

SAMADHAAN SETU: An AI Powered Smart Civic Issue Reporting and Management System

Guide: Ms. Monali Bure, Anshuman Shahu¹, Tohid Khan², Mansi Katre³, Samarth Dhait⁴, Vaibhav Bhandari⁵

¹Anshuman Shahu | Computer Technology | Priyadarshini Collage Of Engineering Nagpur

²Tohid Khan | Computer Technology | Priyadarshini Collage Of Engineering Nagpur

³Mansi Katre | Computer Technology | Priyadarshini Collage Of Engineering Nagpur

⁴Samarth Dhait | Computer Technology | Priyadarshini Collage Of Engineering Nagpur

⁵Vaibhav Bhandari | Computer Technology | Priyadarshini Collage Of Engineering Nagpur

Abstract

Civic issues such as potholes, garbage overflow, water leakage, and manholes are common problems in urban areas and often suffer from delayed reporting, incorrect categorization, and lack of transparency. Samadhaan Setu is an AI-enabled Progressive Web App (PWA) designed to provide a smart and transparent civic issue reporting system. The proposed system captures the citizen's precise geographical location, including latitude and longitude, and allows the citizen to upload an image of the issue. A MobileNetV2-based image classification model using transfer learning is trained on approximately 4,132 images across five categories: pothole, garbage overflow, water leakage, manhole, and unknown. The trained model is converted to TensorFlow.js for integration with the web application and enables automatic classification and department-wise routing of reported issues. The system also provides separate administrative panels, complaint status tracking, time-based escalation for unresolved issues, city-wise visibility, and resolution evidence to improve accountability and transparency. Samadhaan Setu is designed to support multiple Indian cities and aims to improve communication between citizens and municipal authorities through the integration of artificial intelligence, geolocation, and digital civic management.

Key Words: Artificial Intelligence, Civic Issue Reporting, Smart City, Progressive Web App (PWA), MobileNetV2, Transfer Learning, Computer Vision, Geolocation, Crowdsourcing, Civic Governance, Complaint Management, Transparency

1. INTRODUCTION

Rapid urban development has increased the demand for efficient management of public infrastructure and municipal services. Problems such as potholes, overflowing garbage, water leakage, and damaged or open manholes can occur frequently in cities and may affect public safety, cleanliness, transportation, and the overall quality of urban life. Identifying these problems at an early stage and communicating them to the appropriate authority is therefore an important part of effective civic management.

In many conventional reporting processes, citizens are required to manually describe the problem and, in some cases, identify the appropriate department. This can create difficulties when the citizen is unfamiliar with the administrative structure of the city. In addition, manually processing a large number of complaints can increase the workload of municipal authorities and may result in delays in categorization, assignment, and

resolution. Limited visibility of complaint progress can also make it difficult for citizens to know whether their reported issue has been addressed.

The development of smartphones, web technologies, geolocation services, and artificial intelligence provides an opportunity to improve this process. Citizens can contribute real-time information about public infrastructure through digital platforms, while geographical information can help identify the location of a reported problem. Similarly, computer vision techniques can assist in identifying the type of civic issue from an uploaded image, reducing the need for complete manual categorization.

To address these challenges, Samadhaan Setu is proposed as an AI-enabled Progressive Web App (PWA) for civic issue reporting. The system allows citizens to submit an image of a civic problem along with its precise geographical coordinates. The uploaded image is processed using a MobileNetV2-based image classification model developed through transfer learning. The model is trained using a custom dataset of approximately 4,132 images representing five classes: pothole, garbage overflow, water leakage, manhole, and unknown.

After classification, the reported issue can be directed toward the corresponding department through dedicated administrative panels. The proposed system also focuses on transparency by allowing citizens to monitor reported issues and their status. A time-based escalation mechanism can be used when a complaint remains inactive for a predefined period, such as three days. After an issue is resolved, completion evidence can also be made available to support greater visibility of the resolution process.

Samadhaan Setu is designed with a multi-city approach and can be configured for cities such as Nagpur, Mumbai, Pune, Delhi, Bengaluru, Hyderabad, Chennai, Kolkata, Ahmedabad, Jaipur, Lucknow, Surat, Indore, and Nashik. By combining artificial intelligence, geolocation, citizen participation, automated categorization, departmental routing, and transparency mechanisms, the proposed system aims to provide a more organized and accountable approach to civic issue reporting.

1.1 What Is MobileNetV2

MobileNetV2 is a lightweight Convolutional Neural Network (CNN) architecture developed for efficient image recognition, especially on devices and applications where computational resources are limited.

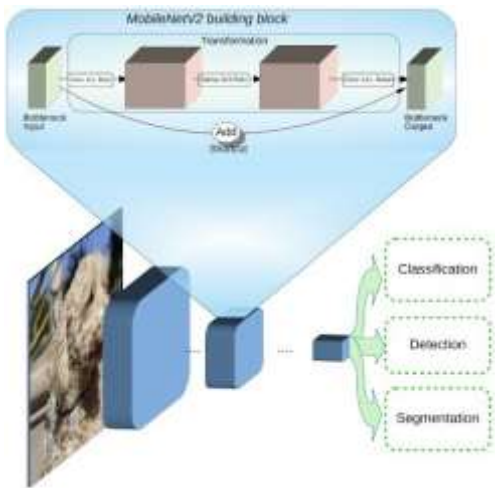


Fig - 1: MobileNetV2 Architecture

It is designed to provide good image recognition performance with fewer parameters and lower computational cost compared with many larger CNN architectures.

The Main concepts of MobileNetV2 are:

- **Depthwise Separable Convolution:** reduces computation.
- **Inverted Residual Blocks:** efficiently process features.
- **Linear Bottlenecks:** Preserve useful information while reducing dimensions.
- **Pretrained ImageNet weights:** allow the model to reuse features learned from a large image dataset.

2. Literature Review

The development of civic issue reporting systems has gradually progressed from basic web-based complaint portals toward mobile, location-aware, and AI-assisted platforms. Recent research has explored different approaches for improving complaint registration, issue prioritization, citizen participation, and administrative management. This section reviews selected studies from 2022 to 2026 and identifies the major technological developments and limitations relevant to AI-based civic issue reporting.

2.1 Mobile-Based Civic Issue Reporting

Walwadkar (2022) proposed a Smart Civic Issue Reporting System based on an Android application integrated with GPS technology. The system incorporated a hybrid CNN-RNN model along with SVM and NLP techniques to analyze reported issues and assist in determining their severity. The approach demonstrated the potential of combining mobile applications with machine learning for automating civic complaint prioritization. However, the system was primarily focused on the mobile environment and did not provide an

integrated web-based architecture with dedicated multi-department administrative panels for complaint routing.

2.2 Web-Based Civic Issue Management

With the increasing adoption of web technologies, subsequent research focused on improving accessibility, scalability, and complaint tracking. Maskar et al. (2024) developed a civic issue tracking system using HTML, CSS, JavaScript, LocalStorage, and MySQL. The reported system focused on improving complaint processing and demonstrated improvements in resolution time and concurrent-user handling. However, its categorization mechanism was primarily rule-based and did not incorporate real-time computer vision for validating uploaded images. This creates a limitation when handling irrelevant, misleading, or spam image submissions.

Gadekar (2024) proposed a crowdsourced civic issue reporting and resolution system using ASP.NET and C#. The system introduced a structured complaint workflow with status management and administrative email notifications for urgent issues. Although the approach improved departmental accountability, its use of older technologies and MD5 hashing presents security limitations. In addition, the system did not incorporate AI-based image analysis for automatically validating or categorizing photographic evidence.

2.3 Integration of AI in Civic Reporting

Recent research has increasingly explored artificial intelligence to improve the interaction between citizens and civic authorities. Thite K. B. (2026) proposed the Jan-Samasya Portal using technologies including React, TypeScript, Firebase, Supabase, and the Gemini API. The system incorporated an AI-based text chatbot to assist citizens with the reporting process. This demonstrates the potential of generative AI for improving accessibility and reducing user-support requirements. However, the AI component primarily focused on textual interaction rather than computer-vision-based validation of uploaded civic issue images. The study also did not provide isolated administrative panels for automated multi-department image-based routing.

Similarly, Sujeetha et al. (2026) proposed a crowdsourced civic issue reporting system incorporating a web platform, GPS, rule-based processing, crowdsourced upvoting, and live status dashboards. The approach aimed to improve communication between citizens and authorities by making complaint progress more visible. However, the absence of an advanced AI-based image validation mechanism limits its ability to automatically assess whether uploaded photographs are relevant to the reported civic issue.

2.4 Comparative Analysis

The reviewed studies demonstrate a clear progression from conventional complaint registration toward mobile applications, web-based platforms, crowdsourcing, and AI-assisted civic management. Mobile and GPS-based systems improved location awareness, while web-based systems improved accessibility and complaint tracking. More recent

systems have introduced AI-based conversational assistance and improved transparency through live dashboards.

However, the reviewed approaches show limitations in integrating computer vision directly into the civic reporting workflow. In particular, automated image-based classification and validation can reduce dependence on manual categorization and help route complaints to the appropriate department. Similarly, dedicated administrative panels for different civic issue categories can provide a more structured mechanism for complaint management.

2.5 Research Gap

Based on the reviewed literature, several research gaps can be identified:

1. Limited integration of real-time AI-based image classification into civic reporting workflows.
2. Continued dependence on manual or rule-based issue categorization in several systems.
3. Limited mechanisms for validating whether uploaded images correspond to the reported civic issue.
4. Lack of integrated multi-department administrative routing in several mobile-first and basic web-based systems.
5. Limited combination of image classification, precise geolocation, complaint tracking, escalation, and transparency within a single platform.

These gaps indicate the need for a unified civic reporting framework that combines AI-based image classification, geolocation, automated departmental routing, complaint monitoring, and transparency mechanisms. The proposed Samadhaan Setu addresses this direction by using a MobileNetV2-based transfer-learning classifier to categorize civic issue images and connecting the classification process with location-aware complaint management and department-specific administrative workflows.

3. Proposed System

Samadhaan Setu is proposed as an AI-enabled Progressive Web App (PWA) for reporting and managing common civic issues in urban areas. The system is designed to simplify the reporting process for citizens while providing municipal authorities with a structured mechanism for categorizing, routing, monitoring, and resolving complaints.

The proposed system focuses on four major civic issue categories: potholes, garbage overflow, water leakage, and manholes. An additional Unknown category is included to handle images that do not belong to the supported issue classes.

When a citizen wants to report an issue, the application first obtains the geographical location of the reported problem. The latitude and longitude coordinates are displayed to the citizen so that the location associated with the complaint remains visible and understandable. The citizen then uploads an image of the civic issue.

The uploaded image is processed using a MobileNetV2-based image classification model developed through transfer learning. The model is trained using a custom dataset of approximately 4,132 images across the five defined classes. After classification, the predicted category is used to determine the appropriate department for handling the complaint.

The system provides separate administrative panels for the four major issue categories. Complaints are routed to the corresponding department, where an authorized administrator can review the report and assign it for further action. The complaint can then progress through different stages, such as reported, assigned, in progress, and resolved.

The system also proposes a time-based escalation mechanism. If a complaint remains inactive for a predefined period, such as three days, a notification can be sent to a higher-level administrator. This mechanism is intended to reduce prolonged inactivity and improve administrative accountability.

3.1 Proposed Workflow

Samadhaan Setu is designed to support multiple Indian cities, allowing civic reports to be organized according to their geographical location. The overall proposed workflow can be represented as:

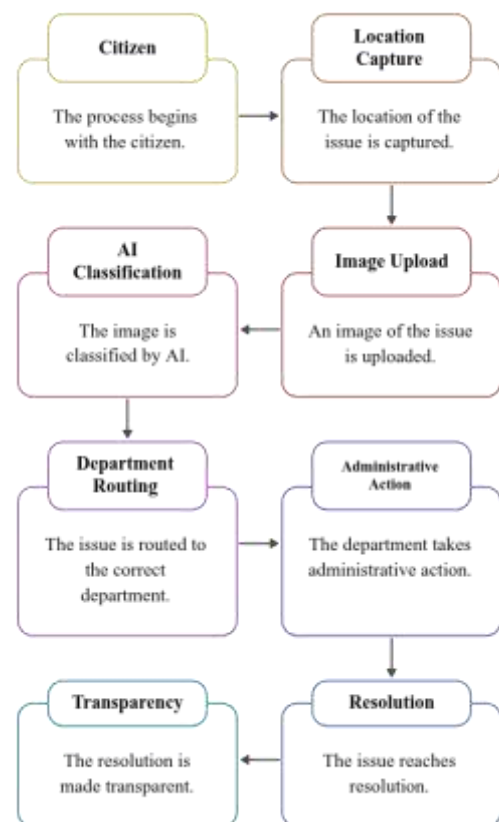


Fig - 2: Proposed Workflow

By integrating artificial intelligence, geolocation, citizen participation, departmental routing, complaint monitoring, and

transparency, Samadhaan Setu aims to provide a more organized and accountable approach to civic issue reporting.

4. Methodology

The methodology of Samadhaan Setu consists of a sequence of stages that integrate image classification, geolocation, complaint management, department routing, and resolution tracking.

4.1 Overall Methodology

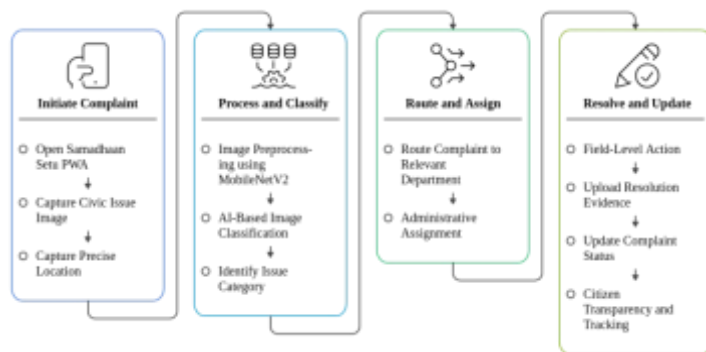


Fig - 3: Workflow

4.2 Location Acquisition

The PWA requests location permission from the citizen.

The system obtains the geographical coordinates (latitude and longitude).

Coordinates are displayed to the citizen for verification.

Location information is associated with the submitted civic complaint.

The location is used for identifying the affected area and supporting complaint routing.

4.3 Image Collection and Preprocessing

The citizen captures an image of the civic issue.

The input image is resized to 224×224 pixels.

Pixel values are normalized using $1/255$ scaling.

Data augmentation is applied during training.

Augmentation techniques include rotation, zoom, and horizontal flipping.

4.4 AI-Based Classification

A pretrained MobileNetV2 CNN is used as the feature extraction backbone.

ImageNet pretrained weights are used.

The MobileNetV2 base layers are initially frozen.

Global Average Pooling is applied to extracted features.

A 128-neuron Dense layer with ReLU activation is added.

Dropout with a rate of 0.3 is used for regularization.

A final Dense layer with 5 neurons and Softmax activation performs classification.

4.5 Issue Categories

The trained model classifies submitted images into five categories:

Garbage Overflow: 172 Images

Open Manhole: 421 Images

Pothole: 638 Images

Unknown: 2,492 Images

Water Leakage: 409 Images

Total Images = 4,135

The class having the highest Softmax probability is selected as the predicted category.

4.6 Model Training

Approximately 4,132 civic issue images are used.

Dataset is divided into 80% training and 20% validation data.

Batch size: 32

Training epochs: 15

Optimizer: Adam

Loss function: Categorical Cross-Entropy

Evaluation metric: Accuracy

Training is performed using Google Colab GPU.

The best validation accuracy achieved was 94.78% at Epoch 12.

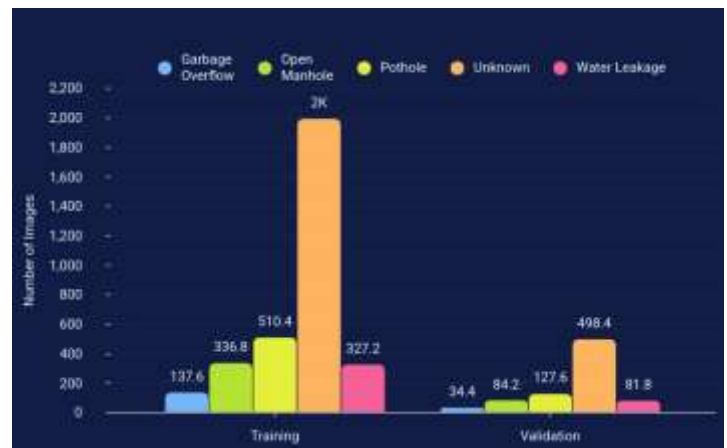


Fig - 4: Model Training

4.7 Complaint Routing

After classification:

AI Prediction

- Issue Category
- Relevant Department
- Department Admin Panel
- Officer/Field Worker Assignment

The four major issue categories are routed to their corresponding administrative departments. The Unknown category can be handled through administrative review.

4.8 Complaint Resolution and Tracking

Department administrators review incoming complaints. Complaints are assigned to responsible field personnel. Complaint status is updated during the resolution process. Resolution evidence can be uploaded through an after-resolution image. Citizens can track the status of their complaints. Time based escalation can be used when complaints remain unresolved beyond the defined period.

4.9 Transparency

1. Relevant civic complaints can be displayed to citizens for better public awareness.
2. Complaint status provides visibility into ongoing actions and resolution progress.
3. Before and after images can provide evidence of completed civic work.
4. City-wise and department-wise information can support transparency and accountability.
5. Resolved complaints can be shared on social media platforms such as Discord and Bluesky to increase public visibility of completed civic work.
6. Social media sharing can provide an additional channel for communicating successful resolutions and improving public engagement.

4.10 MobileNetV2 Model Testing



Fig - 5: Animals Image
(Not related to the civic issue)

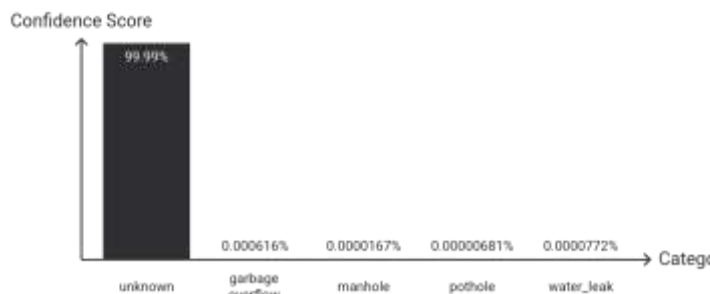


Fig - 6: Unknown Image Classification

Figure 6: Unknown Image Classification:

The model correctly classified the non-civic image as Unknown with 99.99% confidence, while the probabilities for other civic issue categories were negligible.

```
1/1 ————— 0s 46ms/step

Predicted: unknown (99.99%)

All scores: {'garbage': np.float32(6.158651e-06),
'manhole': np.float32(1.6706052e-07), 'pothole':
np.float32(6.812339e-08), 'unknown':
np.float32(0.9999163), 'water_leak':
np.float32(7.721465e-05)}
```



Fig 7: Garbage Overflow
(Related to the one category of civic issue)

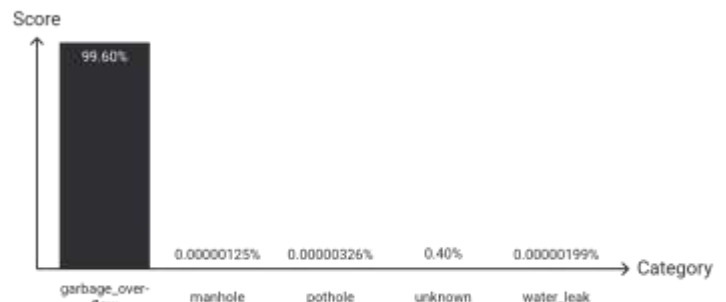


Fig - 8: Garbage Overflow Image Classification

Figure 8: Garbage Overflow Classification:

The model classified the garbage overflow image as Garbage Overflow with 99.60% confidence, with very low scores for the remaining categories.

```
1/1 ————— 14s 14s/step

Predicted: garbage (99.60%)

All scores: {'garbage': np.float32(0.995974),
'manhole': np.float32(1.2549543e-06), 'pothole':
np.float32(3.2597045e-06), 'unknown':
np.float32(0.004019511), 'water_leak':
np.float32(1.9882855e-06)}
```

5. Architecture

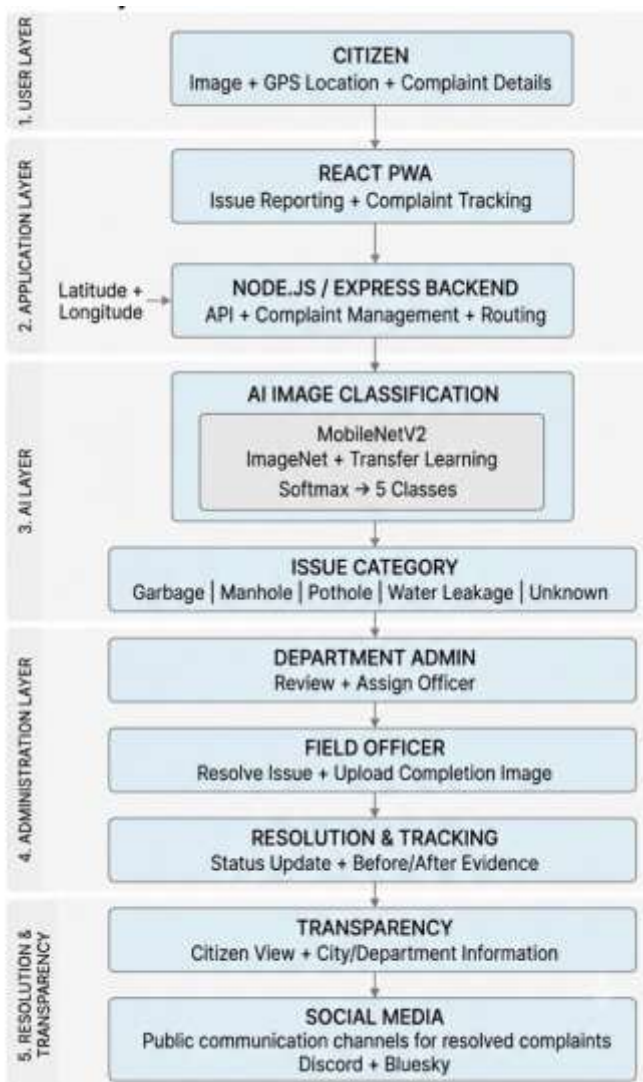


Fig - 9: Architecture

6. CONCLUSIONS

Samadhaan Setu provides an AI-enabled framework for civic issue reporting and management by integrating image classification, precise geolocation, automated department routing, complaint tracking, and transparency features. The MobileNetV2-based model achieved a best validation accuracy of 94.78% for five civic image categories. The proposed system can reduce manual complaint categorization and improve communication between citizens and municipal authorities. Resolution evidence, status tracking, and plan

social-media integration further enhance transparency and public awareness. The system can be extended to multiple cities and additional civic services in the future.

ACKNOWLEDGEMENT

We express our sincere gratitude to Ms. Monali Bure, Professor, Department of Computer Technology and, Priyadarshini College of Engineering, Nagpur, for her invaluable guidance, continuous encouragement, and insightful suggestions throughout the development of this review work. Her expertise and mentorship greatly contributed to shaping the direction and enhancing the quality of this study.

We also extend our sincere thanks to all the faculty members of the Department of Computer Technology and Engineering for their valuable feedback, support, and encouragement. Finally, we acknowledge the contributions of our peers and mentors for their constructive discussions and technical insights, which helped enhance the overall quality of this paper.

REFERENCES

- [1] M. Sandler, A. Howard, M. Zhu, A. Zhmoginov, and L.-C. Chen, "MobileNetV2: Inverted Residuals and Linear Bottlenecks," Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2018, pp. 4510-4520.
- [2] M. Sandler and A. Howard, "MobileNetV2: The Next Generation of On-Device Computer Vision Networks," *Google Research*, Apr. 3, 2018.
- [3] "A Bayesian Spatial Model to Correct Under-Reporting in Urban Crowdsourcing," Proceedings of the AAAI Conference on Artificial Intelligence, 2024.
- [4] TensorFlow, "TensorFlow.js: Machine Learning for JavaScript," TensorFlow Documentation.
- [5] "CitySolution: A complaining task distributive mobile application for smart city corporation using deep learning," *SoftwareX*, vol. 27, 2024, Article 101829.