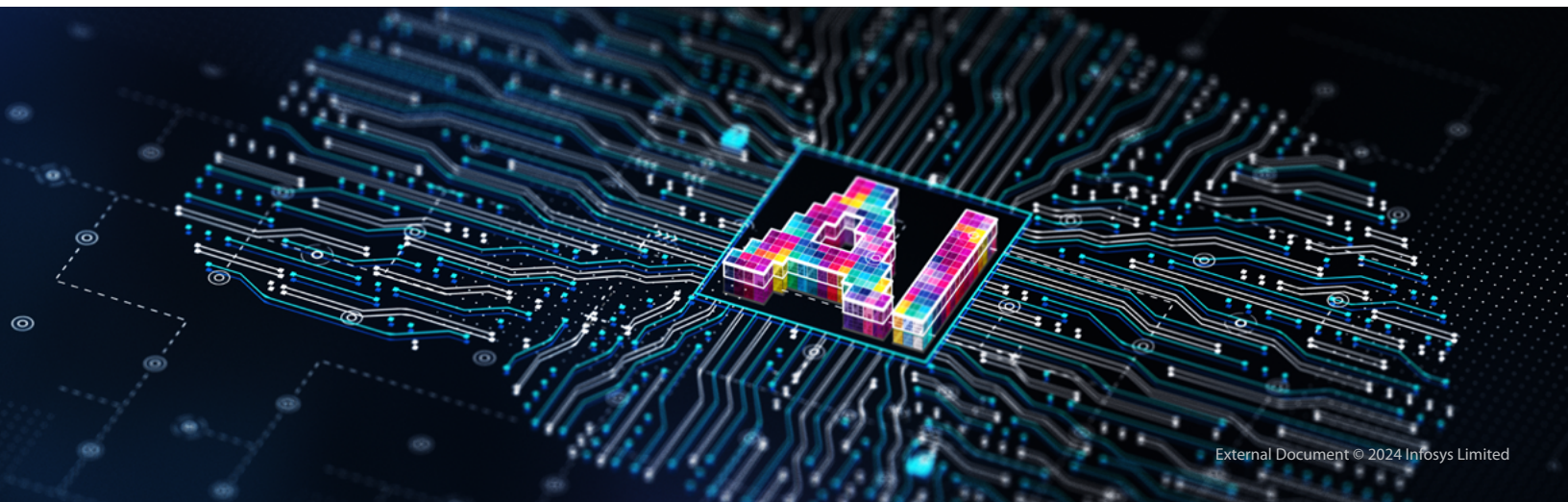
Key Use Cases of AIoT

Intelligent systems that blend hardware and software are very scalable and efficient when AI and IoT are integrated. Therefore, AIoT facilitates the development and maintenance of large-scale deep learning systems. An increasing trend in technology is the use of AIoT in a variety of sectors, including manufacturing, retail, services, oil and gas, logistics, agriculture, and healthcare. AI is used in smart sensing, machine vision, and predictive maintenance, among other areas of Industrial IoT (IIoT) applications. The most common AIoT use cases will be discussed in the sections that follow.

Energy Consumption Management

Video Surveillance

Real-time Machinery Condition Monitoring

Supply Chain Management

Inventory Management

Robust Asset Management

Predictive Maintenance

Cloud

Source: https://www.intuz.com/blog/use-cases-and-advantages-of-aiot

Manufacturing & Production

The Industrial Internet of Things, or IIoT, is a common application for AIoT systems. These sophisticated systems are used in production to track machinery in real time and identify defective components. Modern deep learning apps are gradually replacing traditional machine vision systems for quality control. By using Artificial Intelligence (AI) models to analyze real-time video feeds from low-cost cameras, deep neural networks are taught to identify defective components instantly.

Source: https://viso.ai/edge-ai/artificial-intelligence-of-things-aiot/
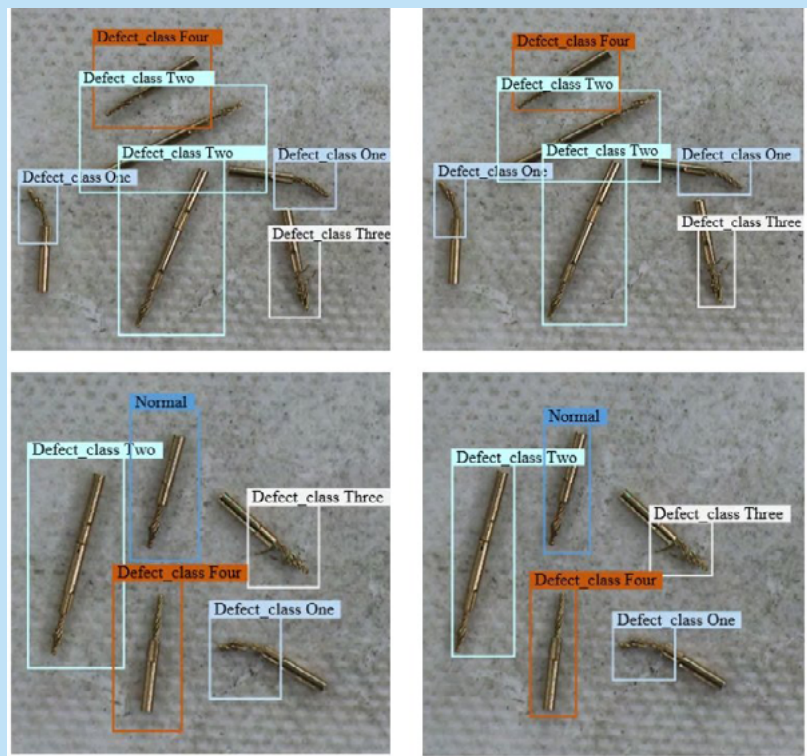
Automated Vehicles

Autonomous vehicles can navigate safely between locations without human intervention. Numerous innovative technologies, with AIoT at its center, enable this. Tesla vehicles serve as an excellent illustration of how AI and IoT can significantly change the automotive sector. To ensure the safe automated driving, these make use of a variety of innovative technologies, including sensors, devices, cameras, and more.

Source: https://viso.ai/edge-ai/artificial-intelligence-of-things-aiot/
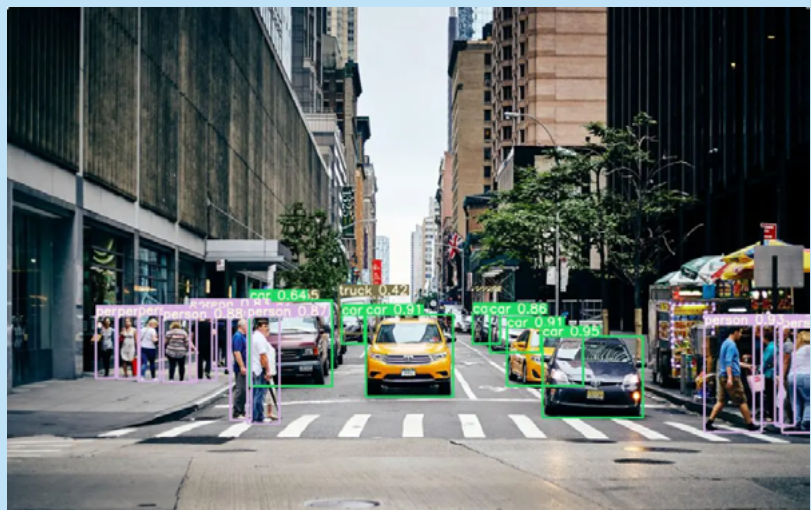
Office Buildings

Smart offices and commercial buildings are another setting where AI and the IoT collide. To improve energy efficiency, businesses can install a network of intelligent environmental sensors in their office or building to detect the presence of staff and even control lighting and temperature. Another application involves using facial recognition technology to control building entry. AIoT is the combination of networke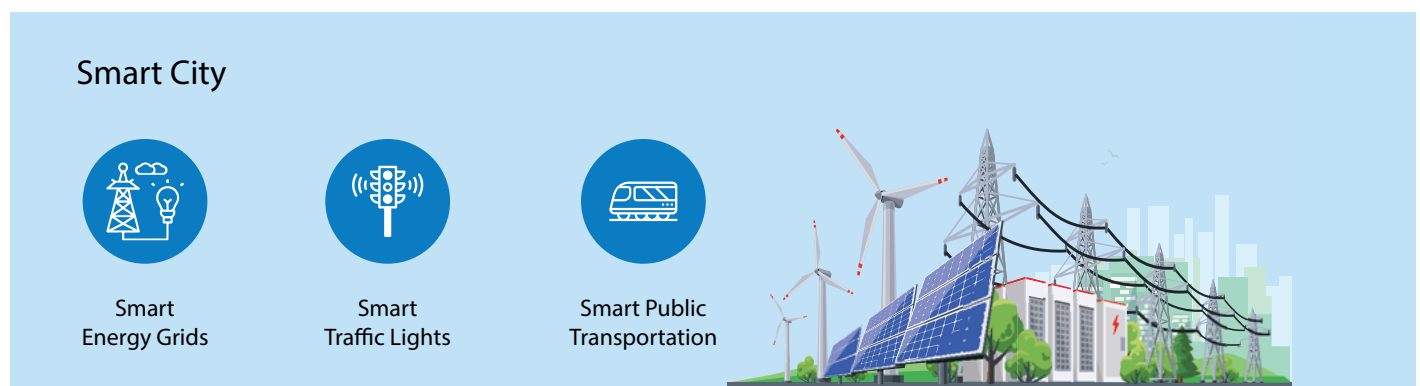d cameras and artificial intelligence (AI) that can identify photos captured in real-time and compare them to a database to determine who should be allowed entry into a building.

Smart Cities

AIoT is used by smart cities to gather, process, and act upon data in real time, resulting in more sustainable and productive urban living. For example, Barcelona, which is renowned for its creative urban solutions, has deployed Internet of Things (IoT) sensors all over the city to control waste collection, monitor noise and air quality, and improve street lighting. As a result, it is claimed that Barcelona saves €75 million a year on water alone.

AIoT is used in Singapore's Smart Nation plan for a variety of purposes, including elder care and traffic control. The city-state optimizes public transportation and traffic flow with AI-driven analytics to lessen traffic and enhance air quality. Similarly, Songdo, a city in South Korea, was developed from the ground up to be a smart city. It features an extensive network of sensors, green buildings, and pervasive technology.

Smart City

Smart Energy Grids

Smart Traffic Lights

Smart Public Transportation

Source: https://premioinc.com/blogs/blog/aiot-and-the-future-of-industrial-4-0

Oil & Gas

Predictive maintenance approaches offered by AIoT are utilized by oil and gas firms to anticipate equipment malfunctions and breakdowns. It can aid in the reduction of human mistakes, which can occasionally result in fatalities and financial losses for businesses. Also, AIoT sensors can continuously monitor pipelines and storage tanks for leaks. Machine learning algorithms analyze sensor data to identify anomalies and potential leaks, minimizing environmental damage and safety risks.

Agriculture

AIoT is transforming farming techniques in smart agriculture. IoT sensors gather information on crop health, weather, and soil quality. To maximize crop yields and resource efficiency, AI models evaluate this data and make recommendations regarding irrigation, fertilization, and pest management.

Retail

AIoT can assist retailers in better understanding customer behavior and customizing their offerings to boost revenue. Crucially, it enables them to verify if customers have scanned their purchases at the register. Also, AIoT sensors on shelves can track inventory levels in real-time. This allows retailers to optimize stock, prevent stockouts, and reduce shrinkage. Additionally, AI can analyze sales data and predict demand, enabling better ordering and reducing waste.

Healthcare

AIoT has enormous potential to improve healthcare through early disease detection, tailored treatment, and remote patient monitoring. Healthcare professionals can collect real-time health data, monitor patients remotely, and create individualized treatment plans by integrating AI algorithms with Internet of Things devices. AIoT enables ongoing observation and analysis of patient behaviors, adherence to medicine, and vital signs. This allows for more targeted and proactive therapies. Additionally, through facilitating prompt treatments, maximizing resource allocation, and promoting preventative care practices, AIoT has the potential to improve healthcare outcomes, save costs, and increase patient well-being.

Environmental Monitoring & Sustainability

AIoT is essential to sustainability initiatives and environmental monitoring. AIoT can monitor and analyze a variety of environmental aspects, including biodiversity, air and water quality, climate conditions, and climate conditions, by implementing networked sensors and AI algorithms. This data-driven approach accelerates prompt actions and effective pollution control techniques while enabling real-time monitoring and early environmental threat detection. Moreover, by monitoring energy, water, and waste production, AIoT can improve resource management and enable more effective use and conservation. Through utilizing AIoT in sustainability and environmental monitoring programs, we may make well-informed choices, carry out focused interventions, and strive towards a future that is more ecologically balanced and sustainable.

Industry Examples of AIoT

London City Airport

London City Airport is the first airport to use AI, IoT, and cross-technology networking. It keeps an eye on every part of the airport and provides travelers with up-to-date flight status information. Through IoT devices, the cabin crew can keep an eye on vital tasks such as baggage monitoring, gate information updates, passenger location, and activity during the boarding queue. The airport's robust IoT digital engine model with Web Sockets, Application Program Interfaces (APIs (Application Programming Interface)), Constrained Application Protocol (CoAP), and Industrial IoT(IIoT) protocols. IoT dashboards and business intelligence (BI) solutions effectively accelerate business delivery.

Source: https://www.intuz.com/blog/use-cases-and-advantages-of-aiot

London City Airport

Boston Dynamic Spot

The industrial sector is renowned for its adoption of innovative technologies to optimize processes. Robotics is one of the newest Industry 4.0 initiatives. More specifically, robots are now able to adjust to the modern needs of factories and provide more sensible ways to improve overall productivity. Hence, as the AIoT has grown, robots have become more intelligent and sensitive to various activities. The American engineering and robotics design company Boston Dynamics has Introduced several robotic devices, including The Spot. It is a swift, mobile robot with unparalleled agility that can automate inspection operations and securely gather data while navigating various terrains. It provides an excellent means of carrying out tasks in factories with greater consistency and efficiency.

Source: https://www.intuz.com/blog/use-cases-and-advantages-of-aiot

Walmart

As the world's largest retail company, Walmart leverages AI, machine learning, and IoT. For every county or state, Walmart employs it to oversee over 11,000 physical stores and an equal number of internet retailers. The integration of facial recognition technology, voice-activated Google Assistant search, and cross-technology solutions have all contributed to the retail sector's increased revenue growth and increased consumer value.

Source: https://www.intuz.com/blog/use-cases-and-advantages-of-aiot

Self-Driven Cars by Tesla

Tesla's autopilot systems use GPS, sonars, radars, and cameras to collect data about driving conditions. Next, an AI system makes decisions about the data the IoT devices are converging. With the power of AI, Tesla's self-driving cars predict pedestrians' and cars' behaviour in various circumstances, e.g. they can determine road conditions, optimal speed, weather, avoid obstructions, and get smarter with each trip.

Source: https://www.intuz.com/blog/use-cases-and-advantages-of-aiot

ET City Brain

Alibaba Cloud's ET City Brain solution is an intelligent Artificial Intelligence (AI) system that uses deep neural networks and big data processing to analyze massive logs, videos, and data streams from devices and sensors located across an urban center. In addition to many other things, this system may identify improper parking, traffic accidents, and alter traffic signals to allow ambulances to arrive at patients more quickly.

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Conclusion

The integration of AIoT is transforming our way of working and living. AIoT is improving people's quality of life everywhere and has the power to drastically change a variety of industries, including mining, oil and gas, logistics, industrial automation, healthcare, and renewable energy. Wearables and smart homes are just two examples of the many uses for AIoT, which boosts customer satisfaction and streamlines processes. Key players across the globe are beginning to recognize the AIoT for its potential to cut costs while increasing productivity and efficiency. The application or use of IoT has grown more secure because of developments in AI/ML algorithms and cybersecurity measures, and AIoT growth prospects have also improved.

In the near future, for instance, we may witness the application of AIoT in edge computing technology for self-driving cars and robots, in Natural Language Processing (NLP) and voice authentication for online payments, and finally, in edge video analytics and super 8K resolution for vision AI.

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