

## **Artificial Intelligence in Smart Cities: Bridging the Gap in Autonomous Decision-Making**

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### **Abstract:**

The smart city term defined as smart environment in which the things are smart like smart security, smart healthcare, smart governance etc. Smart things are somehow smart using the IOT technology smart city facing the issues of decision making and real time prediction. In this paper the smart cities component is discuss that smart cities components are less intelligent but not autonomous in decision making. There still lack in autonomous decision making of a component for real time environment. then the autonomous system of components said to be smart in term of smart leads towards the smart city using artificial intelligence.

**Keywords:** Smart city, Autonomous agent, digitalization, Artificial intelligence, IOT

### **1. Introduction:**

The smart city is a revolutionary concept based on integrating different electronic modules to enhance the information from up to down for the ease of customers. Smart cities term usually referred to as technology-based environment, which uses information communication technology to improve the quality-of-life changes in cities for the betterment of cities to make them sustainable(Vitunskaitė et al., 2019) The smart key challenges were real-time prediction, behavior changes in multi-agents, traffic control congestion, classification issues, and knowledge-based issues still present in different components of smart cities (Bokhari & Myeong, 2022)The suggestive model concept of artificially intelligence-based smart cities makes it more reliable regarding security parameters, sustainability environment s issues, and

collaboration issues between the different components of smart cities. Artificial intelligence makes the smart city more intelligent in decision-making, sustainability, and security flues .and enhance the smart cities' parameters .by using artificial intelligence, there would be a centralized system that will collaborate with different components of smart cities to make an integrated entire single domain rather than a distributed system.

## 2. How does a smart city operate:

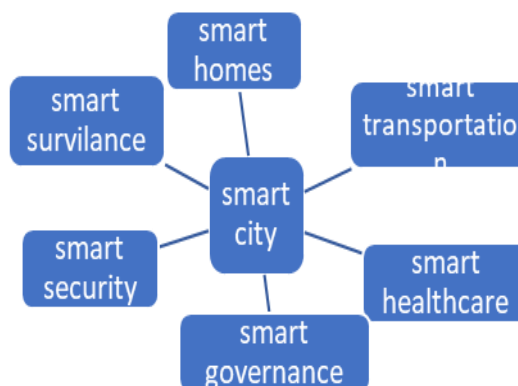
The smart city is a revolutionary concept based on the integration of different electronic modules in order to enhance the information from up to down for the ease of customers(Sarker et al., 2021)The term smart cities usually refer to a technology-based environment that uses ICT technology to improve the quality of life changes in cities for the betterment of cities to make them sustainable (Vitunskaitė et al., 2019)Recently, the urbanization concept has witnessed high rates of becoming a phenomenon in the world. Even in China, it's increased from 36% to 51.27% (Velasquez et al., 2018)



(Kosanke, 2019)

## 3. main key components of a smart city:

However, smart city components have already been installed, like smart monitoring, smart homes, and smart healthcare; these things are part of the smart city's vision[29].



Figure[7]

- **Smart Healthcare**

Smart healthcare evolved from IBM's (Armonk, NY, USA) "Smart Planet" concept in 2009. Smart Planet is an intelligent network that collects information from sensors, transmits it over the IoT, and then processes it using remote servers and other distributed computing resources. [8][9]. can be said as a system which use the latest technology devices such as iot based wearable devices with the connection of mobile internet to retrieve the information from iot, smart healthcare provides the interaction of community of healthcare in one platform and manage the data in a proper manner to avoid any mis happened to the data. In short, smart healthcare is a higher stage of information construction in the medical field [10][27]

- **Smart governance**

The term "smart governance," which can also refer to "smart e-governance," describes the implementation of technological and innovative solutions to improve governmental administrations' capacity for policy-making and strategic planning. It frequently relates to improving democratic processes and modernizing the delivery of public services[11].The implementation of Smart Cities can be made substantially more creative and innovative if a certain model is utilized. The complexity of a city's contexts (e.g., economic, cultural, social, political, organizational, and technological), difficulties (e.g., political, governmental, social, and cultural, and technical), and threats (e.g., political, governmental, social and cultural, and technical) [12]

- **Smart security**

With smart security, you can monitor your home and manage your setup from a PC or mobile device, ending your age-old worries about burglary or vandalism. [13][28].

- **Smart surveillance**

Smart surveillance refers to the use of video surveillance applications that make use of automatic video analysis technology[14]. Combined with an object detection method, video surveillance is a crucial tool for assessing road networks, intersections, and how people move across the city.[15]

- **Smart Transportation**

Smart transportation refers to a strategy that integrates contemporary technologies into transportation infrastructures. Cloud computing, wireless networks, location-based services, and computer vision are just a few ways to enhance mobility [16].is said to be an electronic system which can be used to handle the traffic systems with the help of ai to develop the smart strategies in order to make the city sustainable later than said to be as smart transportation like (ITS)[17][18].

- **Smart homes & Smart Grid**

A subset of ubiquitous computing known as "smart houses" aims to make homes smarter for comfort, healthcare, safety, security, and energy efficiency [19]. Modernizing power systems through real-time monitoring, automation, and self-controlling are the primary functions of SGs. The second-ranked objective is keeping consumers up to date on their

energy consumption, the real-time cost, and their ability to make intelligent decisions. Finally, is the provision of dependable and sustainable energy resources as a mix of renewable and nonrenewable sources.[20]After going through the literature, there was a need to improve smart cities' integration issue of each component towards the smart city, as well as in decision making and prediction, which can be reduced by using ai smart cities. Patterns in data sets can be correctly found using AI for improved analysis. Instruments for real-time air pollution monitoring can be made available using AI and the Internet of Things. Using AI, it is possible to pinpoint the origins of air pollution in a short amount of time [21].

#### **4. Urbanization issues in smart cities?**

Urbanization has a massive role in promoting smart cities to the next level and the transformation of nature to the next level. Due to urbanization, challenges also come quickly (air pollution, sustainable cities, traffic jams, etc.). These changes need to be made soon for the betterment of cities.[4]To solve these issues like air pollution, traffic jams, sustainability, and weather forecasting, the smart city concept was introduced for the betterment of these issues and to make the cities more sustainable [5].in. Smart cities urbanization now a big concern nowadays due to the overpopulation of rural into urban areas; monitor and handling these things are pretty complex to reduce the ai concept can be used as a backup to make it sustainable and reduced the urbanization issues like air pollution and traffic jams in ai technology the system can predict the future outcomes that's how the future looks as like in really steps the government can plan and make it easier for peoples and avoid the air pollution with the help of ai.

#### **5. Smart city having intelligent components.**

The smart city components are somehow intelligent but not too intelligent in terms of decision-making and prediction towards the sustainable smart city. Because the components depend on their information, which is insufficient for decision-making, this issue can be overcome by implementing the autonomous system on smart by using a technology that helps in decision-making and prediction for the betterment of the system.

#### **6. Integration of smart city components**

- There is No integration between smart healthcare and smart city [22]. due to no integration between healthcare and smart city create hurdle to keep track the record of healthcare in smart city to detect the high risk wanted persons.
- Integration of smart security with smart home using facial recognition [23].in this scenario there should be integration between security and smart home to detect the unwanted entering to secure the house.
- Prediction issues integration issues with smart grid and electric vehicle [24]. these should be overcome to sustain the environment. And friendly smart city. The aim of the model is to optimally schedule the EV charging in a smart grid while examining customers' dissatisfaction cost and by considering the EV demand as deferrable.[25][26]

- integration of smart governance and smart transportation the availability of real-time data regarding various aspects of the transportation network has vastly increased due to sensors, cameras, and smartphones. This has offered an opportunity the scheduling of the transportation network from a more integrated and systemic view where information about different modes of transportation is executed and crucial decisions are made by considering the entire system and not just individual repository [27].

### **7. Is a smart city smart?**

In smart city the Cost management, Sustainable energy management, Data storage and processing, Emergency services, and Smart city security are the issues facing the smart city [28]. The smart city still lacks sustainability and security issues which are still present today date. Large-scale implementation and wide with as well as large-scale renewable energy policymaking worldwide.[29] In the smart city there is no mechanism for the renewable energy development to take right decisions for the betterment of smart city Mobility issues for characterization in smart cities to tackle this issue for urbanization.[30] There are still issues regarding the mobility in smart cities which are not complete archived which needs to be done. Prediction of the real-time environment from the road to avoid this.[31]. In smart cities the transportation is also concern in term of efficient and real time tracking of vehicle and prediction for the traffic jams. There should be work needed. Prediction of Behavior change and classification on based liar to cope with this issue.[32]

In the face detection monitoring the emotions detect is not an easy task which are also in smart city in term of security which are needed to be addressed. In terms of a smart city, the main concept Is that the city is intelligent to do things for the betterment of the city, but still, the smart city is not proper smart; it depends on different modules and components to proceed the things why we have not introduced the independent and autonomous system and make the control all the component and decide on real-time rather than gather information and then processing. to reduce the time and complexity the artificial intelligence technology with the smart city can be help full in decision making and predict the results in no time. Then the smart city can be said to be smart because after the implementation of this system the modules are smart enough and self-depended on to take the decision.

### **8. Discussion:**

The smart city is a revolutionary concept based on integrating different electronic modules to enhance the information from up to down for the ease of customers [1]. After going through the different literature, a lot of work has been done on smart cities by integrating IoT technology with machine learning techniques for the betterment of the system towards the audience. But still, there are some issues regarding the complexity and integration issues within the smart cities domain that play a vital role in smart cities that need to be addressed. In the literature review, there are some key issues highlighted that smart cities still lack the ability of decision making and which can be better if the artificial intelligence technology integrates with the smart cities to tackle the problem of decision-making for the betterment of the system and the future needs like sustainable environment, smart grid smart automation

real-time camera monitoring and healthcare sectors. Because artificial intelligence reduces the risk of errors which can affect the performance of any system, these issues can lead in the wrong direction. So, artificial intelligence could be the best option for smart cities integration for the smart cities.

## **9. Conclusion:**

The smart cities concept is towards digitalization in which things are smart, like smart healthcare, smart monitoring, smart security, etc. In smart cities, some problems still make them inefficient and less intelligent by using IoT and machine learning; these are the highlighted issues in above section. The autonomous system components overcome the issues using artificial intelligence with IoT for smart cities to make the smart cities sustainable and environment friendly. The autonomous system-based components will be leads towards smart city. Future work will deeply involve artificial intelligence to make smart cities more secure and reliable towards urbanization.

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