AI IN SMART CITY APPLICATIONS

Abstract

Artificial intelligence is expected to significantly support sustainable development of future smart cities. Conventional cities have been transformed into highly advanced smart cities thanks to the different emerging sectors of artificial intelligence. The development of smart cities is only motivated by the goal of raising living standards by integrating technology into everyday activities of people. The absence of digitalization has caused several challenges for the citizens, which are highlighted in this article along with certain key technology and remedies. It addresses problems with the city's infrastructure, public security, and safety, and offers the best remedies. It places a strong emphasis on using AI in conjunction with other technologies, such as the Internet of Things (IoT), deep learning, machine learning, pattern recognition, big data analytics, and cloud infrastructures, to create a fully functional smart city. In order to increase the inventive value and quantified efficiency of smart grids, electric vehicles, and smart buildings, artificial intelligence can be used to support them.AI is used in daily life in household objects,auto driving vechicles,traffic signals,social media,e commerse websites,voice assistant etc.. .

Introduction

Smart cities are designed to improve the quality of life for citizens by integrating technology and data to optimize city infrastructure and services. Artificial Intelligence (AI) plays a vital role in creating and managing smart cities. AI provides solutions to manage and optimize resources, transportation, energy, public safety, and environmental issues. While most smart city initiatives and technologies have focused on gathering data and learning more about the complexity and dynamics of a city AI moves cities one step further by allowing them to use the data and information to aid in decision-making. Urban AI is defined as "Artifacts operating in cities which are capable of acquiring and making sense of information on the nearby urban environment ultimately using the acquired knowledge to act rationally according to pre-defined goals, in complex urban situations where some information may be missing or incomplete". By 2025 it is anticipated that over 30% of smartcity applications including urban mobility solutions will be enabled by AI. This will considerably improve urban life's resilience, sustainability, social welfare, and vitality.

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Artificial Intelligence for smart cities

AI applications, among other things, can enhance and innovate urban services, water and energy infrastructures, and communities capacity for empowerment and resiliency. When it comes to implementing those applications, local governments, residents, and other smart city stakeholders encounter a number of difficulties.

Artificial intelligence can be used in smart cities to analyze and track how businesses and residents use energy, which generates data that in turn helps with decisions on where renewable sources of energy should be used. This can also show city planners where energy is being wasted and how it can be saved. AI applications, among other things, can enhance and innovate urban services, water and energy infrastructures, and communities' capacity for empowerment and resiliency. When itcomes to implementing those applications, local governments, residents, and other smart city stakeholders encounter a number of difficulties.

AI Applications in Smart Cities:

Smart cities are cities that leverage technology to improve the quality of life of their citizens. AI plays a critical role in smart city applications by enabling advanced analytics and decision-making processes. AI applications in smart cities include the following:

Smart Mobility: AI is used to optimize transportation systems, reduce traffic congestion, and improve the efficiency of public transportation systems. AI-based traffic management systems can analyze real-time data from sensors and cameras to optimize traffic flow and reduce travel times.

Energy Management: AI can optimize energy usage in buildings and reduce energy consumption. AI-based algorithms can analyze energy usage patterns and identify opportunities for energy savings.

Waste Management: AI can optimize waste collection and disposal by analyzing data from sensors and cameras. AI-based algorithms can predict when waste bins will be full and schedule collection accordingly.

Public Safety: AI can enhance public safety by analyzing data from cameras and sensors to detect potential security threats. AI-based systems can also be used to detect and respond to emergencies in real-time.

Healthcare: AI can improve healthcare delivery by analyzing patient data and providing personalized care. AI-based systems can also be used to monitor patients remotely and provide early intervention in case of medical emergencies.

Challenges:

The development and deployment of AI in smart city applications face several challenges including:

Data Privacy and Security: AI systems require access to large amounts of data to function properly. However, this data must be protected from unauthorized access and misuse.

Interoperability: Smart city applications rely on a diverse set of systems and technologies, and ensuring interoperability between these systems can be challenging.

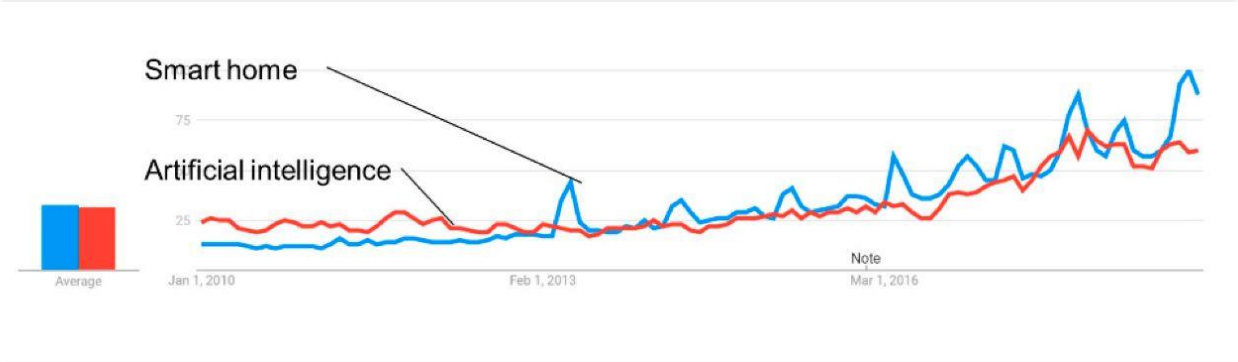
Cost: The development and deployment of AI-based smart city applications can be costly, which can limit the adoption of these systems in some cities.

Transportation: AI can be used to optimize traffic flow, reduce congestion, and improve road safety. AI-based systems can control traffic lights and manage traffic flow through the city. Additionally, AI-powered autonomous vehicles can improve traffic flow and reduce accidents.

Data Management: The collection and management of large amounts of data from different sources is a significant challenge for AI-based smart cities.

Citizen Acceptance: The success of AI-powered smart cities depends on the acceptance and participation of citizens.

AI has the potential to transform the way cities operate and provide more efficient and sustainable urban environments. Smart city applications powered by AI can enhance mobility, energy management, waste management, public safety, and healthcare delivery. However, the development and deployment of these systems face several challenges, including data privacy and security, interoperability, and cost. Addressing these challenges will be critical to realizing the full potential of AI in smart city applications. AI has the potential to revolutionize smart cities by improving the efficiency of infrastructure, services, and quality of life for citizens. However, there are significant challenges that need to be addressed to ensure the success of AI-based smart cities.



There are a lot of smart home gadgets and solutions out there, but just for basic levels of involvement, including managing the home and setting environmental conditions. A few attempts were made, nonetheless, to create the most advanced kind of smart home. Figure, which displays interest over time based on Google Trends, demonstrates how quickly the artificial intelligence sector is expanding. It can be used in conjunction with smart home technologies to create cutting-edge equipment. Few studies, however, have taken into account the integration of books and products with AI and smart home technologies in addition to the space and room kinds in the home.Discussing smart homes from the perspective of architecture is also necessary. This study helped to establish the connections between this field's literature and products as well as the trends in smart home technology and merchandise. This evaluation was done with both architectural and human concern in mind.

Smart Homes use artificial intelligence (AI) and Internet of Things (IoT) technologies such as connected sensors, lighting, and meters to collect and analyze data. This data is used to optimize household infrastructure, utilities, and other services to make daily life easier and more efficient.

- AI for future proof infrastructure
- AI for innovative and smart services
- AI for resilient and empowered communities
- Artificial Intelligence for efficient urban mobility
- Private initiatives for smart urban mobility
- Public initiatives for smart urban mobility
- Deployment challenges for municipalities

Artificial intelligence can be used in smart cities to analyse and track how businesses and residents use energy, which generates data that in turn helps with decisions on where renewable sources of energy should be used. This can also show city planners where energy is being wasted and how it can be saved. The integration of AI in smart cities has multiple benefits for humans as well as the environment. From an eco-friendly environment to sustainable development, AI in smart cities comes with multiple types of advantages for everyone

AI applications help bring about a smarter city experience

Cities are getting smarter thanks to enormous growth in the AI-powered processing of the huge datasets generated by running and monitoring urban centers.
Technology Magazine takes a closer look at just three of the smart technologies that look set to transform city life and the businesses and governments that serve them.

AI IMPROVING TRANSPORT IN CITIES:

Technologists' vision and machine learning technology to transform urban transit infrastructure.
One company to have taken a lead in this area is Hayden AI, which developed the world's first autonomous traffic management platform. The company automates complex processes and improves public services.

The technology works to support a number of different public service vehicles including buses, street sweepers, airport security vehicles, and police vehicles.

Public transport has seen innovation with the use of AI in smart cities. This technology allows users of public transport to receive and access live updates, which improves timing and details of customer satisfaction. Automated buses are also planned to be used within cities, these can reduce emissions, improve routes, and increase frequency.
Using license plate recognition technology, car parks are able to detect cars that have stayed longer than they should, and can also enforce payments and tickets. Other technologies include the ability to recommend spaces depending on the car.

AI AND SAFETY IN SMART CITIES

Although security camera footage is typically reviewed when a crime has been reported, this doesn't prevent the crime itself. Security cameras that use AI have the ability to analyze footage in real-time and detect criminal behavior which can then be instantly reported and dealt with.

These cameras can also detect people by their clothes, allowing the technology to find suspects quicker than ever.
Smart cities can use AI to see their effect on the local environment, global warming, as well as pollution levels.

Using AI and machine learning for pollution control and energy consumption, allows authorities and cities to make well-informed decisions that are best for the environment. Smart cities also use AI to detect CO2, which can lead to transportation decisions.
Another innovation to look out for is the Real-Time Response Centre (RTRC) predicted to emerge in the smart cities of the future. The RTRC is fed data from a range of sources and displays the aggregated intelligence on large-screen video displays, along with live feeds from cameras, traffic sensors, and gunshot detectors.

Applications Of AI

The following seven dimensions can be used to categorise AI applications in smart cities:

• AI for governance e.g.: urban planning, tailored subsidy provision, disaster prevention and management.

• AI for living and liveability, safety, security and healthcare e.g.: smart policing, personalised healthcare, noise and nuisance management and improved cyber security.

• AI for education and citizen participation e.g.: locally accurate, validated and actionable knowledge supporting decision-making.

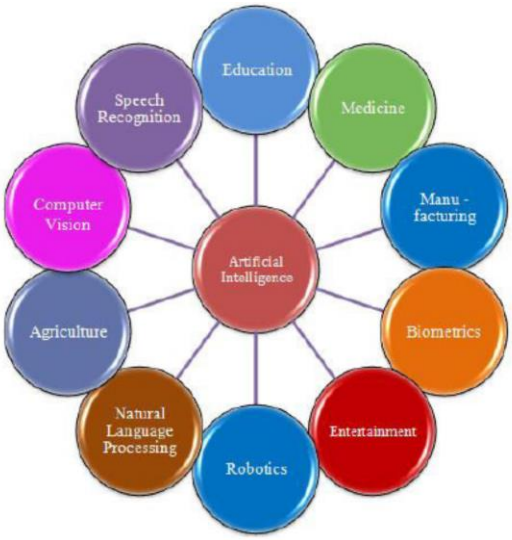
• AI for economy e.g.: resource(cost and time) efficiency and improved competitiveness through, sharing services, efficient supplychains and customer tailored solutions.

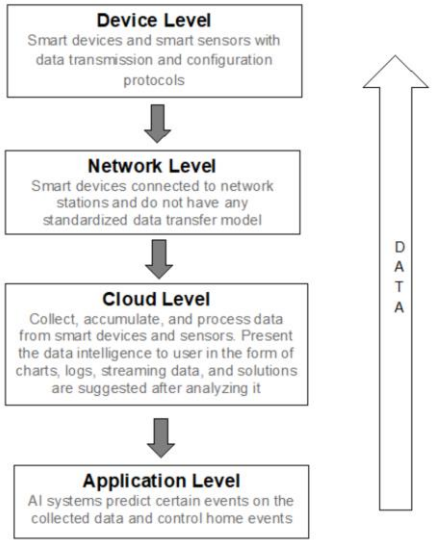
• AI for mobility and logisticse.g.: autonomous and sustainable mobility, smart routing and parking assistance, supply chain resiliency and traffic management.

• AI for infrastructure e.g.: optimised infrastructure deployment, use and maintenance, including waste and water management, transportation, energy grids, and urban lighting.

• AI for the environment e.g.: biodiversity preservation, urban farming and air quality management

Daily Life AI applications:





Voice Assistants,Image Recognition for face unlock in Cellphones,Social media,Virtual Reality,Chatbot, Self-driving Vehicles,Personalized Shopping.

Robot Vacuum Cleaners

AI is used to power technological advancements in robot vacuum cleaners. These gadgets can be set to finish their cleaning duties and follow predetermined courses through the house. The vacuum cleaners require little to no help, and some models can empty themselves.

Virtual Reality

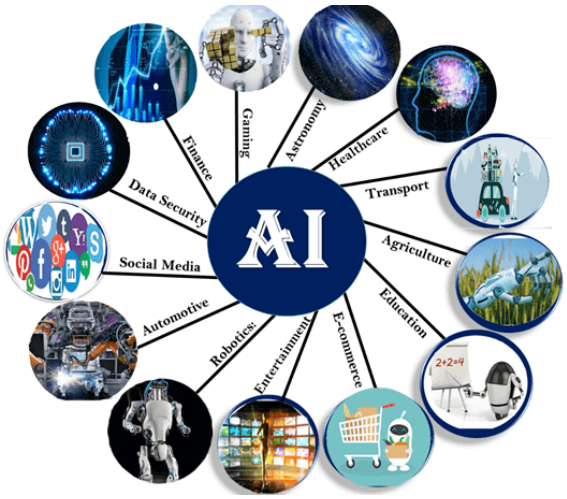
Virtual reality gaming, which is often played through a headset, is growing in popularity among families. This innovation simulates real-world or fantastical settings using AI algorithms. Virtual reality technology is employed in teaching as well as video games.

Traffic Signals

AI is used in traffic lights to detect the speed of vehicles and adjust the timing accordingly.It identifies patterns in the given data and reduces safety risks, and recurring accidents, and controls traffic light systems.

HealthCare

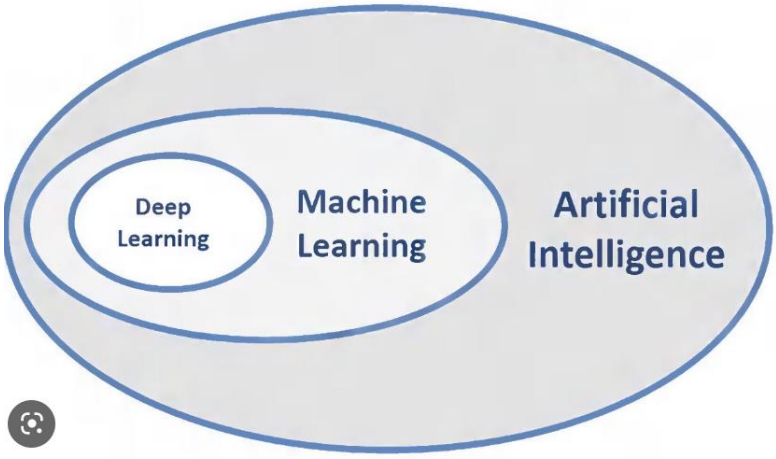
AI in healthcare can be used for a variety of applications, including claims processing, clinical documentation, revenue cycle management and medical records management.wireless integration with medical devices such as blood pressure cuffs to provide medical assistance to patients.



Best applications of Artificial Intelligence in the real world.

1. Google Maps and Navigation
2. Google Search and Search Engines
3. Online Ads Network and Social Media
4. Music and Media Streaming Services
5. Smart home Devices
6. Smart Cars and Drones

AI REVOLUTION FROM 1956 TO PRESENT LIFE



ARTIFICIAL INTELLIGENCE DEFINED:

FOUR TYPES OF APPROACHES

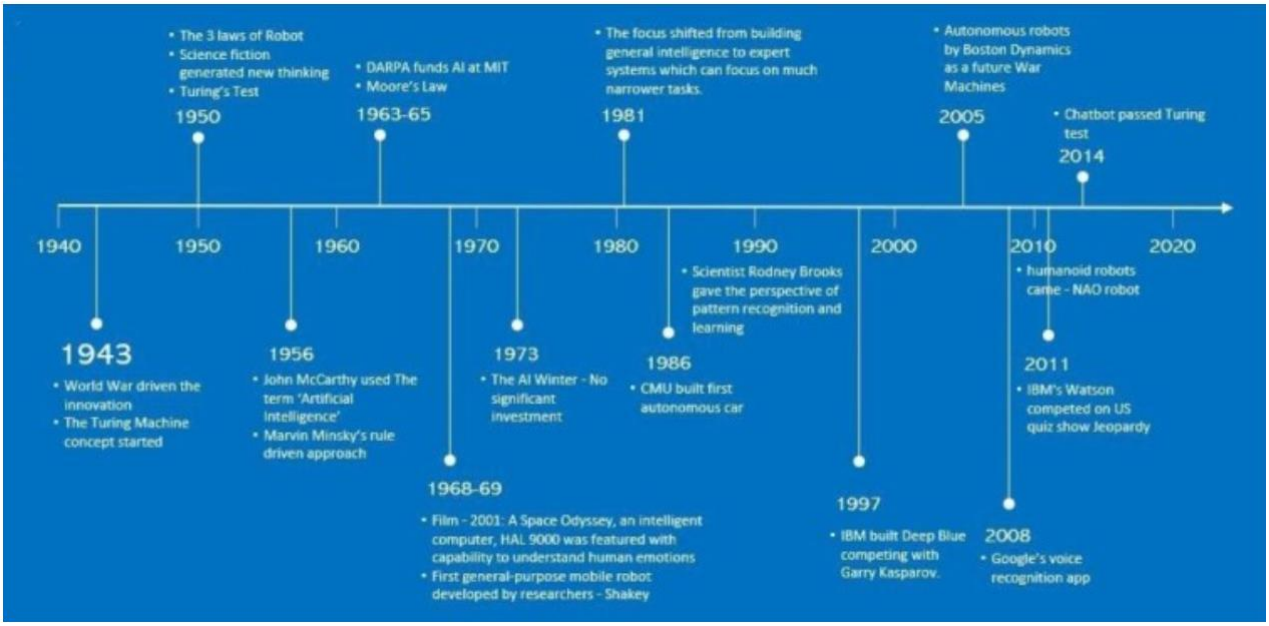
Thinking humanly: mimicking thought based on the human mind.

Thinking rationally: mimicking thought based on logical reasoning.

Acting humanly: acting in a manner that mimics human behavior.

Acting rationally: acting in a manner that is meant to achieve a particular goal.

TIME LINE :



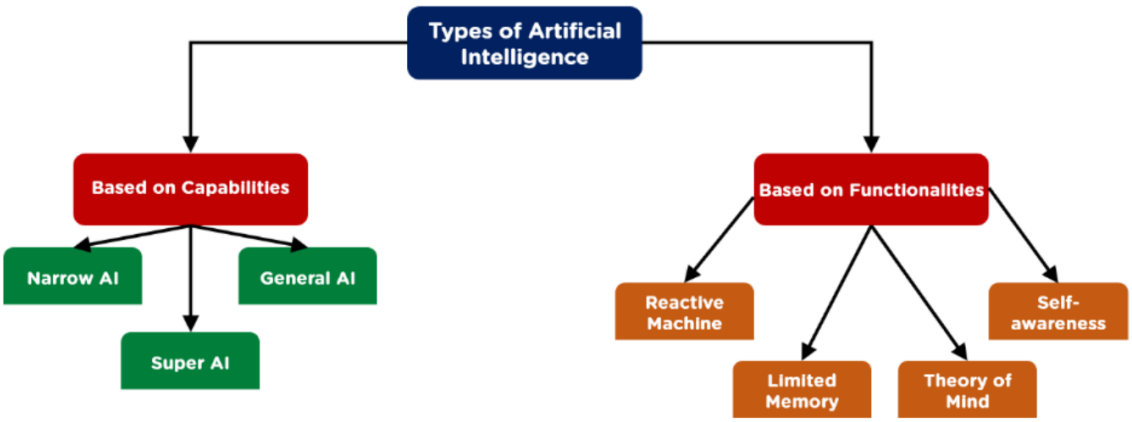
Types of Artificial Intelligence

Artificial Intelligence can be divided based on capabilities and functionalities.There are three types of Artificial Intelligence-based on capabilities -

- Narrow AI
- General AI
- Super AI

Under functionalities, we have four types of Artificial Intelligence -

- Reactive Machines
- Limited Theory
- Theory of Mind
- Self-awareness



Q&A

What is Artificial Intelligence?

Artificial Intelligence (AI) is machine-displayed intelligence that simulates human behavior or thinking and can be trained to solve specific problems. AI is a combination of Machine learning techniques and Deeo learning.Types of Artificial Intelliigence models are trained using vast volumes of data and have the ability to make intelligent decisions.

Why Is AI Used?

People take advantage of AI's strengths since there is more work that has to be done every day. Consequently it makes sense to automate routine tasks. This increases output while saving the organization's staff. Additionally by utilising artificial intelligence the corporation

may find qualified individuals for the development of the business.Businesses today also think that they want to automate all routine and everyday tasks. Additionally they think a straightforward application can automate such commonplace operations. because as data science develops automation is becoming more ubiquitous. Most often internet chat sites employ this AI. Undoubtedly when you visit the websites, you have seen the welcome message. After that the real conversation usually starts.

How Does AI Work and applications of AI

When you enter a dark room, the sensors in the room detect your presence and turn on the lights. This is an example of non-memory machines. Some of the more advanced AI programs are even able to predict your usage pattern and turn on appliances before you explicitly give instructions. Some AI programs are able to identify your voice and perform an action accordingly. If you say, “turn on the TV”, the sound sensors on the TV detect your voice and turn it on. With the Google dongle and a Google Home Mini, you can actually do this every day.

What are the Applications of Artificial Intelligence?

AI Application in E-Commerce

Applications Of Artificial Intelligence in Education

Applications of Artificial Intelligence in Lifestyle

Applications of Artificial Intelligence in Navigation

Applications of Artificial Intelligence in Robotics

Applications of Artificial Intelligence in Human Resource

Applications of Artificial Intelligence in Healthcare

Applications of Artificial Intelligence in Agriculture

Applications of Artificial Intelligence in Gaming

Applications of Artificial Intelligence in Automobiles

Applications of Artificial Intelligence in Social Media

Applications of Artificial Intelligence in Marketing

Applications of Artificial Intelligence in Chatbots

Applications of Artificial Intelligence in Finance

AI in Astronomy

AI in Data Security

AI in Travel and Transport

AI in Automotive Industry

Is ai useful or danger for people.?

AI ADVANTAGES	AI DISADVANTAGES
Reduction of human error	High costs
Zero risk	No creativity
24*7 Availability	Unemployment
Digital assistant	Make humans lazy
New inventions	No ethics
Unbiased decisions	No emotions
Perform repetitive jobs	No improvement in human
Daily applications	
AI in risky situations	

Advantages and Disadvantages of AI

Artificial intelligence has its pluses and minuses, much like any other concept or innovation. Here's a quick rundown of some pros and cons.

Pros

It reduces human error.

It never sleeps, so it's available 24x7.

It never gets bored, so it easily handles repetitive tasks.

It's fast

Cons

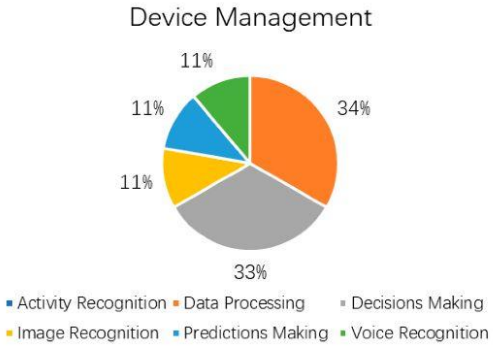
It's costly to implement.

It can't duplicate human creativity.

It will definitely replace some jobs, leading to unemployment.

People can become overly reliant on it.

PICTOGRAPHY:



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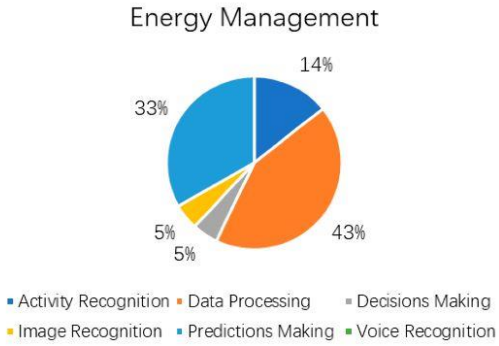

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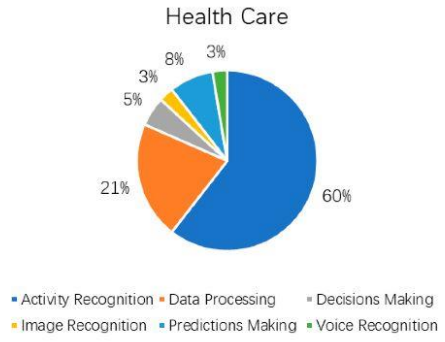

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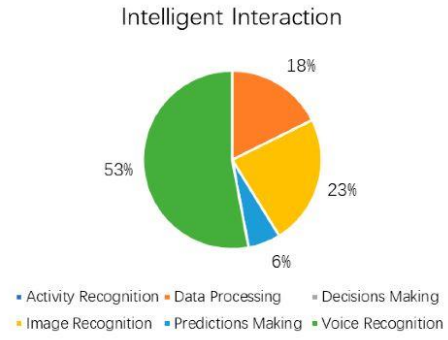

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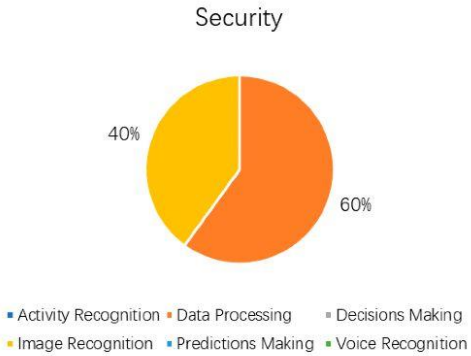

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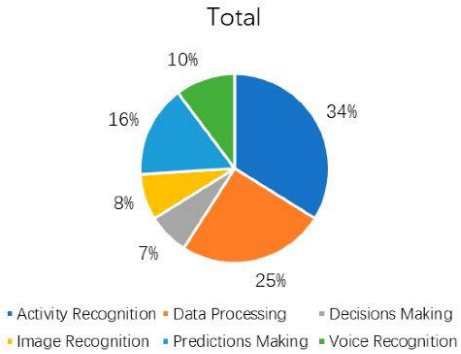

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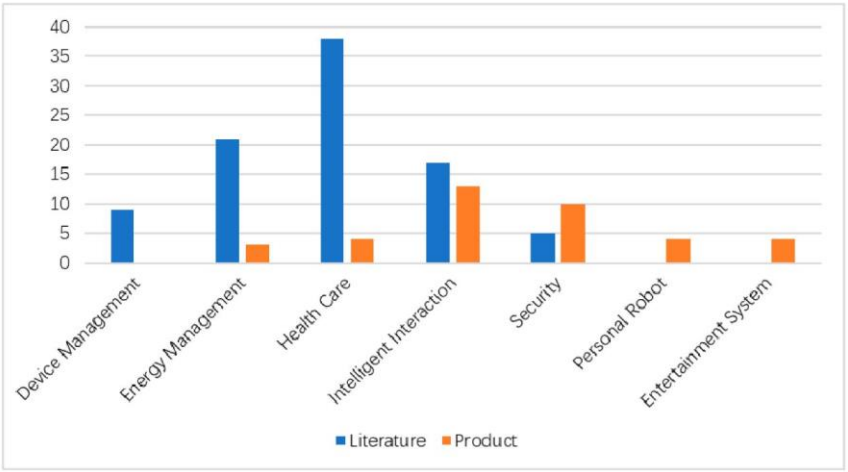
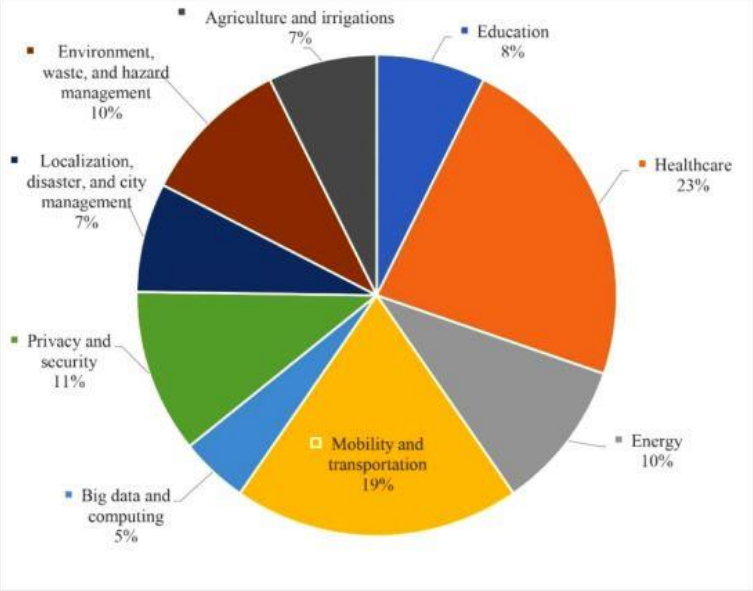


Top ranked smart cities of the world in 2021, (Source: Smart city index 2021 (Smart City Observatory Web, 2021).

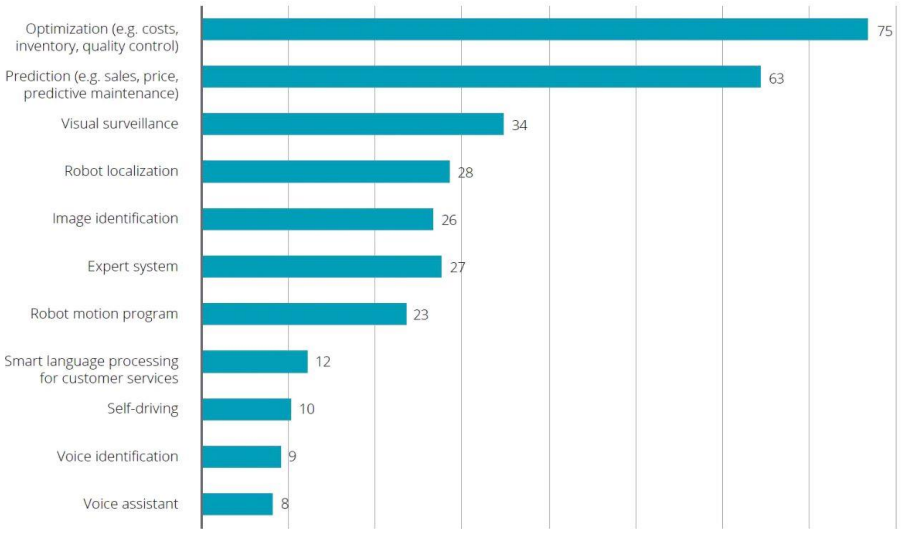
City	Rank in 2021	Rating 2021	Structure 2021	Technology 2021	Rank in 2020
Singapore	1	AAA	AAA	AAA	1
Zurich	2	AA	AAA	A	3
Oslo	3	AA	AAA	A	5
Taipei City	4	A	A	A	8
Lausanne	5	A	AAA	A	New
Helsinki	6	A	AA	A	2
Copenhagen	7	A	AA	A	6
Geneva	8	A	AA	A	7
Auckland	9	A	A	A	4
Bilbao	10	BBB	A	BBB	24

The Institute for Management Development (IMD) and Singapore University for Technology and Design (SUTD) collaborated to present the 2021 Smart City Index

The Institute for Management Development (IMD) and Singapore University for Technology and Design (SUTD) collaborated to present the 2021 Smart City Index Hundreds of people from 118 cities were surveyed in July 2021 about the technology available in each city in five key areas: (1) Health and safety, (2) Activities, (3) Mobility, (4) Opportunities, and (5) Government. The top ten smart cities worldwide are shown in Table based on data from the Smart City Index for 2021.



in a December 2021 online survey of around 20,000 adults across 28 countries, on how they expected the increased use of AI to change their lives in the next 3-5 years, 35% mentioned education, 33% mentioned safety, 32% employment, 30% transportation, 23% income, 15% mentioned personal relationships, but public services were not mentioned.



According to a poll, 83% of businesses believe AI has had or will have a real-world impact. Among them, 27% think AI initiatives have already benefited their businesses, and 56% anticipate they will do so within the next two to five years.

According to technology trends, more businesses will invest in hybrid technology systems to undertake predictive maintenance, forecast sales and prices, and optimise production, costs, inventory, or quality control. Businesses are less eager to invest in technology that serves a specific goal, such as expert systems, robot localisation, and visual surveillance.

RESULTS & Conclusion:

Several industries have shown success with artificial intelligence. Big data, improved algorithms, higher processing and storage capacity, as well as the growing popularity of AI, have led to AI systems being an integral part of digital systems and having a significant impact on intelligent decision-making. As a result, there is an increasing need for social science and information systems researchers to investigate and appreciate the implications for decision-making in order to support the development and success of AI technologies on a theoretical and practical level. By evaluating and emphasising the curative role of social innovation in the interaction between AI and smart decision-making, this work aims to satisfy this criterion while also highlighting the important problems and areas for future research. The application of AI in decision-making is the subject of four research hypotheses, with social innovation serving as a mediating factor. Our multiple regression results in SPSS indicate that social innovation and wise decision-making in smart cities are significantly influenced by AI employing large data from sensors. Statistics have also shown that social innovation mediates the relationship between artificial intelligence and wise decision-making in a significant and crucial way.

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