ResQNet - Concurrent Protection to Living Things to Connect Public with NGOs

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Abstract. Stray dogs represent one of the major problems in India, according to NCDC (National Centre for Disease Control) reports in 2024 & 2025, including road accidents and dog bite cases. To address this issue, we are developing a web platform that allows public users to submit reports to registered NGOs. This website is built using EJS, CSS, and JS for the front end, Node.js for the server, and PostgreSQL for the database. To determine the user's location, we utilise the Navigator API, a browser-based tool that provides the user's current coordinates. Additionally, a custom feedforward CNN model is employed to detect stray dogs in uploaded images, and the Distance Matrix API is used to calculate distances between the user's location and NGOs, which are then used to find the nearest NGO to send the submitted report effectively. Once the nearest NGO is identified, a notification about the incident is sent via Twilio.

Keywords: Stray dogs, NGO, CNN, Distance Matrix API, Twilio, PostgreSQL.

1 Introduction

Stray dogs pose a significant threat to urban areas in India, where urbanization is growing rapidly, and inadequate animal control measures and limited awareness contribute to their rising population across the country. According to various reports (IDSP, NCDC, etc.), India has one of the largest stray dog populations in the world, raising concerns about the spread of rabies, road accidents, public fear, uncontrolled breeding, and animal welfare issues. While governmental bodies and NGOs play an important role in addressing these issues, the absence of a unified technological system often hinders effective collaboration [3][7] between citizens and organizations.

NGOs are the primary responders in cases involving injured, aggressive, or abandoned dogs. However, they face several issues, such as a lack of timely information and no proper information about the location. On the other hand, citizens also do not know which NGO to approach or how to report effectively.

To bridge this gap and connect the public with registered NGOs, we propose a web-based platform called ResQNet, where citizens can report stray dog-related incidents

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by uploading photos, selecting the nature of the problem (e.g., treatment required, aggressive behavior), and sharing their GPS-based location. The platform integrates the Navigator API to capture live coordinates and the Distance Matrix API to identify the nearest NGO and faster response.

2 Related Works

- This enables GPS-based reporting of snake sightings. While effective for location tracking, it lacks verification and response mechanisms. This limitation highlights the need for validation, which the authors [1] address in ResQNet through CNN-based image verification.
- It provides a platform for reporting human–wildlife issues. However, the system primarily focuses on data collection and does not support response allocation. ResQNet extends this by integrating automated NGO assignment, as proposed by the authors [2].
- Analyses crowdsourced civic platforms and emphasises challenges related to data reliability and user-generated content. While improving participation, systems lack domain-specific validation, motivating the use of CNN-based verification in ResQNet to enhance credibility by authors [3].
- Presents a web-based platform for NGO management and coordination, improving communication and organizational efficiency. However, it lacks support for real-time incident handling and response mechanisms. ResQNet addresses this gap by enabling immediate response to reported cases [4].
- Focuses on citizen science data collection for biodiversity monitoring and highlights challenges related to data quality and validation. However, the approach relies heavily on post-collection verification rather than real-time validation, indicating a gap addressed by ResQNet [5].
- Explores computer vision applications in animal welfare monitoring, demonstrating the potential of AI-based techniques. However, it does not integrate these methods into a unified reporting and response system, which ResQNet aims to achieve [6].
- Proposes a digital portal to enhance NGO outreach and collaboration. While effective for communication, it lacks real-time incident management and automated routing, underscoring the need for an integrated system such as ResQNet [7].
- This is an IoT-based wildlife monitoring system for real-time tracking. However, it lacks user-based reporting and real-time incident response [8].
- It is a deep learning-based animal detection system for surveillance. However, it does not support real-time alerts or emergency response [9].
- It uses an IoT system for forest fire detection and wildlife protection. However, it is limited to fire scenarios and lacks user reporting features [10].
- This is a mobile-based emergency response system using location tracking. However, it does not address wildlife-specific incidents [11].

- Reviewed citizen science in environmental monitoring. However, it focuses on post-processing rather than real-time validation [12].

2.1 Front End

Composed of EJS, CSS, and JavaScript. EJS is used for server-side rendering to fetch data from the database. JavaScript handles responsiveness, fetches the user's location via the Navigator API, and sends alerts.

- Public Page: Captures coordinates, camera access for dog images, and problem descriptions.
- NGO Page: Displays NGO details, reports received, and posts.
- Post Page: Displays accomplishments and images of rescued dogs.

2.2 Back End

Handled via Node.js and Express.js to manage requests and API calls.

- Distance Matrix Api: Determines the distance between the user and the NGO to find the nearest responder.
- Axios: A promise-based HTTP client for making API calls.
- Bcrypt: Used for password hashing during authentication. Passwords are stored as hashed values, and during login, the entered password is hashed and compared to the stored hash.
- CNN: CNN used to detect stray dogs, consisting of convolutional and max-pooling layers for feature extraction, followed by a fully connected layer for classification. It is trained on labelled images with preprocessing (resizing, normalization) using backpropagation, Adam optimizer, and cross-entropy loss.

2.3 Database

Created using PostgreSQL to store user information and reports.

- Public Schema: Contains details like usernames and passwords.
- NGO Schema: Contains contact details and location information.
- Reports Schema: Stores incident reports and coordinates.

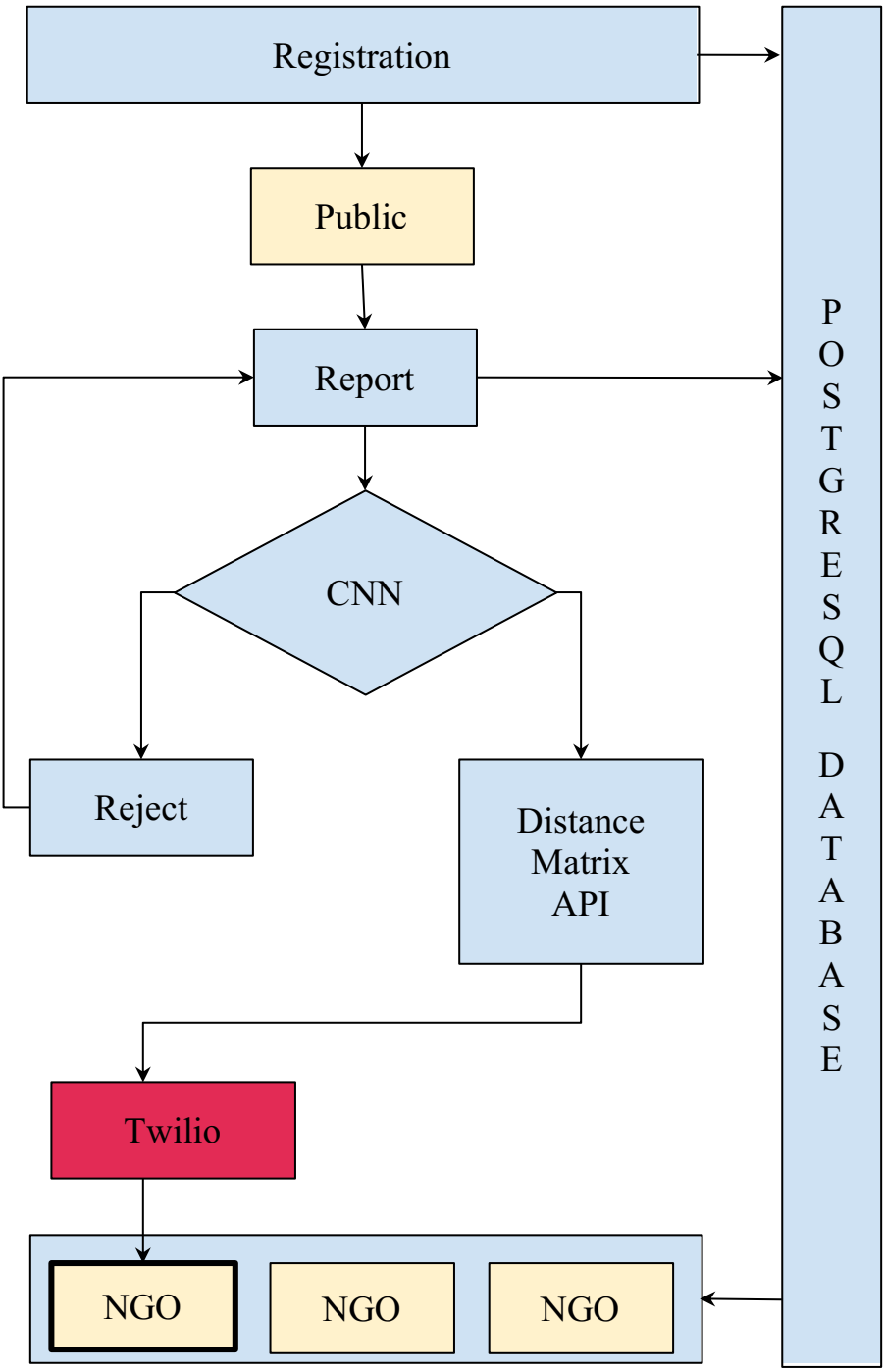

Fig. 1. System Architecture.

Once the user submits the report it is passed on to Convolutional Neural Network for image analysis, the model outputs class probabilities, and if the probability of the stray dog class exceeds a defined threshold, the report is recorded in the database along with the location shown in fig.1. Now this location is used to identify the nearest registered NGO using Distance Matrix API to which the notification is sent using Twilio [7].

3 Technologies

- EJS: Template language for server-side rendering.
- CSS: Styling language for a modern UI.
- JS: JavaScript for website responsiveness.
- Node & Express: Runtime environment and framework for routing and middleware.
- Twilio: Cloud communication for integrating SMS notifications.
- PostgreSQL: Reliable Object-Relational Management System.

4 Workflow

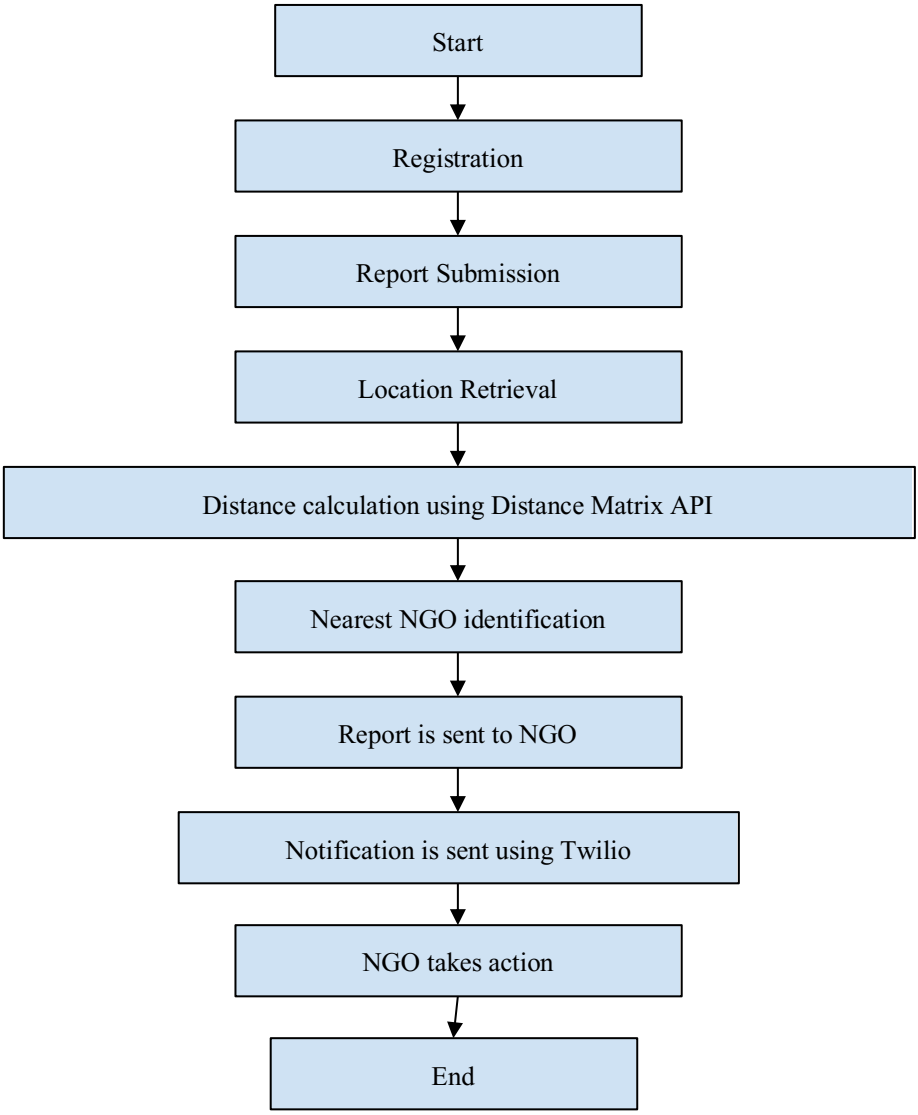

Fig. 2. Flowchart of the process.

The NGOs are required to register with their details (name, location, etc.) as shown in fig. 2. Next, the public needs to submit a report on the website along with an image of the stray dog, during which their location is retrieved using the geolocation API. The returned data consists of a key-value pair, “value:7561,” for each registered NGO; the

lowest value indicates the nearest NGO. Using a simple algorithm, the lowest value is identified, and the NGO is notified about the incident.

5 Result

The motive of this project is to develop a system that verifies stray dog reports, identifies the nearest NGOs and enables real-time notification for quicker response, thereby reducing the population of stray dogs and preventing stray dog bite cases for a safer environment with a good relationship between the public and NGO.

Fig. 3. CNN image prediction.

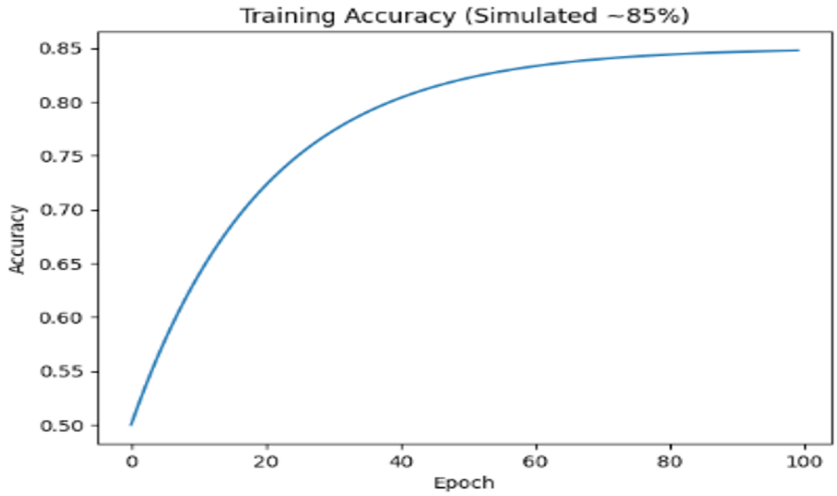

Fig. 4. Accuracy graph for CNN model.

The results in fig. 4 confirm that the CNN-based image classifier successfully detects the presence of a stray dog with 85% accuracy in images submitted by users along with their reports [3]. The model analyses the uploaded images and predicts whether a dog is present, ensuring that only images with stray dogs are processed further. This image verification system improves reliability by reducing false reports, ensuring that NGOs receive only proper reports submitted by users.

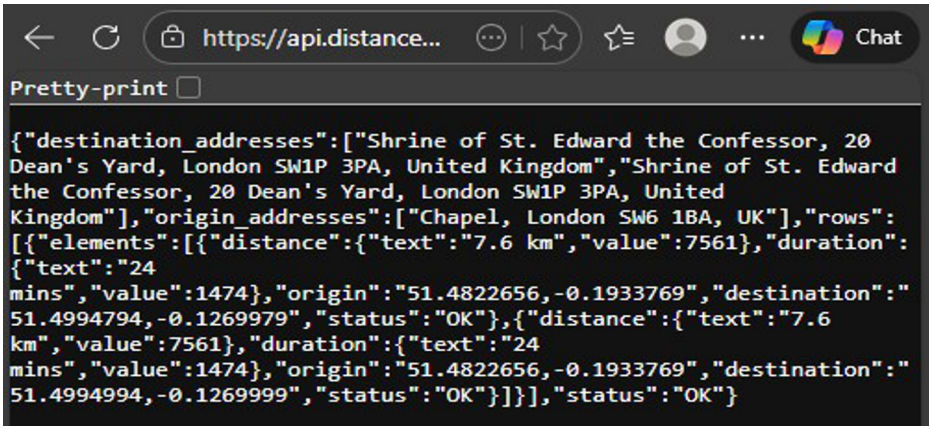

Fig. 5. Distance Matrix API calculating distance between public and NGOs.

The results in fig.5 above show the use of the DistanceMatrix.ai API to calculate distances between the reported incident location and the NGOs' locations. The returned data consists of a key-value pair, “value:7561,” for each registered NGO; the lowest

value indicates the nearest NGO. Using a simple algorithm, the least value is identified, through which the NGO is notified about the incident.

id [PK] integer	latitude integer	longitude integer	description character var	image character var
1	13	80	[null]	L:\New fo...
2	13	80	[null]	L:\New fo...

Fig. 6. PostgreSQL database schema.

The above fig.6 shows the use of PostgreSQL as the backend database for the system. All report details, including user information, incident location, uploaded image metadata, NGO assignment, and report status, are securely stored in PostgreSQL. This ensures reliable data persistence through ACID-compliant transactions, efficient for data retrieval and proper database integration for managing and tracking records.

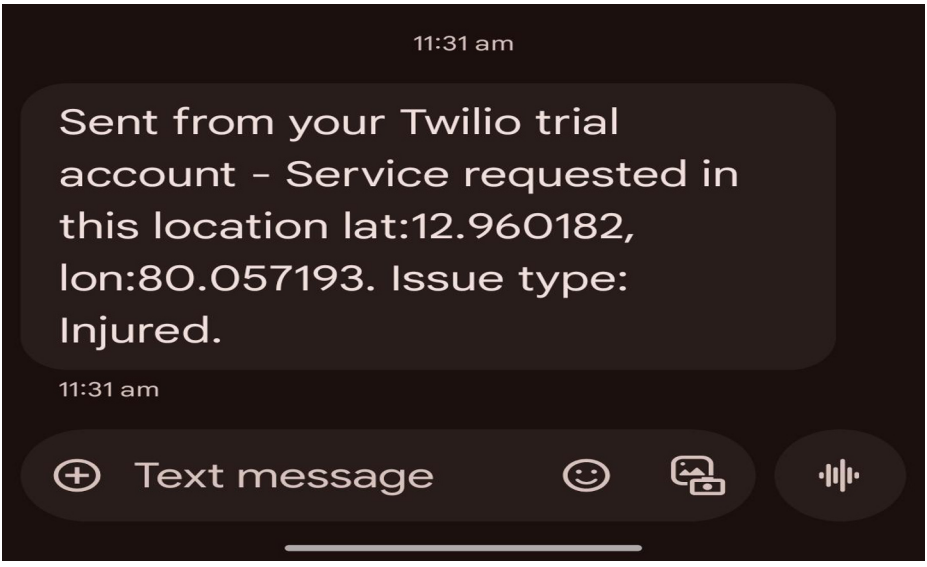

Fig. 7. Real-time Twilio notification system.

The above Fig.7 shows that the SMS notification was successfully received by the registered NGO, confirming proper integration of the Twilio APIs with the application. This result proves that the system can automatically notify the NGO, once the nearest NGO is identified [7]

Overall, the above results show that the proposed project effectively integrates image verification system, location-based NGO identification, secure data management, and real-time notification, making it suitable for practical deployment in stray dog monitoring and response systems.

6 Conclusion

ResQNet is a web platform that connects the public users with NGOs for reporting stray-dog incidents. This system allows the public to submit stray-dog reports as soon as they encounter them, which notifies the nearest NGO for an immediate response and quicker action to resolve the issue. By deploying this project, the overall population of stray dogs can be reduced, rabies cases can be reduced, and the problems they have created can be mitigated.

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