

# Swachh Alert: Image-Based Detection of Public Spitting

Shreya Chordiya

Department of Computer Science  
Dr. D. Y. Patil Arts, Commerce & Science College,  
Pimpri, Pune, Maharashtra, India

Durvesh Falak

Department of Computer Science  
Dr. D. Y. Patil Arts, Commerce & Science College,  
Pimpri, Pune, Maharashtra, India

**Abstract** - Clean public spaces are very necessary for better health and a good quality of life. Public cleanliness plays an important role in stopping illness and creating a healthy environment for people. One common problem seen in several cities is public spitting, which spreads dirt, germs, and illness. Spitting in public places makes roads, footpaths, and public areas unhealthy and annoying. Monitoring such behaviour by humans is very hard and time-consuming because it needs continuous observation and a large employee. Existing solutions mainly depend on manual cleaning, warning boards, which are very rare, and people supervising. These methods are slow and not very effective because the same places become dirty again after cleaning. Warning boards are often ignored, and human monitoring cannot be done at all places all the time. Due to these restrictions, there is a need for a smarter and more automated solution to recognize spitting activities in public areas.

This research paper presents Swachh Alert, a spitting detection system that detects public spitting using camera footage and Python-based image detection techniques. The collected data helps to understand which areas are clean, which areas need more observation, and where spitting is regular. This information is useful for identifying cleanliness patterns in distinct locations. The system may face limitations such as internet failure or technical issues, which can affect live monitoring and data storage. Proper handling of such challenges is important for dependable performance. While using cameras in public places, people's privacy is handled carefully to avoid misuse of data. Overall, Swachh Alert supports smart city capabilities and promotes a cleaner and healthier environment by helping authorities understand public cleanliness issues in a better way.

**Keywords:** - Artificial Intelligence, Public Cleanliness, Spitting Detection, Smart City, Swachh Bharat

## 1. INTRODUCTION

Complaints related to public cleanliness are often slow and not very effective. Many cities face serious problems related to hygiene and sanitation, especially in public places such as roads, bus stops, railway stations, and public buildings. One major issue that is commonly seen

is public spitting. Spitting in public places spreads dirt, bad smell, and harmful germs which can cause serious health problems. It also affects the beauty and cleanliness of cities and creates an unhealthy environment for people. Even though cleanliness is an important part of a healthy society, stopping public spitting is very hard. Authorities mainly depend on manual cleaning and society's complaints to handle this problem. However, manual cleaning requires a lot of time and which leads to sometime waste of time, money, and human effort, and the same places often become dirty again within a short time. Complaint-based systems also take time to respond and do not always reach the correct authorities on time. Because of these reasons, such methods are not very effective for a long time as a solution. Many public places already have cameras installed for safety and monitoring purposes. As a result, it becomes difficult to understand where cleanliness problems occur frequently and which areas need more attention. Without proper data, planning cleaning activities becomes challenging for authorities. The idea of Swachh Alert is based on the require for a smarter and more arranged way to understand public spitting behaviour. The system focuses on finding spitting activities and collecting useful information. This information can help in considering patterns of public spitting and identifying areas that require special observation. Instead of focusing on punishment, the system aims to support awareness and better problem solving. It also supports the aims of smart cities by inspiring cleaner public spaces and promoting healthier living conditions. Proper care is taken assurance that people's privacy is respected while monitoring public places.

## 2. LITERATURE REVIEW

AI-powered photo surveillance has been widely studied for recognizing behaviours such as trespassing, violence, and traffic violations [1]. Deep learning-based object detection algorithms like YOLO (You Only Look Once) are commonly used due to their real-time actions and high accuracy [2].

Several researchers have researched AI-based systems for detecting littering and spitting in public places. Prior research highlights the use of convolutional neural networks (CNNs) to detect such actions from images and photos [3]. However, most of these systems concentrate

only on detection and shortage of analytical reporting for area-wise cleanliness planning. Additionally, deficient supply of real-world spitting datasets remains a challenge [4]. The proposed Swachh Alert system addresses these breaches by integrating detection with data storage and visualization.

### 3. PROPOSED METHOD

#### 3.1 System Architecture

The Swachh Alert system is designed to systematically detect spitting behaviour from live camera feeds and store the information for more detailed study.

System synopsis

The system consists of the following components:

- Camera or CCTV feed
- AI-based detection model
- Event storage database
- Cleanliness analytics dashboard

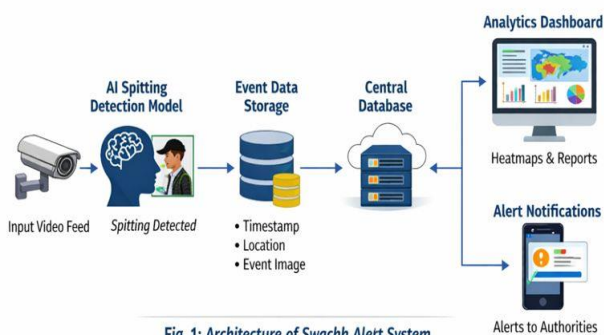


Fig. 1: Architecture of Swachh Alert System

#### 3.2 Methodology

- Live photo is captured from the camera.
- Photo frames are taken out and pre-processed.
- trained deep learning model evaluations each frame.
- If spitting action is detected, the event is recorded
- The dashboard displays area-wise and time-wise spitting dataset.

#### 3.3 Unique / Highlight Features

- Real-time AI-based spitting detection using computer vision
- Behaviour-based cleanliness mapping instead of random monitoring

- Dashboard-driven decision support for cleaning authorities
- Non-punitive approach focused on awareness and planning
- Privacy-aware design with scope for face anonymization
- Scalable system for detecting littering and other hygiene violations.

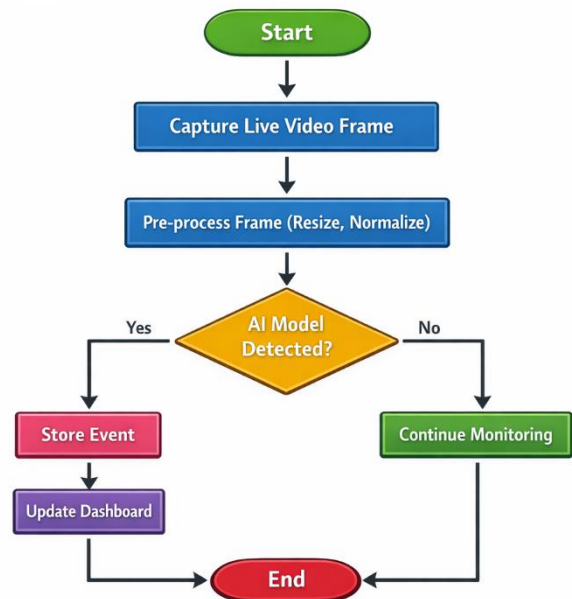


Fig. 2. Flowchart of Swachh Alert System

### 4. RESULTS AND DISCUSSION

#### 4.1 Expected Results:

Trying out the Swachh Alert system involved using trial pictures along with real-time camera feeds - this helped see what it could do when spotting people spitting. When visuals were sharp and unambiguous, the tool managed to pick up on that behaviour without issues. Timing mattered most; capturing the exact snapshot linked spitting to the right moment, confirming basic functionality when things were running smoothly. This shows the system finds the right action if both picture clarity and how the camera is set work well. When spitting is noticed, the setup instantly saves the taken picture on a digital dashboard. Time and location tags come along too, part of the stored data. Keeping every observed event neatly logged becomes easier because of this setup. What makes the dashboard work is how it gathers everything into one clear spot. Information sits here for later checking, which means officials do not have to dig through many sources. Having space to hold records on demand helps them look back at events whenever needed.

Even though it started out shaky, the outcomes point toward solid performance when it comes to spotting issues and logging data. Because of what unfolded during evaluation, trust in its ability grows - especially around clearing up cluttered signals into readable formats. That kind of clarity might just guide smarter choices down the line.



Fig. 3: Sample Output of Spitting Detection

#### 4.2 Detection evaluation

Under bright lighting, the system correctly pinpointed spitting behaviour most of the time. Visual insights from the dashboard revealed hotspots where spitting happened often, while quieter zones stood out too. With these details, city planners might adjust trash collection routines to match real demand. Despite solid performance, spotting people in busy spots or low light often lowers how accurately objects are classified. Over time, stronger results might come from adding more examples during training, also swapping out older camera setups for newer models that handle such conditions better.

When placed right, the camera allows steady performance. Clear images during use improve how well the system identifies movements. Watching changes on the dashboard regularly reveals trends that

### 5. CONCLUSION

This paper presented Swachh Alert, an AI-based system for detecting public spitting using computer vision and deep learning techniques. The system enables automated monitoring, data collection, and area-wise analysis of spitting behaviour. By shifting from manual observation to AI-driven insights, Swachh Alert supports cleaner public spaces and smarter cleanliness planning. With further improvements and real-world deployment, the system has the potential to significantly contribute to smart city and public health campaigns.

#### 5.1 Applications

- Smart cities
- Railway stations and bus stops
- Markets and crowded areas
- Municipal corporations
- Public health departments

#### 5.2 Future Scope

1. Immediate cleaning dispatch
2. Integration with IoT-based cleaning machines
3. Expansion to more public behaviour detection
4. Mobile app for authorities
5. AI-based awareness display boards

### 6. REFERENCES

- [1] Wikipedia, *Artificial Intelligence for Photo Surveillance*, 2024.
- [2] J. Redmon et al., "You Only Look Once: Unified, Real-Time Object Detection," *IEEE Conference on Computer Vision and Pattern Recognition*, 2016.
- [3] N. Chaudhari et al., "Swachh AI: Real-Time Spitting Detection Using Camera," *International Journal of Advanced Research in Computer and Communication Engineering*, 2022.
- [4] A. Sharma et al., "Automated Detection of Public Littering and Spitting Using Deep Learning," *IJARSC*, 2023.
- [5] S. Jain et al., "Deep Learning-Based Human Action