Applying AI in Industries

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Initiatives: Artificial Intelligence

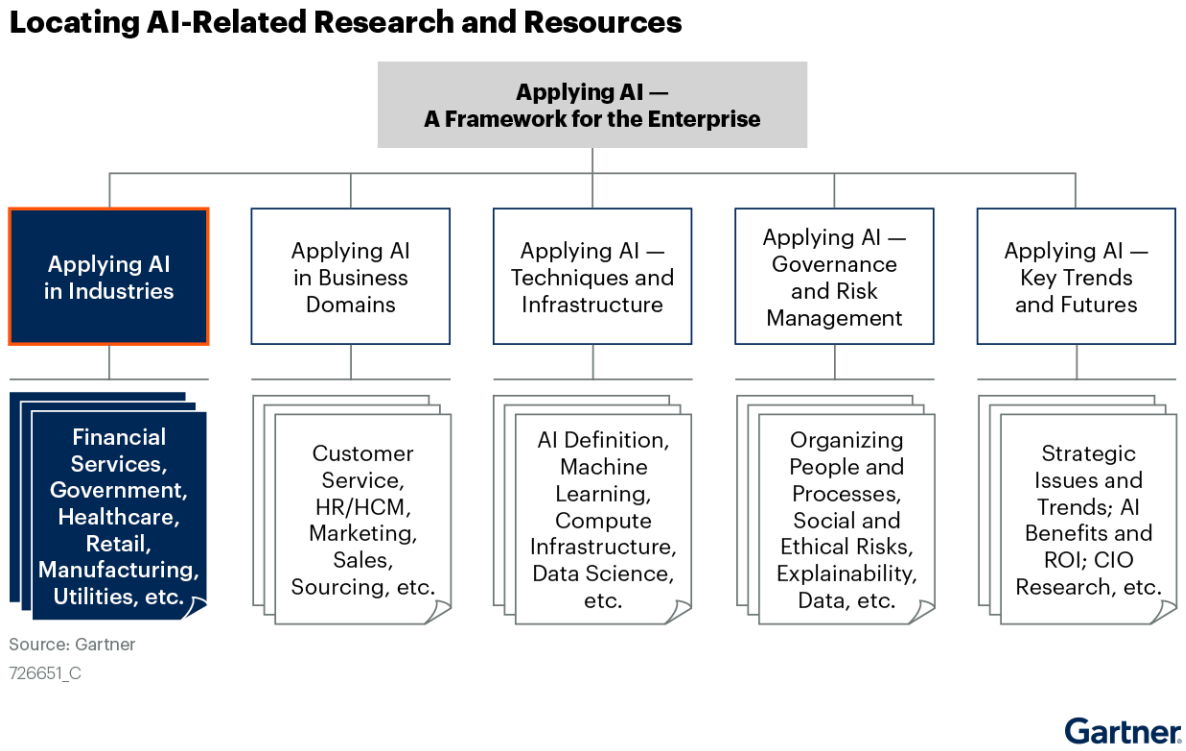
AI is applied in vertical areas to address industry-specific problems. In some cases, these are for competitive differentiation; in others, the methods are common to a sector. This report provides an overview of Gartner's AI research and coverage as related to industry sectors and industry themes.

Analysis

Artificial intelligence (AI) is a part of over 50 separate research areas within Gartner. To make research and resources easier to locate, Gartner divides this broad topic into the research areas below. The top-level document is called Applying AI — A Framework for the Enterprise.

This report focuses on AI in industry verticals.

Figure 1: Locating AI-Related Research and Resources



The links below take you directly to the documents outlined in Figure 1.

- **Applying AI in Industries** (this document) describes where and how AI is applied in industries such as financial services, healthcare, retail, manufacturing and government.
- Applying AI in Business Domains describes where and how AI is applied within business domains and enterprise departments such as customer service, HR, marketing and sales.
- Applying AI — Techniques and Infrastructure includes the fundamental techniques and practices that comprise AI and AI engineering.
- Applying AI — Governance and Risk Management includes strategies and methods related to transparency, interpretability, ethics, privacy and security issues. It also addresses personnel and skills development, staffing, developing AI centers of excellence and defining the ROI for AI projects.
- Applying AI — Key Trends and Futures focuses on the key trends and the future of AI, both in terms of strategic emerging technologies and key skills and governance options. It includes a focus on CIO and CTO executive priorities.

In the following sections, we provide an overview of Gartner's written and analyst resources as related to the application of AI in industries:

Industry Sectors	Industry Themes
■ Automotive and Transportation ■ Banking and Investment Services ■ Consultancies and System Integrators ■ Defense and Law Enforcement ■ Education ■ Healthcare and Life Science ■ Insurance ■ Manufacturing ■ Media ■ Retail ■ Semiconductors ■ Technology Providers ■ Telecom ■ Utilities	■ Consumer Products With AI ■ Regional AI Perspectives ■ Smart Cities and Smart Spaces

Research Highlights

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Industry Sectors

Automotive and Transportation

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The car and commercial vehicle of the future will be nothing but a huge, moving, cloud-connected computer. Vehicles will become automated and will integrate with optimized logistics chains, including vehicle-specific maintenance, dispatch and operations. AI is now being used across the whole value chain of mobility, from vehicle development to fleet servicing, enabling improvements in safety, cost and quality.

Analyst resources: Michael Ramsey, Jonathan Davenport, Pedro Pacheco, Masatsune Yamaji, Bart De Muynck, Carly West, Marc Halpern, Ivar Berntz, Venecia Liu

Research resources:

- Infographic: Artificial Intelligence Use Case Prism for Automotive Enterprises
- Infographic: AI Use-Case Prism for Transportation
- AI Multisensory Tech in Automotive HMIs
- How 'Total Experience' Can Be Applied to Improve the Connected Car
- Hype Cycle for Connected, Electric and Autonomous Vehicles, 2021
- Hype Cycle for Transportation and Smart Mobility, 2021
- Top 2021 Automotive Market Trends for CIOs

Banking and Investment Services

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In this industry, AI applications are moving from product creation, asset trading and process automation to transforming financial services. AI-based tools are predominant in retail banking, corporate banking, wealth management, asset management and capital markets. Leaders now have dedicated data science and machine learning (ML) teams.

Analyst resources: Moutusi Sau, Jason Malo, Jeff Casey (general), Ali Merji (wealth management), Vittorio D'Orazio, Alistair Newton

Research resources:

- Artificial Intelligence Heat Map for Banking and Investment Services
- Infographic: Artificial Intelligence Use Case Prism for the Banking Industry
- Quick Answer: Could Adopting Explainable AI in Lending Lead to Increased Financial Inclusion?
- Human Controls for AI Dangers (SignatureValue Bank)

- Toolkit: Strategic Technology Maps for AI Use Cases in Banking and Securities for Product Planning
- Emerging Technologies and Trends Impact Radar: Artificial Intelligence in Banking and Investment Services
- Financial Services CIOs Must Focus AI Investments on 'Responsible AI' in 2021
- Financial Services CIOs: Artificial Intelligence Could Be Your Next Misselling Scandal

Consultancies and System Integrators

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Consulting and system integration (C&SI) services refer to the strategy, design and implementation, and managed services offered by certain types of agencies to enterprises. Services include end-to-end project responsibility, or targeted assistance on specific parts of projects. Common targeted areas include building and training algorithms and models, curating data, operationalizing AI initiatives, assessing and mitigating risks, and augmenting enterprise AI skill requirements.

Analyst resources: Shubhangi Vashisth, Neil Barton, Stephanie Stoudt-Hansen, Joachim Herschmann, Sid Nag, Frances Karamouzis, Afraz Jaffri

Research resources:

- Market Insight: 3 Ways AI is Transforming Consulting and System Integration Services
- Infographic: Artificial Intelligence Use Case Prism for Software Development and Testing
- Tech Providers 2025: Next Great Frontier in IT Services — The Nexus of Cloud, Edge, 5G, AI, IoT, and Data and Analytics
- Tool: Vendor Identification for AI and Data and Analytics Service Providers
- Emerging Technologies: Critical Insights Into AI-Augmented Software Development

Defense and Law Enforcement

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Many Defense and Law Enforcement organizations have identified artificial intelligence as a top priority. Drones, autonomous vehicles and surveillance systems are already having a direct impact on defense, law enforcement as well as public and personnel safety. Organizations increasingly also use technology to collect data from people and things to improve situational awareness for commanders, supervisors and deployed personnel as they face increasingly dynamic events. Analysis of that data, using AI and related techniques such as graph, geospatial analytics and computer vision, creates accurate and actionable information for the right people at the right time.

Analyst resources: Farhan Choudhary, Bill Finnerty, Michael Brown

Research resources:

- Infographic: AI Use Case Prism for Defense and Intelligence
- Successfully Implementing AI in Department of Defense and Military Supply Chains
- Get Started With AI in Aerospace and Defense Government Supply Chains
- Postpandemic Scenarios: The Future of Public Safety and Law Enforcement
- Top Trends in Public Safety and Law Enforcement for 2021

Education

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AI is making significant inroads into education, as institutions implementing some form of AI are experiencing measurable results in areas such as student retention, recruiting and faculty productivity. Because AI in education is still in a nascent phase, institutions need to distinguish between true artificial intelligence examples and those that are more about robotic process automation (RPA), or just hype.

Analyst resources: Jan-Martin Lowendahl, Kelly Calhoun Williams, Peter Krensky

Research resources:

- 5 Best Practices for Artificial Intelligence in Higher Education
- Hype Cycle for K-12 Education, 2021
- Hype Cycle for Higher Education, 2021

- Top Technology Trends Impacting Higher Education in 2021
- Top 5 Trends Impacting K-12 Education in 2021
- Tool: Data Science and Machine Learning Education — Navigating the University and MOOC Landscape

Healthcare and Life Science

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Today, many — especially large — healthcare organizations are making practical decisions about what AI use cases to prioritize and how to acquire or build AI solutions. Do they buy "off the shelf" appliances, use platforms and precanned solutions, create with cloud AI development services, or program from the ground up natively? Myriad AI applications can be found in epidemiology, diagnostic imaging, pharmaceutical R&D, process optimization and many other areas of healthcare. Adopted AI capabilities include natural language processing (NLP), process augmentation, decision augmentation, computer vision and AI-driven robots. HDOs commonly use cloud platforms along with an interesting mix of edge, hybrid and on-premises hosting. Governance of AI is still inadequate, making it the root cause of many obstacles.

Analyst resources: Jeff Cribbs, Sharon Hakkennes, Pooja Singh, Sachin Dev, Nick Ingelbrecht, Animesh Gandhi, Jeff Smith, Michael Shanler

Research resources:

- Infographic: Artificial Intelligence Use Case Prism for the Healthcare Provider Industry
- Infographic: Artificial Intelligence Use-Case Prism for Life Science Manufacturers
- Healthcare Provider CIOs: Get Ahead of AI Innovation With Strong AI Governance
- Life Science CIOs, Accelerate Early-Stage Discovery Research With New Applications of Artificial Intelligence
- How to Use AI to Fight COVID-19 and Beyond
- Innovation Insight for Natural Language Processing for Healthcare Provider CIOs
- Innovation Insight for AI-Enabled Diagnostic Imaging Interpretation for Healthcare Provider CIOs

- Infographic: Artificial Intelligence Use Case Prism for the U.S. Healthcare Payer Industry

Insurance

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Innovative property, casualty and life insurers have adopted AI and ML for a variety of use cases, from customer-facing activities to back-office transaction processing. To date, the top use cases are customer service and claims, but many are emerging such as underwriting and distribution. Insurers are seeking to use a range of AI technologies, including chatbots for customer engagement, ML for fraud detection, NLP for next best action, and image analysis for claims estimation of loss. According to the 2021 Gartner CIO Survey, AI is viewed as the top game-changing technology for this industry and holds the promise to support the entire value chain and enable business transformation.

Analyst resources: Kimberly Harris-Ferrante, Richard Natale

Research resources:

- Infographic: Artificial Intelligence Use Case Prism for the P&C and Life Insurance Industry
- Tool: Artificial Intelligence Use Cases for Insurance
- Innovation Insight for Artificial Intelligence in Life and P&C Insurance
- Digital Insurance Success Requires Leveraging Data, Analytics and Artificial Intelligence
- Financial Services CIOs Must Focus AI Investments on 'Responsible AI' in 2021
- Financial Services CIOs: Artificial Intelligence Could Be Your Next Misselling Scandal
- Why Digital Life Insurance Success Demands Autonomous Underwriting

Manufacturing

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AI offers substantial potential for manufacturing companies, both in operations and business process optimization. Industry 4.0, factory of the future and smart manufacturing strategies point toward a self-adaptive and automatically reconfigurable production capability. In operations, a confluence of physical and virtual automation raises quality, reduces waste, accelerates continuous improvement and improves factory service levels. AI plays a vital role in all of these areas and others through smart robotics, computer vision for quality, ML for predictive maintenance, social listening for ideation, optimization algorithms for supply chain management and production execution.

Analyst resources: Ellen Eichhorn, Simon Jacobson, Michelle Duerst, Bettina Tratz-Ryan

Research resources:

- Manufacturing AI Use Cases: Thought-Starter
- Toolkit: Communicate What AI Means in Manufacturing
- 2021 Top Trends in Manufacturing Industries
- Hype Cycle for Manufacturing Operations Strategy, 2021
- Emerging Technologies: Top Edge AI Use Cases for Asset and Operational Intelligence
- Top 5 Strategic Business Trends in Manufacturing Industries for 2021
- Top 5 Strategic Technology Trends in Manufacturing Industries for 2021

Media

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AI is increasingly used in the media industry, in a variety of use cases. These include the personalization of content recommendations and advertising, and even automatic content moderation and production — authentic or fake. To fight the latter, AI is also used for automated fact checking and content fingerprinting.

Analyst resources: Magnus Revang, Colin Reid, Mike McGuire, Brian Burke, Nicole Greene, Andrew Frank, Anthony Mullen, Jessica Ekholm

Research resources:

- Infographic: Artificial Intelligence Use Case Prism for the Media Industry
- Hype Cycle for Digital Advertising, 2021
- Innovation Insight for Generative AI
- How to Benefit From Creative AI — Assisted and Generative Content Creation

Retail

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AI is seen as a game-changing technology for the retail industry, and retailers should view it as the primary interpreter to assist in connecting their data to business results in a fast-moving digital business world. Their already voluminous data hoards are becoming more and more complex and unmanageable as retailers begin to feel the additional impact of IoT-generated data and other streaming data sources. AI can be used to deliver both cost and revenue optimization, at the right time, based on the goal of enhancing both employee and customer experiences.

On the enterprise side, AI is used, for example, to improve demand forecasting for more targeted planning, and to optimize the cost of goods — the largest cost category for a retailer. The cost of goods includes the costs of selection, assortment, pricing, promotion, inventory levels, and the distribution and delivery of products and services offered. In addition, AI can be deployed in product development, pricing scenarios, assortment planning, product selection, customer segmentation and generation of real-time offers.

Analyst resources: Robert Hetu, Akif Khan, Jonathan Care, Kelsie Marian, Miriam Burt

Research resources:

- Infographic: Artificial Intelligence Use Case Prism for Retail
- What Retail CIOs Need to Know About AI for Merchandising
- Preparing for the AI-Based Retail Nervous System
- How to Select a Machine Learning Vendor for Fraud Detection in Online Retail
- Market Guide for Smart Robots in Retail
- Hype Cycle for Retail Technologies, 2021

- Top 5 Technology Trends in Retail Merchandising for the 2020s

Semiconductors

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Semiconductor manufacturing and design constitute a complex process that generates vast amounts of data from each step in the process. With such complexity, the data processing required to drive analytic insights from this data is very sophisticated. Chip companies are now seeking to leverage AI-based tools to parse through this complex data to identify patterns and provide insights to help save cost, optimize processes for new and existing products, reduce time to market, and improve yields. For applications such as automotive, medical devices, aerospace and consumer electronics that rely on complex microelectronics, implementing these tools can improve the long-term reliability and performance of products.

Analyst resources: Gaurav Gupta

Research resources:

- Infographic: AI Use Case Prism for Chip Manufacturing and Design
- Market Trends: Top 5 Use Cases for Artificial Intelligence in Semiconductor Industry
- Market Trends: Digital Revenue Opportunity Through AI-Based Analytics for Semiconductor Firms
- Market Trends: Acquisitions of AI Analytics Firms in Semiconductors Raises Stakes for Big Data
- Market Trends: Conquer Hurdles in Deploying AI for Semiconductor Manufacturing

Technology Providers

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AI offers one of the biggest gold rushes in recent years, with nearly every startup looking to stake its claim. Emerging and startup technology providers face distinct challenges in how to best leverage AI capabilities in software and service offerings, given the hype and confusion in the market. Established tech providers are trying to figure out how to participate in the action. In the next few years, almost every technology provider will introduce AI into its core product strategy. Every software application (and business process) is likely to become more intelligent as more providers embed AI capabilities into their solutions.

Analyst resources: Jim Hare, Eric Hunter, Roberta Cozza, Craig Roth, Bart Willemsen, Sid Nag, Alys Woodward, Eric Goodness, Annette Jump, Alan Priestly, Kevin Quinn, Arup Roy

Research resources:

- Infographic: Artificial Intelligence Use Case Prism for Software Development and Testing
- Tech Providers 2025: Next Great Frontier in IT Services — The Nexus of Cloud, Edge, 5G, AI, IoT, and Data and Analytics
- Tech CEOs Need to Exploit Disruption by Offering AI Solutions
- Video: Work Everyday AI Into Offerings to Stay Competitive
- How Tech CEOs Can Differentiate Wearable Solutions With Artificial Intelligence

Telecom

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AI promises to be one of the most disruptive and innovative classes of technologies for the next 10 years and has been identified as top game-changer technology by communications service provider (CSP) CIOs. Major CSPs in developed markets have — to some extent — been leveraging advanced analytics, artificial intelligence and automation (AAA)-related technologies for some years now. Key AI use cases can be found in sales and marketing, network management and operations, and customer experience. Moreover, AI offers opportunities for CSPs to provide AI services to their own enterprise clients, such as ready-to-monetize edge AI applications for computer vision or digital twins, bundled with 5G private mobile networks. This provides CSPs with a potential differentiation with respect to newer competitors within the telecom segment, such as hyperscalers, but few have shown sufficient momentum so far in moving past the connectivity layer.

Analyst resources: Sylvain Fabre, Peter Liu, Amresh Nandan, Susan Welsh de Grimaldo

Research resources:

- Infographic: AI Use-Case Prism for Telecommunications CSP Networks
- Market Insight: Unleash the Potential of AI in Telecom 5G Era
- Market Trend: Expand CSPs' Monetization With 5G, AI, Edge Compute
- Emerging Technologies: Top Edge AI Use Cases for Asset and Operational Intelligence

Utilities

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Faced with the challenges of decarbonization, decentralization, digitalization and democratization, utilities are required to reconnoiter a decade of deep redesign wherein they must adapt the design of business and operating models and significantly advance operations capabilities. This will be accomplished through a combination of digital and physical augmentation and automation. AI plays a vital role in this as it is developed for and integrated with situational awareness and analysis systems, smart robotics and software-defined capabilities applied to asset management, network operations and optimization. AI will also play a critical part in utility field service, customer service and most other business operations. AI will be increasingly sought across the entire utility value chain — supply, transmission, distribution, retail and end use — and across all utility commodities, including electricity, natural gas, water, steam and district thermal.

Analyst resources: Ethan Cohen, Zarko Sumic, Lloyd Jones, Nicole Foust, Sruthi Nair, Pieter den Hamer

Research resources:

- Infographic: Artificial Intelligence Use-Case Prism for Utilities
- AI Operationalization in Energy and Utilities
- How Utility CIOs Can Use Advanced Analytics and AI to Improve Load, Price and Weather Forecasting

- Emerging Technologies: Top Edge AI Use Cases for Asset and Operational Intelligence
- Hype Cycle for Digital Grid Transformation Technologies, 2021

Industry Themes

Consumer Products With AI

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AI in consumer products will reduce friction and create efficiencies, especially in mundane tasks for users and buyers. Today, AI is most visible in consumers' lives in the form of virtual personal assistants (VPAs) on smartphones (e.g., Siri, Cortana, Google Assistant, Baidu) and VPA speakers in the home (Amazon Echo, Google Home). VPAs are now rapidly being introduced into mobile settings (automotive platform integration) and new device categories (Amazon Echo Input, Echo Auto).

AI is being used to visualize products inside the home and on consumers themselves (for example, Warby Parker's Virtual Try-On of its range of glasses, Madison Reed's virtual hair color assistant, and L'Oréal's color concierge services). Another use is with an edge computing device, such as Nima (gluten/peanut allergen tester), LG washer dryers (sensing the right settings and the amount of detergent) and at-home exercise equipment like Peloton, NordicTrack and Mirror. Gamification can also play a role, such as Colgate-Palmolive's Magik smart toothbrush, which teaches kids how to brush their teeth through an interactive game (toothbrush connected to the app).

Analyst resources: Michelle Duerst, Ellen Eichhorn, Roberta Cozza, Annette Zimmerman, Roger Sheng

Research resources:

- Consumer Goods: Increase Product Innovation and Revenue with Edge AI
- Market Trends: Top 5 Technologies Driving the Evolution of Consumer Devices, 2020
- How to Differentiate Wearable Solutions With Artificial Intelligence
- Emerging Technologies: Edge AI Adoption Patterns Deliver Business Value
- Emerging Technologies: Edge AI for User Personalization and Behavioral and Operational Intelligence

- Consumer Goods Trend: Digital + Product

Regional AI Perspectives

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The EU has issued guidance on how it plans to regulate artificial intelligence. Regulation will have complex effects both in the EU and globally. CIOs should address the requirements such regulations will have on their AI strategies. The European Data Protection Supervisor (EDPS) has also called for specific attention regarding face recognition technology. [1]

Ethical and human rights concerns have also been addressed by the Office of the Privacy Commissioner of Canada, [2] as well as by the HRC in Australia. [3] Several jurisdictions are investing in AI and simultaneously attempting to enhance transparency, fairness, privacy protection and explainability through frameworks and regulations or codes of conduct.

In China, booming AI investment in a rapidly evolving ecosystem will drive local innovations and expand use-case scenarios. Alibaba, AWS, Baidu, Microsoft and Tencent compete in cloud-based AI services with a full range of offerings — from AI applications to ML services.

Analyst resources: Bart Willemsen, Frank Buytendijk, Arnold Gao, Arun Chandrasekaran, Tracy Tsai

Research resources:

- How Forthcoming EU Legal Framework Will Affect Your AI Initiatives
- Infographic: Artificial Intelligence Use Case Prism for Privacy
- What Non-Technology Executives Should Do in Support of Responsible AI Initiatives
- Artificial Intelligence in China: Landscape Analysis of Key AI Technologies
- Competitive Landscape: Top Cloud-Based AI Services in China

Smart Cities and Smart Spaces

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AI is increasingly applied in a great variety of smart city and urban ecosystem scenarios. Examples include the use of AI in dynamic traffic management, air quality management, crowd management, social welfare, green space management, waste management, smart public lighting and smart dynamic parking.

Smart spaces include smart homes, (office) buildings, venues and factories. In the next few years, smart space technology will evolve rapidly from the fusion of smart edge devices, the IoT and AI.

Analyst resources: Bettina Tratz-Ryan, Bill Finnerty, Ben Kaner, Roberta Cozza, Bart Willemsen, Annette Jump, Eric Goodness

Research resources:

- Infographic: Artificial Intelligence Use-Case Prism for Smart Cities
- Establish an Urban Data Exchange for Smart Cities
- Hype Cycle for Smart City Technologies and Solutions, 2021
- Hype Cycle for Smart City and Sustainability in China, 2021
- Emerging Technology Analysis: Smart Spaces
- Use Sensors and Multimodal Interactions to Differentiate UX in Connected Home Solutions

Evidence

[1] Artificial Intelligence Act: A Welcomed Initiative, But Ban on Remote Biometric Identification in Public Space Is Necessary, European Data Protection Supervisor, European Union.

[2] Draft Privacy Guidance on Facial Recognition for Police Agencies, Office of the Privacy Commissioner of Canada.

[3] Human Rights and Technology Final Report, 2021, Australian Human Rights Commission.

Industry Sectors	Industry Themes
Automotive and Transportation	Consumer Products With AI
Banking and Investment Services	Regional AI Perspectives
Consultancies and System Integrators	Smart Cities and Smart Spaces
Defense and Law Enforcement	
Education	
Healthcare and Life Science	
Insurance	
Manufacturing	
Media	
Retail	
Semiconductors	
Technology Providers	
Telecom	
Utilities	