**Comparative Analysis of Various AI Techniques for Smart Cities work progress visualising**

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Abstract- This Chapter will include the various AI Techniques introduction and these comparison for visualising of Smart city work progress . This Chapter cover information about Artificial intelligence techniques its features , characteristics ,application and wide utilization of a particular application for Smart city . In this way, i try to formulate the chapter structure. AI (Artificial Intelligence is the simulation of Human begins or human Intelligence here this chapter include the intelligence for the smart city work visualization the work progress through AI technique chapter include the list of Artificial Technique for Smart city to be provided the best solution for the concern problem. The another aspect of this chapter is to include the list of relevant problem in selected domain and its good solution while comparative study. AI Technique to suggest solution for concern problem of smart city domain for the proper structured a analysis is included in this chapter.

Key Word :- Smart City , AI , AI Technique , Visualization .

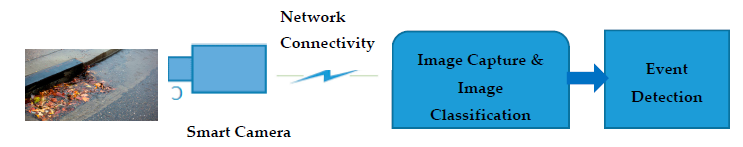
* 1. **Introduction:**

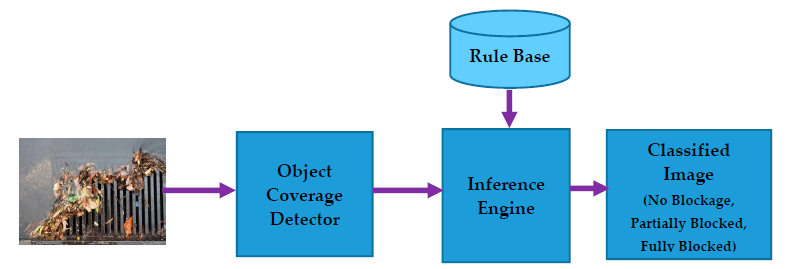
In the Current Era Artificial Intelligence (AI) technologies widely used in developing smart cities solutions, Deep learningmodel , various Machine learning model for training the data set , testing thedata set , feature selection many more. Artificial intelligence (AI) techniques and method s is also used for represent the output in visual effect , this could be easy to understand by view in all aspects .

Proper planning and making the well structured policy for the smart without Artificial inelegance it little bit complex and difficult . So this is the way to archive the turst, acceptabile solution for smart city through AI .

**Case Study Problem 01 - Using AI Smart Solution Proper Flood Monitoring Application :**

This is o web based solution for monitoring the flood related things in smart city . The author are introduce the Semantic Web Technology under the consideration of ‘Explainable Deep LearningModel“ This is one kind of flood monitoring Application for smart city . The AI technical concept they were used misidentification of the Images such as Plastic bottles, leaves etc near by the drainage in crucial areas. As shown in the Fig mention below.





**Conceptual flow diagram of Hybrid Image Classifier**

Based on this authors implement the web based application using the DL- Based classifier to indentifying the above mention object . Here author capture the selected images through cameras in real time mode This work highlights the AI concept with DL and Semantic web application solution with hybrid mode classifier . The working concept of are as Hybrid classifier of DL component identifying the selected images and applying the semantic rule for the classification .This hybrid classifier able to provides the coverage relationships and image categories as well .

The experimental results demonstrated with a real-world use case showed that this hybrid approach of image classification has on average 11% improvement (F-Measure) in image classification performance compared to DL-only classifier. It also has the distinct advantage of integrating experts’ knowledge on defining the decision-making rules to represent the complex circumstances and using such knowledge to explain the results.

* + 1. **THE SMART CITY CONCPET**

If we want to define the smart city Smart cities leverage technologies to provide services to the citizens. Various electronic methods and sensors are used for collecting data. The insights of the data received help the operational improvement of garbage collection, utility supply, traffic movement, environmental management, and managing social services.

**2.Features of the Smart Cities**

Smart cities have several features included in them, including a smart healthcare system, governance, transportation system, better surveillance for security, smart infrastructure, better job opportunities, and every other facility and amenities for comfortable living.   
A city can be considered as a smart city if it has the following features:

* Society needs well-developed health care, education, housing, and infrastructure.
* Deliver enhanced key services to the community reliably and cost-effectively.
* Better housing.
* Improve economic growth of the society.
* Effective management of the resources to reduce depletion.
* Create more job opportunities.
* A well-developed smart plan for data analysis and involvement of the community in broad
* Boosting the local economy.
* Well-handled urbanization and coping strategies for population growth and climate change.
* Use of smart technology for community needs
* The streamlined transportation system.

**3. Steps to Make a normal city into a Smart City**

The steps to make a normal city smart city are

Step-1: Collect data about the city and its key improvement areas.

Step-2: Set the metrics for what it wants to become, along with the available time frame and budget.

Step-3: Initiate with 1-2 small projects and complete them within a set time frame. The city's existing standard operating infrastructure and IT practices may get changed/altered while completing the project.

Step-4: Scale all the city's procedures.

Step-5: Review the experience and start working on other projects to make a normal city a smart one.

1. **Literature survey**

In general, a smart city is defined as a city that monitors and integrates critical infrastructure and services through sensor and IoT devices [23]. The IoT devices capture data of the instances under monitoring and those data are transferred and stored for further processing. Smart Cities application integrates real-time data using IoT and the rational method to design and plan any decision making more systematically. For decision making, human experts have been the core element of all analysis and objectives [24]. Human experts often make the decision based on data coming to any application. Decision making in the context of smart cities became more challenging because of the information available and the involvement of multiple stakeholders [25]. A wide range of sensors and IoT based applications data is being stored and processed in the digital infrastructure of the cities to support decision making [26]. With the change in tools and techniques on the digital platform, a variety of data from apps and other real-time data sources are combined to analyse and make a decision to address specific issues of the city [27]. There have been qualitative and quantitative data for decision making to meet some objectives, which often app ear with conflict. Therefore, all smart city applications had to operate and adapt working routines in moree\_ective ways. Any changes must be dependent on the data being used for the application, and hence, the decision making [28]. One of the major challenges of decision making in the smart city has been how to deal with application data and how to apply human expert knowledge. SemanticWeb technology in combination with data analysis has been used for expert-based recommendation systems [29,30]. The semantic techniques give the flexibility to apply human experts’ knowledge and control over the prediction model. In di\_erent application-based system, the implementation of semantic representation enhanced the performance levels as the semantic rules were developed by applying high-level information, which was gathered from experts from the corresponding fields. We list several types of transparency expected in smart cites models. Each may require a different sort of explanation, requiring different measures of easy [18]:Flood monitoring is one of the major concerns in most of the cities around the world. Over the years, rainfall forecast and satellite images have been used for predicting and monitoring flooding conditions. A wide range of examples also exists, primarily in the modelling of natural hazards and emergencies [31] or the wider context of flooding [32]. Methods such as Liquid level monitoring [33], the water level of gully pot monitoring [34,35] has been applied. Despite the improved access to rainfall data, water level reading, satellite imagery and improved forecasting accuracy, real-time monitoring to support decision making is still a challenge [36]. There are some limited examples of the application of semantic technology for flood risk analysis by applying an expert’s knowledge [37]. However, the model had not applied any machine learning to analyse and extract features from the existing flood-related data to support risk analysis. In this example, semantics were only used as a

descriptive mechanism using high-level information for recommendation system. Much research in flood monitoring involves the use of imagery available in the public domain. However, these studies are either too generic or rely on further contextual data to support classification tasks [38]. Objects analysis has been used for analysing image-based decision-making applications. In such applications objects are identified and analysed individually based on extracted information [39–41]. This extracted information has been used to classify the images into corresponding classes. During the object analysis, target objects were often defined and all other objects were treated as noise [42]. An image can be classified into multiple classes depending on the types of objects present within the image along with the context of the object. In multi-object scenarios, multi-class label approaches are applied to classify such images [43,44]. In those approaches, one classifier is trained for each object to be analysed the image. The classified outputs are combined with the probabilities of the individual classes to classify the image. Object analysis along with semantic representation is also used for scene recognition [45,46], where the detection of objects and semantic segmentation is applied to recognise the scene. Apart from these approaches, ontology-based approaches are also used to retrieve a specified [31] image from the library [47,48]. In the ontology-based methods, computer vision and manual annotation are used to search the specified image from the library.

1. **List of AI Technique**

AI in smart cities is going to play a big role in making urbanization smarter aim to be sustainable growth making the cities equipped with advanced features to live, walk, shop and enjoy a safe and more convenient life in such an environment.

Actually, while developing cities to make smart, several challenges like administration, sanitation, traffic congestion, security surveillance, parking management and many more that[**AI**](https://medium.com/vsinghbisen/tagged/artificial-intelligence) can help to provide a sustainable solution to habitants.

**5. Advance Security Camera & Surveillance System**

AI-enabled cameras and sensors can keep an eye on the surroundings to enhance the security level in the city’s neighbour hoods. Such cameras can recognize the people and their faces or track the unusual activities done by them in restricted areas.

The high-resolution [**AI cameras**](https://www.cogitotech.com/use-cases/security-surveillance/) can track the movement of all registered vehicles and can monitor crowd density and cleanliness of public spaces round-the-clock. And thanks to the historic data available from different departments of the city, police can predict category and intensity of crimes monitoring all such activities in a particular area.

Vehicle Parking and Traffic Management System

In cities, most of the people have their own cars and also there is a huge movement of commercial vehicles to transport people as well as goods. So, parking of such vehicles and traffic management is another space where AI can help.

Using the road surface sensors or CCTV cameras incorporated into parking spots allow cities to create real-time parking and traffic maps, helping drivers to save their time by avoiding waiting to find an empty space to move smoothly or be in traffic.

AI-supported traffic sensor systems can use cameras to collect real-time data of vehicles on road, and send it to a control centre, which collates the data fed from other points and adjusts the signal timings to ensure smooth flow of vehicles.

Smart transportation also includes the public sector, and thanks to AI, there are lots of opportunities for improvement of public transit. And now cab services like Uber are also using AI to give a better riding experience to its customers.

# 6. Autonomous Flying Objects for Ariel View Monitoring

AI-enabled drones or [**autonomous flying**](https://www.cogitotech.com/use-cases/autonomous-flying/) similar objects can be used to monitor the inner-city and houses or other concerning areas. The in-built cameras in drones help to provide the real-time visuals of the different locations where humans cannot reach easily or quickly helping the administration and security departments to take timely actions.

# 7. Face Detection Cameras and Movement for Public Safety

AI in face recognition technology is capable to detect the different people from their faces disclosing their personal identities.

AI in security cameras or drones can recognize the human faces and match with the database to trace his identity and authenticate the person entering the cities, societies and other restricted areas.

# 8.Smart Waste and Disposal Management System

People living in cities produce a huge amount of waste that is another challenge for urban management to find the right way of managing garbage and keep the environment clean to maintain the hygiene level in society.

ut AI-enabled installing sensors on waste bins can make the waste collection more efficient. Authorities can receive notifications when the bins are about to be filled and ensure reducing operational costs by eliminating unnecessary pickups, providing dynamic collection routes, and schedules for optimization of waste management.

# 9.Better Governance and Planning Management

While developing the cities or urban townships, AI or **machine learning** techniques can be used to map land use across time to generate crucial insights using the satellite imagery and aerial view 2D or 3D images of geographical areas.

# 10.BENEFITS OF SMART CITY DEVELOPMENT

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 discussed below.

# 11.Positive Impact on the Environmental

One of the best benefits of smart city development is that there will CO2 emission and it would be the main driver behind the development of smart and sustainable cities.And it would be possible due to energy-efficient and eco-friendly, waste and traffic management, which helps to curb pollution and makes the environment less polluted.

# 12.Optimized Energy & Water Management

Similarly, in smart cities, the power generating grid and smart water management are leading factors that help to produce energy with less pollution. Such an approach also helps to get clean drinking water to keep our environment clean.

# 13.More Accessible Transportation System

In smart cities, clean and efficient transportation of goods, services are essential for the people. In the hope of optimizing mobility, many cities are turning to smart technologies to ease traffic congestion and provide users with real-time updates.

# 14.Advance Security and Safety in the Public

The safety of the people in the cities is at topmost priority in such cities. The AI-enabled development of smart cities allowing municipalities to better monitor their citizen’s thanks to CCTV cameras with facial recognition.Furthermore, **AI cameras**are also equipped with motion and smoke detectors for better security surveillance.

# 15.AI SMART CITY CHALLENGE

Achieving the AI in smart cities is not a simple task, as there are multiple challenges in making the cities smart. Apart from lack of funds, lack of technological edge and other things discussed below make it difficult to develop such cities.

# 16.Infrastructure and Costing

Most of the devices, equipment, systems, and machines installed in smart cities use sensor [**technology**](https://medium.com/vsinghbisen/tagged/technology) to gather and analyze information such as rush hour stats, gather a huge amount of data from AI cameras or other security systems or air quality or crime rates. The implementation of these sensors requires a sophisticated and costly infrastructure.

**17.Security and Privacy Concerns**

Another challenge in developing such metropolises is the security and privacy of people living in such cities. As the data of monitoring people or watching their activities gathered can be regarded as a challenge as the use of IoT and sensor technology increases.

Besides, the threat of cyber-attacks is a critical issue for smart cities. Hence, to avoid concerns about data use, smart cities need to involve their citizens.

Awareness, education, and transparency on the purpose of data collection are crucial to make the community feel that they are truly taking part in making their city more sustainable.

**18.Risk of Socialization**

While developing such cities, inclusive urbanization must be a priority to deal with the increasing vulnerability of poor and slum populations. That is why we need to ensure that no population is excluded from smart city data collection and use. Covering all age, gender, class and income group of people from society is necessary.

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