



International Journal of Research Publication and Reviews

Journal Homepage: www.ijrpr.com ISSN 2582-7421

Design and Development of Smart Civic System and Reward Recognition

Aditi K N¹, Meghana K Ramesh², Deeptha Balaraj³, Geethanjali P⁴, Dr. Shivashankar⁵

¹ Information Science and Engineering, Global Academy of Technology Bengaluru, India aditkn2005@gmail.com

² Information Science and Engineering, Global Academy of Technology Bengaluru, India meghanakramesh68@gmail.com

³ Information Science and Engineering, Global Academy of Technology Bengaluru, India deepthabalaraj118@gmail.com

⁴ Information Science and Engineering, Global Academy of Technology Bengaluru, India drshivashankar21@gmail.com

⁵ Information Science and Engineering, Global Academy of Technology Bengaluru, India ianjugowda@gmail.com

ABSTRACT—

Rapid urbanization has increased the challenges related to different municipal infrastructure problems such as potholes, garbage accumulation, water leakage, drainage blockage, and malfunctioning streetlights. Traditional complaint management systems rely on complaint handling through manual verification, processes begin after many delays, and communication is very little between the people of the city and the government officials. So, the resolution of problems is still very slow. This research paper explains how the Smart Civic System and Rewards Recognition platform can use Artificial Intelligence and mapping technologies plus other geospatial technologies to enhance the city complaint management process so that it works faster and more accurately. The proposed solution includes a Convolutional Neural Network (CNN) that is trained to identify city problems by looking at pictures uploaded by citizens, and a Recurrent Neural Network (RNN) that matches a complaint description with an image that has just been uploaded so that irrelevant or false complaints can be rejected quickly. The system also uses GPS to detect duplicate complaints and identify the reports that originate from the same location and automatically decides the order in which complaints are dealt with based on its severity, the duplicate complaints from the same location and will be given a higher priority when multiple users report the same issues. The system uses smart routing of problems to its respective departments, and enables citizens to keep track of complaint status in real time. Additionally the system includes a reward mechanism which motivates people to report genuine city problems. Through these changes, the proposed system aims to reduce the amount of manual work done by human beings and to be more precise in judging complaints, get a faster answer, and make the entire process transparent.

Keywords—Civic Complaint Management, Computer Vision, Convolutional Neural Network (CNN), Deep Learning, GPS, Image Validation, Natural Language Processing, Recurrent Neural Network (RNN), Smart City, Smart Governance.

I. INTRODUCTION

The Smart Civic System aims to enhance the quality of life in urban areas by incorporating digital technology into public infrastructure and government services. Despite these efforts, municipal authorities still face major problems in handling complaints from citizens. These issues include outdated complaint systems, slow problem-solving, lack of openness, and challenges in overseeing city infrastructure. Everyday problems like potholes, garbage accumulation, water leakage, drainage blockage, and malfunctioning streetlights harm public safety, cleanliness, and the general well-being of people. Traditional complaint management systems rely on manual verifications that are time consuming, and offer limited interaction between the public and local government, leading to slow responses and solutions. To fix these problems, researchers have suggested smart civic management systems that use Artificial Intelligence (AI), mobile apps, cloud computing, and geospatial tools to make complaint registration, tracking, and service delivery more effective. Deep Learning, especially Convolutional Neural Networks (CNNs), has been widely used for identifying road damage, sorting waste, and spotting various urban problems from images. Also, many studies have combined GPS-based location, cloud computing, and mobile or web apps to help with submitting complaints, tracking them in real-time, automatically assigning them to the right department, and improving communication between the public and local government. These developments have greatly improved the effectiveness and openness of managing civic problems. As a result of this, many studies have investigated different methods, algorithms, and technologies for creating smart city solutions. It is important to understand the methods, algorithms, and technologies used in current research to recognize what has been achieved, what still needs improvement, and where future research can go. Therefore, this survey paper offers a detailed overview of recent studies on AI-based detection of civic issues and smart complaint management systems. This paper looks at the techniques used in the literature, compares their pros and cons, and highlights major research gaps to give valuable insights for developing more efficient, open, and intelligent systems of city governance.

II. LITERATURE SURVEY

The paper [1] proposes a smart streetlight monitoring system which uses internet of things technology, wireless telecommunication, and a mobile application to identify faults in the streetlight and manage power usage effectively. This system adjusts the lighting level of the streets as ambient illumination and allows the operators to remotely monitor the system using a safe SMS-based protocol. The duplicate communication backup ensures that operation is not affected during failure of the primary network. It helps to make streetlight management much easier and cheaper versus traditional systems by reducing power wastage and maintenance expenses.

Even so, it only favors the streetlights management rather than the management of other civic complaints. The concept by [2] aims to develop a smartphone-based pothole detection system that is based on vibration data obtained through the sensors implemented into the device and the GPS. After processing vibration signals, the authors apply Convolutional Neural Networks to differentiate between different types of road characteristics.

The good part of this implementation is that it does not require external sensing components and that means it is cheaper to deploy. Promising results are obtained for the detection of potholes in real-world scenarios. The disadvantage is that the system is designed only for anomaly detection, not civic infrastructure detection. The proposed implemented model [3] is an automatic pothole detection model based on Convolutional Neural Network with transfer learning using a pre-trained VGG16. Image enhancement methods are implemented to improve the feature extraction and obtain high classification accuracy in different road conditions. This method is an efficient way to reduce training time though providing cost effective and reliable pothole detection for an intelligent transportation system.

Experimental results illustrate the accuracy is greatly higher compared to a typical deep learning method. But the implementation is limited to potholes only; other categories of civic complaints cannot be processed. The paper introduced a revised method [4] for pavement damage detection using the YOLOv8 algorithm, which greatly increased detection precision with lower computational complexity and resource consumption. By using attention modules and optimized network components, more effective features are extracted for accurate identification of cracks and pavement distresses on the road surface. The lightweight network architecture enables real-time applications deployed on low-powered hardware devices without loss of performance. Laboratory and field tests displayed better robustness and accuracy for different pavement surfaces.

But this pavement damage detection structure only, apart from civic complaint management. This approach [5] develops a smartphone-enabled road defect detection system with automated data collection powered by deep learning. It classifies several kinds of road defects, including potholes, speed bumps, or manholes with the deployed CNN models, based on commercial smartphones for realistic application. The auto labeling result improves the process of generating a dataset and the scalability of the proposed system. It can by a lot shorten and automate the manual inspection process to plan the timely maintenance. Though, the system is only for road defect monitoring with traffic surfaces. limited to waste management; the concern with civic complaints is left untouched.

The proposed structure [6] incorporates image processing with deep learning to build a smart city complaint management platform. Citizens can lodge a complaint by uploading images of civic issues to the mobile app. These images are automatically categorized into various categories before being routed to municipal authorities for resolution. Also, the system offers complaint viewing and tracking capabilities to facilitate interaction between citizens and municipal authorities.

The proposed setup reduces manual work in handling grievances and streamlines the procedure of complaint management. Though, it does not implement duplicate complaint detection or intelligent classification of the severity of complaint. The research work [7] presents a real-time grievance handling system which makes it easier for the public to record and resolve any issues faced by them.

The application offers an easy-to-use interface for registering complaints by the citizens and monitoring and resolution by administrators. Real-time status progress increases transparency and cooperation between public and administration. It makes the system more approachable and protocols less time consuming; has deficiency of image classifications based on AI, automatic routing of complaints. This structure [8] proposes a federated deep learning structure for smart city intelligent trash classification. Several convolutional neural network models are built together to obtain the desired classification accuracy with privacy preserving distributed learning to overcome the restrictions of data privacy. This setup helps in data-driven sustainable trash management, waste segregation and recycling in smart cities.

The experimental results show that the deep learning setup gives higher classification accuracy in different categories of waste. But the designed setup only applies to waste classification; it doesn't apply to other civic complaints. The model [9] presents a smart waste segregation approach based on a deep learning driven ResNet model to separate several kinds of waste automatically. Image pre-processing and data augmentation have been used to efficiently increase the generalization ability and the classification accuracy of the model. The result makes the work feasible for boosting the recycling program as well as providing a sustainable way of urban waste management. The experiment results demonstrate the model's steady stability over various environments.

But the model only applies to the waste separation task instead of all kinds of civic issues of management. The proposed way [10] advocates the implementation of intelligent waste categorization to be employed for IoT-enabled smart cities by integrating features extracted from VGG16 setup with Cat Swarm Optimized Random Forest classifier. The hybrid scheme is observed to be more promising with improved classification precision Beyond autonomous waste monitoring via IoT setup. The use of optimization strategy implies more accurate and dependable operation of civic management. The experiment carried out with the proposed approach shows better results than these obtained for traditional learning machine algorithms. Though the scheme may be used exclusively for waste categorization and ignoring integrated processing of civic complaints.

The proposal [11] is a clever civic problem reporting system combining image-based reporting with a reward system to motivate urban problem reporting. The system allows users to report urban issues, upload addresses, and participate in waste recycling activities via one single platform. Gamification mechanisms like reward points and ranks increase user participation and feedback interaction with city governments. The comprehensive system encourages sustainable waste management and responsible civic behavior. Yet, the system lacks sophisticated AI to check the complaints or identify repetition of complaints. The proposed architecture [12] attempts to deploy a cloud-based system to deal with civic complaints using machine learning and Google maps API to validate the report and automatically classify and route the complaint to relevant government authority.

Citizens can report complaints with images, and the system classifies and routes the complaints to the relevant government agency overseeing the public service. Dedicated dashboards for government agencies and public voting for identifying and prioritizing complaints make efficient civic complaints management and expedited handling by the government agency. Although this system improves the system's transparency, it still lacks validation of image-text consistency and detection of similar complaints.

A comprehensive system [13] is proposed, which gives a smart civic problem reporting structure based on hybrid artificial intelligence classification and geo-spatial analytics for governing city effectively, where citizens report their problems with photo evidence and textual description, and AI tools automatically identify the severity of each issue, by a single multi-axial attribute. The admin dashboard centrally administers the problems and affords to reduce the resolution of time through automated intelligence. Multimodal learning has Much improved the under sophisticated complaint understanding.

Yet, a broader testing of the system is needed for performance validation in a real smart city context. The system [14] designs a geo-based civic complaints management platform that allows the citizens to identify the public issues through location, images and selecting from existing categories of civil complaints. The system is designed with a defined workflow for charge to responsible municipal authority for identification, confirmation and solution of civic complaints. The system enhances transparency and trust in municipal operations by publishing resolved complaints on public maps. It also eliminates duplicate civic complaints through location-aware civic complaints management. But the system does not implement intelligent image-text validation to counter-verify the image submitted for civic complaints.

The proposed solution [15] presents a civic complaint management system empowered with AI using computer vision and geolocation and web applications, to automate the process of complaints. The system gives user-friendly interfaces for uploading images with location information which can later be classified and prioritized with civic issues and forwarded to appropriate civic bodies. The web application offers citizens with real-time complaint status tracking, updates, and analytics dashboards to improve transparency and municipal functioning. The proposed solution empowers citizens with technology to strengthen communication channels with civic bodies by reducing manual effort. But it does not recommend duplicate complaint detection or image validation with text.

The investigated system [16] consists of a web-based civic complaint and resolution system with geotagged image verification for integrity check. Its systems architecture relies on GPS tracking, reverse geocoding, and browser image grab to offer transaction traceability. Citizen and department worker flows are designed based on automated e-mail notification as well as image-based verification workflows. Constituents' engagement is marketed as an important factor for solution adoption. GIS data would be utilized for in-le and off-le service provision. Image classification solutions based on AI for auto classification of civic problems are not used. The implementation of the proposed system [17] was a mobile application aimed at managing citizen complaints related to urban civics more easily.

The users could report a complaint at a given location by choosing its category, and then automatically receive a reference number for further tracking. Municipal authorities could log into an online administration and manage the complaint reports, prioritizing and addressing them. It enhanced citizens' accessibility to services and urban arrangements reviews, enabling urban officials to improve responsiveness and accountability. Though the system still relied on the manual reporting system, without any Artificial Intelligence-based confirmation algorithms. The created solution [18] is a new intelligent e-governance approach aimed at improving the accuracy of civic complaints management. The solution should establish an integrated system that brings a verifiable civic corruption reporting service using geotagged images embedded with relevant metadata. This way enables authorities to process e-governance applications and make informed decisions.

The solution should allow citizens to be able to document civic issues from the public domain. Structured workflow modules for administrators and field workers should be created, establish email notifications about submitted civic complaints, enable citizenry tracking with pictures as visual proof is essential, and assist increased efficiency in the systematic implementation of programs through reduced fraud and reporting as well as affordable costing. The solution though can track the civic issue with no autonomous classifying through the AI uploaded civic issue. The system [19] presents the AI-based platform for general civic complaints, using computer vision and geolocation technology to automatically classify and follow-up citizen complaints.

Citizens submit complaint images with location information, and the system determines issue types, predicts severity, and then directs the complaints to city authorities. Citizens also receive anonymized system updates and analytics dashboards. The system applies artificial intelligence to reduce response and resolution time to civic issues.

Though the platform lacks exact duplicate complaint identification, as well as false character verification between image and text. The method [20] presented in this paper is an enhanced pothole detection and visualization system through object detection using YOLO, geospatial visualization using GPS tags, OpenStreetMap, and dashcam images. It automatically detects potholes using images from dashcam and tags the patrol with geospatial information by OCR combined with GPS tags. The detected road defects are indicated and visualized with an interactive map interface, which can be useful in urban road maintenance. Compared to other approaches, the system design can be used as a scalable and inexpensive monitoring system of road condition in a smart city. The system can only be used for monitoring road infrastructures and cannot manage other types of civil complaints.

III. RESEARCH GAP

Although a lot of progress has been made in using AI for managing civic complaints and in Smart Civic System application, there are still several issues with the systems that are currently in place. Most of the systems that have been developed focus on solving just one type of problem, like detecting potholes, sorting trash, or monitoring streetlights. They don't offer a single platform that can handle many kinds of urban complaints. This way of handling things makes it harder for smart governance to work effectively.

Many of these systems mainly use images to classify complaints but don't check if the text the user has written matches the image.

Because of this, some complaints might be wrong or misleading, making the whole complaint process less reliable. Also, when people report the same issue more than once, each report is treated separately, which adds unnecessary work for city officials and uses resources inefficiently. Another big problem is that these systems don't have smart ways to prioritize complaints or automatically assign them to the right department. In many systems, complaints must be checked and sent to the right team by hand, which takes more time and delays fixing important city problems. Moreover, few platforms offer detailed tracking of complaints or clear information about how complaints are being handled.

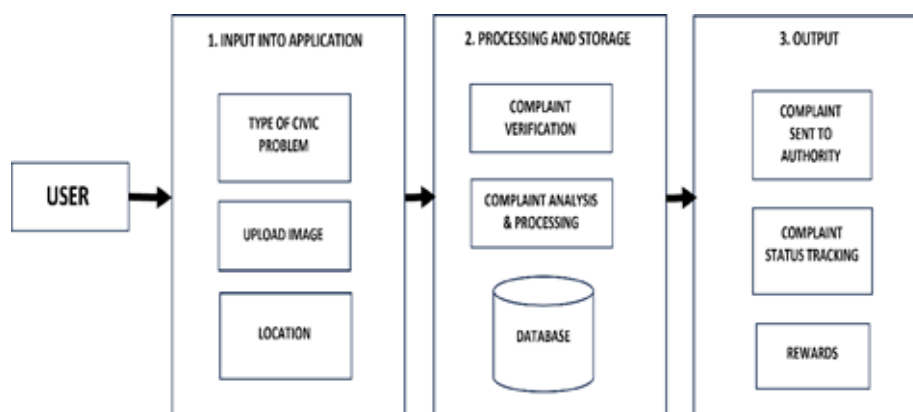
Citizen involvement is also not well addressed in these systems. Most of the solutions don't include ways to get people actively involved in solving city issues by offering rewards or recognition. Without these kinds of incentives, people aren't engaged, and it's harder to make governance more community driven. To fix these problems, there's a need for a complete and integrated system for managing civic complaints. This system should use AI to classify images, check if text and images match, find duplicate complaints using GPS, prioritize complaints, route them to the right department automatically, track complaints in real time, and give rewards or recognition to citizens. Such a system would help make complaints more accurate, reduce the need for people to do things manually, improve transparency, and encourage more public involvement in smart city governance.

IV. PROPOSED SYSTEM

The proposed Smart Civic System with Reward Recognition is an intelligent, AI system that aims to provide an efficient civic complaint management system. The system gives an easy way for the citizens to report civic problems like Potholes, Garbage dumps, drain blockage, Water leakages and non-working of streetlights by uploading a picture and a small description about the issue. It automatically takes the location of the image using the GPS. To automate the process of complaints, the system will use CNN based image classification. The system will analyze the image and reports to identify the type or nature of civic problems in the image uploaded. Also, the Recurrent neural network (RNN) will be used between image and text for image text validation process. It is used to compare between uploaded images and said description by the user. This will help to improve the credibility of complaints due to reducing false complaints. In the same way, a duplicate complaint detection element is implemented in the system using GPS. When a new complaint is found then its location and image is compared against reports which have been made already, if the same complaint has been reported before, then the new complaint gets related to the previously been complaint. This means no new inquiry will be generated, leading to less processing power usage and more efficient use of municipal resources. Once verified, the complaint is automatically categorized and forwarded to the concerned municipal department. The authorities can then monitor the complaint, change complaint status, and upload resolution details via an administrator module. Citizens are allowed to track the progress of the complaint and be notified when there's a change in its status.

Reward Recognition: To mobilize the citizens, the system should have a Reward Recognition feature. Citizens who regularly file useful complaints will be awarded points and badges. This feature will motivate and attract citizens to participate actively in a cleaner, safer, and smarter city. By combining AI, CV, NLP, GPS and cloud computing into a single to be designed, the suggested proposition gives a cost effective scalable transparent and efficient way for smart civic governance by reducing the human effort, enhancing the accuracy of complaint classification, decreasing the time duration and strengthening the communication between citizen and municipal authorities.

V. SYSTEM ARCHITECTURE OF PROPOSED SYSTEM



This System is designed based on modular architecture which combines Artificial Intelligence, Computer Vision, Geospatial Technology, Cloud Computing, which results into a very efficient civic complaint handling system. The system consists of the following six key modules. Citizen Inputs: Citizen registers and logins to the application.

Citizen logs complain stating the civic problem by submitting a photo of the civic problem and providing a short description. The application automatically records the GPS location of the civic problem.

The uploaded image is analyzed by CNN to identify the nature of complaint potholes, garbage, drainage blockage, water leak, streetlight failure, etc. The uploaded image and the text are then checked for consistency through RNN. This step is taken to avoid false and irrelevant complaints. If the complaint is validated successfully, the complaint management module checks for duplicate complaints.

The new complaint is compared with existing complaints using the GPS location and the image features to determine whether the complaint is duplicate or not. If the complaint is duplicate, then the complaint management module links the complaint to the existing complaint. Otherwise, a new complaint database entry is created. The complaint is then prioritized based on severity and is forwarded automatically to the authority for processing and handling. The complaints are accessible by the municipality authorities through an admin interface where they can read the complaints, edit them, or send them for resolution.

Complaint statuses are also being updated in real time, and the citizens can follow them through the application. An alert is also generated whenever the complaints statuses are being changed. To encourage citizen participation, the User Reward Recognition Block gives points and Recognition Badges to users who constantly raise authentic complaints that can be used for urban infrastructure enhancements. This architecture offers a holistic scalable transparent system for smart city governance integrating intelligent problem identification, autonomous complaint processing, location-based services, and citizen participation in a single system.

VI. ALGORITHMS USED IN EXISTING SYSTEM

- Convolutional Neural Networks (CNNs) are commonly used for tasks like image classification and detecting objects, such as potholes, road damage, and waste types. These models automatically find important features in images, which helps them classify things accurately and detect them better.
- YOLOv8 is a top object detection method that can quickly identify road damage and potholes in real time. Improved versions like YOLOv8-PD are better at finding features without using too much computer power, which makes them good for smart city systems that need fast and efficient solutions.
- Models like VGG16, which have been trained on large datasets, are widely used for tasks like pothole detection and waste sorting. Using transfer learning helps these models learn better, saves time during training, and improves how well they can predict outcomes, especially when there isn't a lot of training data.
- ResNet-based models and Federated Learning are used for smart waste classification and training models across different devices. These approaches work well together to improve classification results while keeping user data private by allowing models to be trained without sharing personal information.
- GPS and geotagging help accurately find the location of reported issues, confirm where complaints were made, avoid duplicate reports, and help city officials locate and fix problems more quickly.
- Cloud computing and mobile apps help store complaints in one place, track them in real time, automatically send them to the right department, and make it easy for people to communicate with city officials. These tools make complaint management more open, easier to use, and more efficient overall

VII. COMPARATIVE ANALYSIS

The studies reviewed show that there's an increasing use of Artificial Intelligence (AI) and Deep Learning (DL) to make city governance and handling complaints from citizens more efficient. Many research projects focus on creating smart complaint systems that use mobile apps, cloud computing, and GPS for location tracking. These systems help people easily report issues, track the progress of their complaints in real time, and communicate better with city officials. The benefits include more transparency, faster processing of complaints, and better organization of how complaints are handled. However, most of these systems rely on fixed categories for complaints, need manual checks, and don't have features like finding duplicate complaints, validating images and text, or rewarding citizens.

A lot of research also looks at using computer vision to monitor road conditions. Models like CNN, YOLOv8, VGG16, and transfer learning help detect potholes and other road damages automatically. These methods are accurate, extract useful features, and work quickly, which reduces the need for manual inspections. Some studies also use smartphone sensors, GPS, OCR, and OpenStreetMap to show locations of issues and plan maintenance better. Even though these methods are helpful, they are mostly for detecting road problems and can't handle other types of civic issues. Research into smart waste management often uses CNN, ResNet, Federated Learning, and mixed deep learning methods for sorting trash and recycling. These techniques help with

sorting waste more accurately, support sustainability, and protect data privacy through distributed learning. While these systems are very effective in waste management, they are specialized and can't handle multiple types of civic complaints. Some studies also look at using IoT devices, wireless sensors, mobile apps, and cloud systems to monitor public infrastructure like streetlights.

These systems help detect problems automatically, allow secure communication, and operate efficiently. While they improve maintenance, they are focused on a single part of the city and can't manage a wide range of civic issues. Looking at all this, the research shows that AI, computer vision, IoT, GPS, cloud computing, and geospatial tools have been successful in solving specific problems in smart city management. These solutions are accurate, make processes faster, and run efficiently in their areas. However, none of the studies has created a single system that combines AI-based image classification, image-text validation, GPS for finding similar complaints, smart complaint prioritization, automatic routing to the right department, real-time tracking of complaints, and rewarding citizens. So, there is still a lot of room to develop a complete smart civic management system that can tackle many city problems while making services more transparent, involving citizens more, and improving the efficiency of city services.

VIII. LIMITATIONS OF EXISTING SYSTEM

While much has been made of advances in applying Artificial Intelligence techniques to civic complaints and the detection of road damage, several issues remain with the state of the art. A lot of these systems tend to be addressing single issues alone, like potholes, rubbish broken streetlights rather than providing a unified platform capable of dealing with various issues in the city. Most of these solutions rely heavily on images to identify problems, because of this their accuracy can be affected by bad quality images, bad lighting or different camera angles.

Also, a lot of deep learning models require big data and quick computers; it is difficult to use those methods on cheap and slow computers. Most complaint handling systems will let people complain and check the progress of a complaint. Still, you cannot detect duplicate complaints, auto-prioritize and routing of complaints to the appropriate department from them. This also results in additional work for the authorities, increased delays, and poorer services to city consumers. Though there has been improvement in location tracking due to GPS and geotagging, the existing systems still do not integrate the different mediums of information images, text, and maps for validation of the complaints. Also, only some of the features presented in the few existing works can be easily related to citizens (such as feedback, rewards or obvious dashboards that tend to increase participation).

Basically, existing solutions address some aspects of smart city administration. But its ground up approach lacks a comprehensive, scalable and smart platform to cope with a variety of complaints efficiently. They cannot be accurately categorized, open and transparent, communicate smoothly and have effective citizen participation.

IX. FUTURE RESEARCH DIRECTION

As can be seen from what has been written about this topic, there are of course many aspects that can be studied further in the future when it comes to the use of AI to process complaints from citizens. In the future, it would be best to create systems capable of processing different kinds of civic problems simultaneously, rather than in a piecemeal way. One can use information from, for example, image analysis, text messages, GPS, and real-time sensor information to improve the reliability of the complaint checking process. Also, the employment of state-of-art artificial intelligence techniques, including multi-modal deep learning, Explainable Artificial Intelligence (XAI) and Federated Learning, can also contribute to the transparency of the system, ensure people's privacy and enhance decision making processes. Automatic considerations such as duplicate complaint detection, prioritization as severity of complaints, forwarding complying into appropriate departments can improve efficiency of city services and reduce the manual effort for citizens. Later, these systems should also motivate citizens to participate with other initiatives like incentives, gamification, and consulting feedback to improve the service.

The use of Internet of Things (IoT) devices, cloud computing, Edge Intelligence, and Geospatial-to-Cloud tools should enable continuous observation of the city's infrastructure and the identification of issues before they arise. Though, it is also important to design systems that are scalable to larger urban populations while maintaining privacy, ensuring system performance, and maintaining resource efficiency.

X. CONCLUSION

This paper presents a compilation of up-to-date works on topics like AI-based civic complaints, road damage recognition, waste sorting, and the overall idea of a smart city. Based on the literature, these existing platforms have quite good functionalities, like complaint filing, image recognition, GPS-based tracking, and real-time monitoring. Though each of these systems addresses separate civic issues, there are not really any of these ones that have the ability to combine all of the aspects of a civic management issue. The major constraints that are pointed out in this paper are the lack of intelligent duplicate complaint detection capabilities, the absence of the mechanism for automatic complaint ranking, and the lack of mechanisms for unifying complaint handling as well as effective ways of engaging citizens.

To overcome this major problem of the civic systems, the developers are proposing Smart Civic Systems with Integrated Recognition of Rewards system. This new system, in fact, is a fusion of image-based AI categorization, location tracking using GPS, detection of duplicate complaints, automatic routing to the department, real-time complaint tracking through the system, and a reward recognition mechanism. The main objectives of designing the system are to raise the level of efficiency, ensure complete transparency and establish a reliable environment for civic issues as well as to mobilize the citizens for an active role in the civic affairs and make their feedback part of the solution. The utilization of mobile phones and the cloud will support the system

and by incorporating AI methods, this system will be a powerful solution promoting smart city concepts and resulting in cleaner, safer and more sustainable city areas.

REFERENCES

- [1] M. Kanthi and R. Dilli, "Smart streetlight system using mobile applications: Secured fault detection and diagnosis with optimal powers," *Wireless Networks*, vol. 29, pp. 2015–2028, 2023, doi: 10.1007/s11276-023-03278-9.
- [2] F. Ozoglu and T. Gökgöz, "Detection of road potholes by applying convolutional neural network method based on road vibration data," *Sensors*, vol. 23, Art. no. 9023, 2023, doi: 10.3390/s23229023.
- [3] J. Zeng and H. Zhong, "YOLOv8-PD: an improved road damage detection algorithm based on YOLOv8n model," *Scientific Reports*, vol. 14, Art. no. 12052, 2024, doi: 10.1038/s41598-024-62933-z.
- [4] F. Shama, A. Aziz, and L. B. M. Deya, "CitySolution: A complaining task distributive mobile application for smart city corporation using deep learning," *arXiv:2410.12882 [cs.HC]*, 2024.
- [5] N. V. Kamble, M. Shinde, S. Teli, P. Dalal, and S. Karpe, "CitizenConnect: Real-time grievance management app," *International Advanced Research Journal in Science, Engineering and Technology*, vol. 11, no. 2, pp. 85–89, 2024, doi: 10.17148/IARJSET.2024.11213.
- [6] S. Swain and A. K. Tripathy, "Automatic detection of potholes using VGG-16 pre-trained network and convolutional neural network," *Heliyon*, vol. 10, Art. no. e30957, 2024, doi: 10.1016/j.heliyon.2024.e30957.
- [7] G. Kim and S. Kim, "A road defect detection system using smartphones," *Sensors*, vol. 24, Art. no. 2099, 2024, doi: 10.3390/s24072099.
- [8] H. A. Khan, S. S. Naqvi, A. A. K. Alharbi, S. Alotaibi, and M. Alkhathami, "Enhancing trash classification in smart cities using federated deep learning," *Scientific Reports*, vol. 14, Art. no. 11816, 2024, doi: 10.1038/s41598-024-62003-4.
- [9] E. F. S. Sherley, S. T. S. Kaanth P, and J. Samuel S, "Comprehensive dataset for urban streetlight analysis," *arXiv:2407.01117 [cs.CV]*, 2024.
- [10] D. D. Meshram, R. R. Sahu, S. V. Pathak, K. P. Fukte, A. P. Darodkar, G. S. Ramtekkar, and M. S. Meshram, "Smart civic issue reporting, resolution & waste recycle reward system," *International Journal of All Research Education and Scientific Methods*, vol. 13, no. 11, pp. 1377–1380, 2025.
- [11] G. Ahmad, F. M. Aleem, T. Alyas, Q. Abbas, W. Nawaz, T. M. Ghazal, A. Aziz, S. Aleem, N. Tabassum, and A.M. Ibrahim, "Intelligent waste sorting for urban sustainability using deep learning," *Scientific Reports*, vol. 15, Art. no. 27078, 2025, doi: 10.1038/s41598-025-08461-w.
- [12] A. Gaurav, B. B. Gupta, V. Arya, R. W. Attar, S. Bansal, A. Alhomoud, and K. T. Chui, "Smart waste classification in IoT-enabled smart cities using VGG16 and Cat Swarm Optimized random forest," *PLOS ONE*, vol. 20, no. 2, Art. no. e0316930, 2025, doi: 10.1371/journal.pone.0316930.
- [13] R. Kumar B. N, T. S. S. R, S. P. R, and S. R, "CivicFix: Smart complaint routing for urban solutions," *International Journal of Advanced Research in Computer and Communication Engineering*, vol. 14, no. 12, pp. 145–150, 2025, doi: 10.17148/IJARCCE.2025.141222.
- [14] D. Kumar, "Smart city app for citizen complaint management," *Indian Journal of Engineering Research Networking and Development*, vol. 2, no. 5, 2025.
- [15] R. R. Sahoo, S. S. Mohanty, and S. Mishra, "iWatchRoad: Scalable detection and geospatial visualization of potholes for smart cities," in *Proc. 13th ACM IKDD Int. Conf. Data Science (CODS 2025)*, Pune, India, Dec. 2025, 9 pp., doi: 10.1145/3799830.3799873.
- [16] R. R. Sahoo, S. S. Mohanty, and S. Mishra, "iWatchRoadv2: Pothole detection, geospatial mapping, and intelligent road governance," *arXiv:2510.16375 [cs.CV]*, 2025.
- [17] F. G. David and J. Savitha, "FixMyCity – A geo-based smart civic complaint management system," *International Journal of Scientific Research and Engineering Development*, vol. 9, no. 1, pp. 1228–1231, 2026.
- [18] S. S. Choudhary, H. M. Chandanshive, P. P. Chande, A. R. Gaud, and A. Manjalkar, "CivicSync: Local civic complaint management system," *International Journal of Creative Research Thoughts*, vol. 14, no. 4, pp. 453–458, 2026.
- [19] S. Prakash, R. Chaurasia, and P. K. Chaubey, "Smart civic issue reporting system with hybrid AI classification and geospatial analytics for efficient urban governance," *International Journal of Engineering Research & Technology*, vol. 15, no. 5, pp. 1–5, 2026.
- [20] S. Mangave, V. Rajput, A. Mujawar, G. Hipparkar, and V. V. Kheradkar, "CivicAI complaint management system," *International Journal of Advanced Research in Computer and Communication Engineering*, vol. 15, no. 6, pp. 72–80, 2026, doi: 10.17148/IJARCCE.2026.15609.