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Enhancing Human Safety and Biodiversity Protection: A Proposed AI-Driven Automated Smart System for Identifying Rabies-Afflicted Dogs Near Sukanta Mahavidyalaya, Dhupguri

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ABSTRACT

In this part of the world, in India, the deaths due to dog bites for rabies almost take precedence and there is hardly any area where so many people die from rabies as a result of dog bites, except in the countryside, where towns merge and assistance comes too late. A new kind of watchful system could revolutionize the way sick animals are detected before harm can be done, not far from Sukanta Mahavidyalaya in the town of Dhupguri, West Bengal. In lieu of relying on a person to see a problem, cameras and motion-sensing devices detect odd behavior as it occurs. These tools are trained using deep learning to recognize patterns, which differentiate between normal actions and indications that a dog might be suffering from rabies. The network is activated if unusual motions occur, such as a person stumbling for no apparent reason or acting aggressively, and alerts on phones carried by locals are sent. No central command center required, each piece communicates with the following, and awareness is created in a step-by-step manner. The initial testing runs around the colleges demonstrated quicker turn-around times than the earlier system of relying only on word-of-mouth or delayed reporting. Minimized delays equates to fewer bites, less panic, and slower spread of diseases between land-bound animals. If this type of school is replicated in other neighborhoods, it could be a silent force for good in a community. It starts innocently on the campus and then filters out, not a lot, but consistent - roads get thinner, medical aid follows.

KEYWORDS: Automated system; Rabies; Sukanta Mahavidyalaya; Biodiversity; Dhupguri.

1. INTRODUCTION

Rabies can still kill people, but it doesn't have to - many cases of rabies occur in India. Most are following the dog bite and usually hit kids and teens, particularly at the town/farmland interface. Achievement is limited due to late warning, incomplete records, lack of coordination of animal health systems. Despite national plans, there are real barriers to the goal set for 2030 of stopping dog linked infections. In one such place, Sukanta Mahavidyalaya is located in the farming area of Dhupguri in West Bengal. Here, people meet roaming dogs on a daily basis: in front of classrooms, houses, fields with crops. Early detection of abnormal animals could help limit the spread of the disease, influence medical decisions following contact, alleviate the impact on both pets and wildlife in the area (Kasse et al., 2025; Mac Loughlin, 2025; Radhakrishnan et al., 2020).

Advances in machine thinking, image reading and linked devices make it possible for individuals to create inexpensive automatic watch systems to identify ill livestock. Due to such tools, this study proposes a smart alert setup that is operated by algorithms created specifically for Sukanta Mahavidyalaya land and its surrounding areas, particularly for dogs that are likely to be suffering from rabies. This method is accompanied by intent – filling gaps in the monitoring of areas, assistance to community members to be smarter, to serve as an example in the community to protect lives and nature even in facing outbreaks locally (Vanak et al., 2023; Mullick & Mandal, 2026).

2.1. The Impact and Problems of Rabies

Rabies outbreaks are continuing in most areas, primarily from dog bites. If there is a case, it is not necessarily recorded: local health systems do not record cases. If there is testing, it is too time-consuming, and reporting is often not well outlined. Even if clinics are close, slow vaccine response and poor knowledge and care of wounds after animal attacks exacerbate the situation (Ojija et al., 2025; Mullick & Mandal, 2025).

Growth is rapid, unplanned and here in the towns that meet the countryside in Dhupguri, for instance – the number of stray dogs grows and access to animal care is low. This deficiency allows rabies to fit between packs of uncontrolled dogs, and spread quietly. The life of the wild inhabitants – mammals, birds and others – that live nearby, changes when disease enters unknowingly through these wanderers.

2.2. Role of Ai and Smart Systems in Animal Health Surveillance

To identify disease in animals, most of the time, the computer identifies patterns. These are used to look at a dog's behaviour or symptoms of disease to determine the likelihood of rabies. There are pictures of farm/wild animals too, which are used to find illness. As a result, the warnings are quicker. Vets get assistance when making choices. The need for individuals to review each individual case is minimal. This has been proven to work in a number of situations (Hulme et al., 2023; Ghosh & De, 2025; Gupta et al., 2025; Radhakrishnan et al., 2020; Mullick & Mandal, 2026).

In these towns and smaller cities in India, the test runs of the monitoring setups show the impact of technology on the number of cases identified and vaccines delivered. But nearly all of the current approaches expand the scope too much – they're for the district or for the state as a whole, and that doesn't inevitably reflect the cadence of the school itself, or the local rural contexts. That deprivation triggers another path – a bespoke AI system which develops in Sukanta Mahavidyalaya influenced by its environment.

3. OBJECTIVES OF THE STUDY

The automated smart system is based on the usage of AI driven smart solution intended to achieve the following basic goals in the present investigation:

- As it happens, when dogs are spotted near Sukanta Mahavidyalaya that may have rabies, the process happens in a flash. Warning is distributed to nearby residents no later than it goes out to the people affected. This close watch is the College site and homes around the College. When an animal is ill, alerts are given immediately. Everything happens as it happens, and everyone is informed.
- The rule of thumb for warnings is, "the sooner the better." The campus staff are alerted to the call first. Clinics in the vicinity are notified as well. Animal helpers are integrated in the process. This is not a common scenario for close encounters. This leads to a reduction in injuries. Dogs stay at a distance more frequently. The key to making this possible is quick messages.
- Reduced spread of rabies into local wildlife and domestic animals reduces natural variety. If numbers of infected foxes, dogs or raccoons decline, ecosystems remain more balanced. The less animals are sick, the less they pose a risk to others. This change will help native species to survive over time.
- New ways to monitor rabies start with more basic equipment, and remain cost effective. One lab could give rise to another, especially in areas of limited resources. It could be used at other locations with similar situations, and modified as appropriate. The idea is to be clear, not flashy or cumbersome – easy to carry from community to community.

4. METHODOLOGY: SYSTEM ARCHITECTURE

One continuous pulse of connection – real-world signals without interruption – out there, somewhere. This stream is connected to smart systems that are able to filter out noise for meaning. From sense making comes steps forward – clear steps that are not random, but determined, by clarity. Humans, and people who are affected by their actions, follow suit. What emerges is not just tech, it's a connected system, sensing and thinking are connected and thinking is connected to doing and doing is connected to reacting together. The integrated AI IoT community framework is shown in Fig. 1 (Soumya et al., 2025).

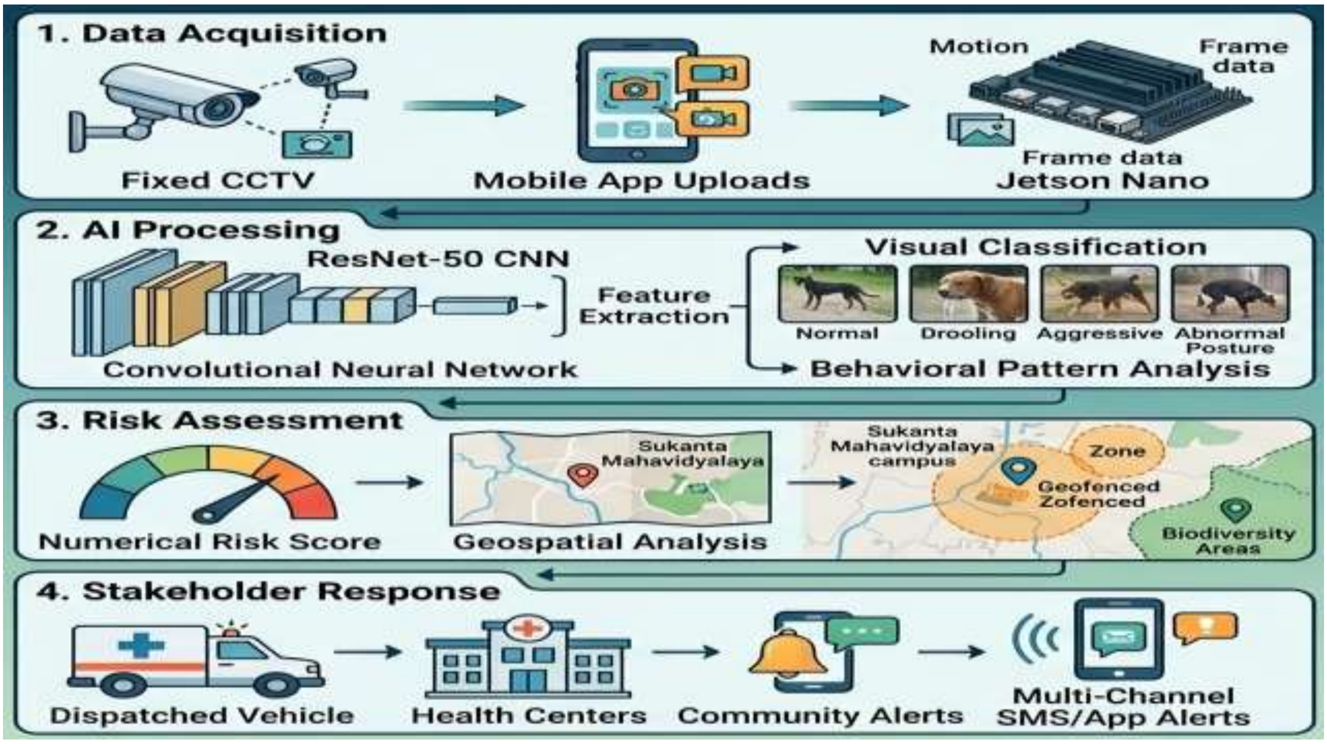

Fig. 1. Integrated AI IoT community framework

4.1. Data Acquisition Layer

First of all, sensors collect various data of monitored area. Multiple channels are received at the same time. Multiple information channels are received simultaneously. Each stream has a different element to the picture. The next piece is determined by the combination of the inputs. Signals come together but do not blend. Collecting takes place in a number of formats at once (Mullick & Mandal, 2024).

4.1.1. Camera Network

Close to the gates, eyes peer from above - stable posts with wires running from which the lives are broadcast. Lenses facing towards paths located near adjacent lanes are placed along building edges. In clear ground, glass is transparent during the day and night. All selected locations are oriented towards movement and feed far away. At all points from entrance to corners near rural trails, signals do not stop (Soumya et al., 2025).

A student occasionally sees a wild dog with some rough behaviour. A quick clip scrolls through the cell phone app. Staff can be infected, too - same story, straight into the system. If villagers spot something wrong, they take pictures. Here are the reports, in each of those categories. Real occasions, expressed in a rush. There is no fancy here, and only uncluttered piles of records.

4.1.2. IoT Sensors and Edge Devices

Video is processed directly where it is recorded using a small computer, like a Raspberry Pi or one of the Jetson models. Wherever there is motion, there is a reaction to that system. Selecting frames is done on site rather than in the cloud. Filtering reduces additional data prior to sending. The fewer bits that are traveling, the less strain is going into other parts. Pre-processing can help lighten the workload on the server equipment. A sound monitor may hear unusual sounds from the dog and relay these for a more detailed examination.

4.1.3. Community Based Reports

A tap is the beginning of it all – photos with location tagging, small videos, notes on symptoms like drooling or a lack of walking ability. Fast operation even for older smart phones. No additional actions required, simply snap and send. Clean and simple text boxes. In no time at all everything is uploaded. Woosps glitches and does not freeze. For real-life conditions, not ideal labs.

4.2. AI processing Layer

A clever engine is at the center of it all, with pictures and actions associated with dogs. From there, it is able to form a score indicating whether there is a risk of rabies - the ultimate score being influenced differently by each clue. Behaviour is equally important as an image, and contributes to the rating. It is unknown what will come out, but it does indicate some possible concern.

4.2.1. Image-Based Rabies-Risk Classification

A CNN learns patterns from labelled photographs of dogs exhibiting each of these: Normal behavior (baseline); Aggressive or confused behavior; Saliva dripping, more than usual, can appear along with a wobbly stance. There is a feeling of "off balance" when moving. Legs don't walk right; they stumble in unawares.

4.2.2. Behavioral-Pattern Analysis

Video clips come one frame at a time, showing how things move, which way, but also who or what they encounter on the way. Smart systems classify these moments, rather than guessing, according to characteristics detected by the cameras, as well as the time and location of the occurrence. Movement details are still used, along with image details, in a mix of movement clues in a model such as a Random Forest or XGBoost. Weighing each sighting as its behaviour changes its meaning depending on the context across visits. Risk is not determined - it changes when patterns are observed repeatedly under different conditions.

4.2.3. Users Contribute Information, Which Becomes a Combined Pool

When people share media with images taken by cameras, a single incident file is created for each dog (Bozzuto et al., 2020; Fitzpatrick et al., 2016; National Rabies Control Program, 2026). These files are time series data files that tabulate observations at a single location. The two sources are not separated, but instead the two sources become one. Frequent occurrences are repeated and recorded alongside time stamps. Repeated occurrences are repeated, and recorded next to timestamps. Information is not fragmented but gathers together. The Fig. 2 depicts the work flow of the system.

4.3. The Ability to Make Decisions and To Detect Warnings

The data comes out, and it heads to a system piece that assists in making choices - this component has rules that are optimized depending on the context:

4.3.1. Rabies-Suspect Threshold

The numbers indicate the risk involved in each dog sighting. If that number increases too quickly (either due to the same dog being reported by multiple people within a short period of time), the system flags it as being possibly rabid (Sobha Xavier et al., 2023).

4.3.2. Geospatial Proximity Analysis

The system monitors dogs in the vicinity of human population, such as Sukanta Mahavidyalaya, houses, schools or shops. It also observes their proximity to the lands where nature relies on them – forest boundaries, rivers, ponds, farmland with free-ranging animals.

4.3.3. *Automated Alert Generation*

If the barking is too frequent near houses, it could be a problem. Messages, sirens or/and radio tones must be able to sound the alert as soon as possible. There are many sounds that are associated with one sign. Networks are awakened by trouble that is nearby. One viewing of the iconic image switches buttons on screens. Warnings spread out – rapid, silent, relentless. Signals flash on when dogs behave abnormally in the vicinity of forests. The word doesn't go down the first path only. Every alert connects to another one and so on.

If someone nearby opens the app, alerts trigger – messages are sent by SMS or email to campus security – and alerts are also sent to local animal-control teams. These appear to remind people to maintain a distance between people. It is recommended at that moment, to stay apart. Warnings are only displayed if you are nearby. The screen tells you before getting too near, when someone nears a school or clinic, an alert goes off. This assists medical sites to prepare vaccines in advance in case. Sites remain prepared in case of exposure in the vicinity. There are only limits to the areas where alerts are issued. Early warnings enable staff to act quickly. The notification is automatically created if the user is close. Preparation starts when there are no confirmed cases. The simulated pilot results of the system are shown in Fig. 3.

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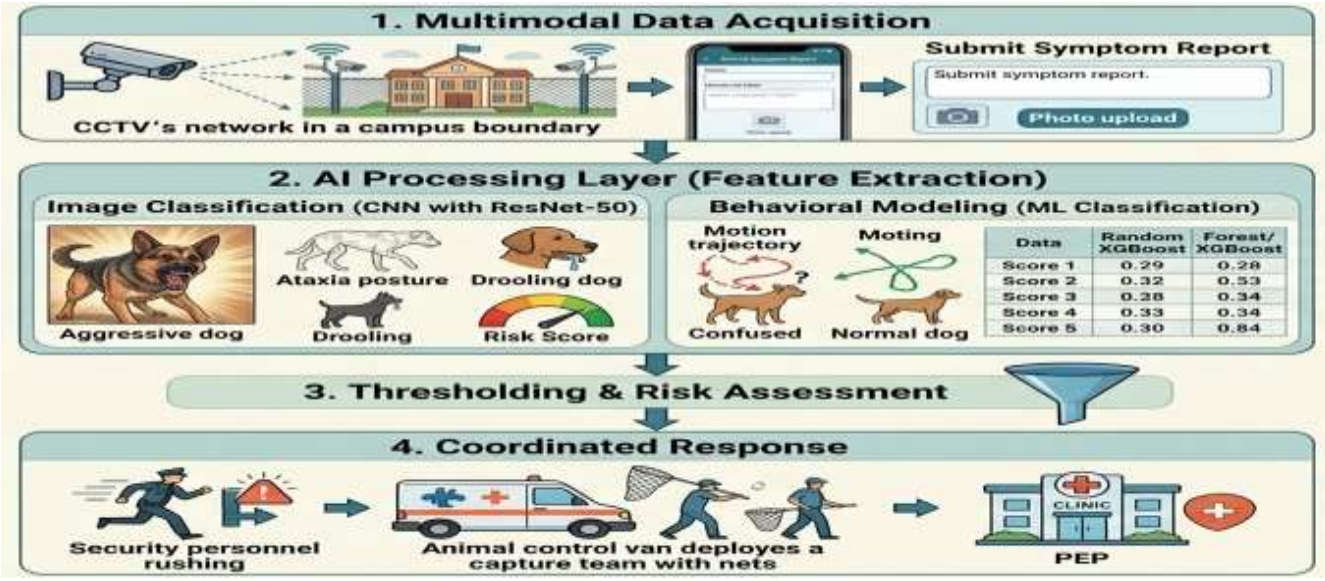

Fig. 2. Work flow of the system

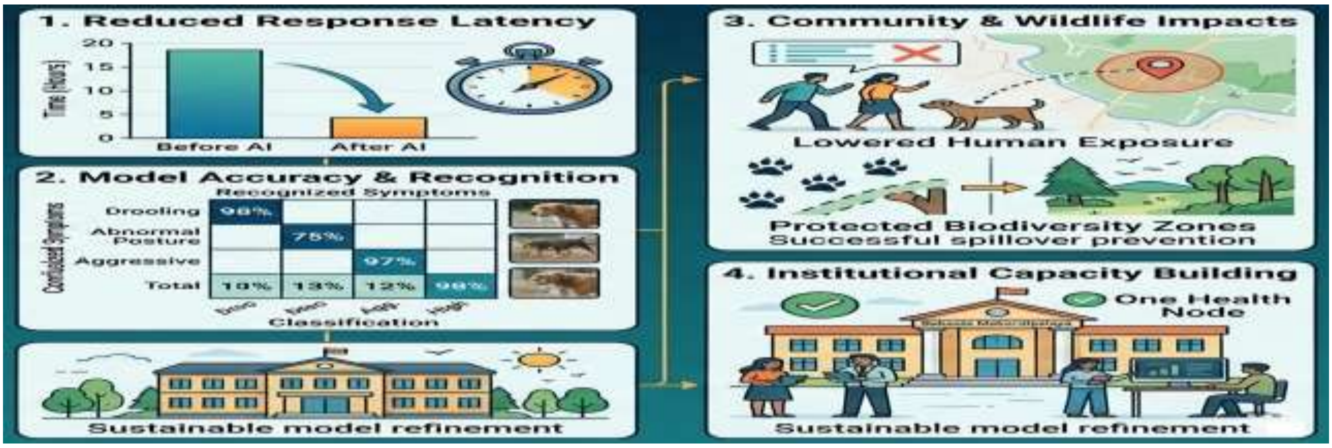

Fig. 3. Simulated pilot results of the system

4.4. Stakeholder Response Layer

One action at a time dictates the response of teams on the ground, under the auspices of the National Rabbies Rules. What is to come is dependent on the actors that are united in common objectives.

4.4.1. Immediate Containment and Veterinary Intervention

If a dog exhibits unusual behaviour, a local dog rescue or animal organization may be able to intervene. On site, they gently approach the animal and do not chase the animal. The animal is then carried, under observation, to the medical personnel who examine it thoroughly. Lab work is performed if supplies permit to determine if the behaviour is caused by rabies.

4.4.2. Human-Health Follow-Up

Bite/Scratch is added immediately. Afterwards, the points towards the nearest clinic are displayed. This corresponds with the national rabies plan which states that immediate medical action is required after.

4.4.3. Campaigns For Vaccinations and Education

Information retrieved from the system influences the dog vaccination effort at times. School children, employees, even neighbours that come along join in with the talks and clear steps on care are shared. It is especially notable that shots are emphasized and knowledge of appropriate action given in the event of being bitten. Taking a proactive approach, showing up.

4.4.4. Biodiversity-Oriented Monitoring

Along with the regional forestry and animal protection teams it also documents occurrences of dogs near and around sensitive natural habitats to assist in the assessment of the potential threat to predators, plant-eaters, and whilst other wildlife species are barred from this.

5. EXPECTED CONTRIBUTIONS

5.1. Enhancing Human Safety

The system reduces the response time if a rabid dog appears on campus, either by waiting for reports, or by using smart tools that have the ability to detect danger at an early stage. Warnings are issued more quickly: Hazardous zones are temporarily vacated and people are moved away from hazard and any individual who has been bitten is dealt with right away. There have been fewer people who have suffered and died from rabies near Sukanta Mahavidyalaya due to these changes in positive identifying the threats before they can spread.

5.2. Supporting Biodiversity Protection

When reactions are not considered, wildlife suffers the most. What grows, eats, lives are interrupted by unplanned moves. Balance is quickly lost when people come running in anger. Calm choices are a necessity for nature not heated ones. Spatial and temporal patterns of dog illness are clearly evident. These sickness trends are relevant most near to wildlife abundance. Timing and place of observation are key to developing more effective protection plans. The higher the risk, the more animals are at risk in areas where they live, particularly if there is more activity by dogs in those areas.

5.3. Institutional and Community Engagement

Teachers and students in the zoology or environmental science, computer science or public health departments, work collaboratively to refine models, label information, verify results on the ground. The area around Dhupguri becomes tougher during ecological shifts, as people around the area observe and participate in the outreach.

6. IMPLEMENTATION CHALLENGES AND MITIGATION STRATEGIES

A system that is sustainable, but there are a number of practical and ethical issues to overcome before the system is realised in the real world.

6.1. The Quality and Privacy of Data

First, all the data will be scrubbed before it gets anywhere. This involves removing or obscuring metadata and any potentially identifying fragments of data that could point back to the dog or its owner. We will also ensure that any image that is uploaded is done so with informed and clear consent from the person and adhere to local data protection regulations.

6.2. Modelling With Bias and False Positives

The condition and breeds of the world are not uniform so we will keep the AI updated with fresh data from the local breeds. This practice will prevent an unfair bias towards or against any breed or area. More important, the AI will not be a diagnosis, it will be a “risk indicator” and the vet will have the final say.

6.3. Infrastructure and Connectivity

From the technical point of view, we will be adding edge computing units to the mix so that the model can run locally and won't be screaming for bandwidth. When the network connection is weak, we create the mobile app to be used in low bandwidth. Where the link goes wrong, they send basic SMS messages that keep stakeholders updated.

6.4. Ethics and Animal Welfare

All dogs will be treated in an ethical manner, with stress reduction procedures and will be monitored by vets at all times in all their care. Strict animal welfare standards will be followed – we will not be euthanizing animals for no good reason! That, if not after a careful diagnostic check and public-health risk assessment, is only a last resort.

7. DISCUSSION

The AI automatic smart system described herein is a first of its kind application of artificial intelligence in the control of rabies in a particular semi urban scenario of India. The use of technology and the geographical characteristics of local areas with community practices and institutional capacities are combined together in the system at

Sukanta Mahavidyalaya, Dhupguri. The campus model of the survey system has the following benefits over the comprehensive citywide surveillance system. It's used in a confined space where humans and dogs come in contact to validate alerts and track them fast. The environment of education facilitates learning, annotation of data and research which ultimately builds up local skills. Furthermore, the combination of safety of humans and protection of wildlife has become a priority in both NRCP activities and ecological health.

8. CONCLUSION

The objective of this paper is to present an automated smart system for the identification of rabid dogs around the vicinity of Sukanta Mahavidyalaya, Dhupguri with explicit considerations towards the human safety and conserving the biodiversity using the help of the artificial intelligence. The proposed system is an integrated system which involves a combination of real time image and behaviour analysis, edge-based IoT sensing and crowd-driven reporting of suspected rabid dogs in the human inhabited and biologically vulnerable areas. In case of a notification-into-action time lag, such a system would result in no human deaths due to dog bites from rabies, and also aid in the post-exposure prophylaxis strategy and help in reducing the transmission of rabies in wildlife in the immediate vicinity. The pilot system being implemented in Sukanta Mahavidyalaya can be replicated in other academic institutions and semi-urban communities across India where AI can be a progression tool.

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CONFLICTS OF INTEREST/COMPETING INTERESTS

The authors have no relevant financial or non-financial interests or conflict of interest to disclose.

REFERENCES

Bozzuto, C., Schmidt, B. R., & Canessa, S. (2020). Active responses to outbreaks of infectious wildlife diseases: objectives, strategies and constraints determine feasibility and success. *Proceedings of the Royal Society B: Biological Sciences, 287(1939),* 20202475. https://doi.org/10.1098/rspb.2020.2475

Fitzpatrick, M. C., Shah, H. A., Pandey, A., Bilinski, A. M., Kakkar, M., Clark, A. D., Townsend, J. P., Abbas, S. S., & Galvani, A. P. (2016). One Health approach to cost-effective rabies control in India. *Proceedings of the National Academy of Sciences, 113(51),* 14574–14581. https://doi.org/10.1073/pnas.1604975113

Hulme, P. E., Beggs, J. R., Binny, R. N., Bray, J. P., Cogger, N., Dhami, M. K., Finlay-Smits, S. C., French, N. P., Grant, A., Hewitt, C. L., Jones, E. E., Lester, P. J., & Lockhart, P. J. (2023). Emerging advances in biosecurity to underpin human, animal, plant, and ecosystem health. *IScience, 26(9),* 107462. https://doi.org/10.1016/j.isci.2023.107462

Ghosh, L., & De, A. (2025). Artificial Intelligence and Animal Ecology. CRC. https://doi.org/10.1201/9781003492788

Gupta, J., Pal, S., Jain, S., Bharti, D., Gurung, P., & Sharma, S. (2025). Emerging Paradigms and Predictive Models in Eco-Epidemiology for Disease Control in Human and Wildlife Populations (pp. 315–347). Springer Nature Singapore. https://doi.org/10.1007/978-981-95-0329-2_16

Kasse, G. E., Cosh, S. M., Humphries, J., & Islam, M. S. (2025). Leveraging artificial intelligence for One Health: opportunities and challenges in tackling antimicrobial resistance - scoping review. *One Health Outlook, 7(1),* 51. https://doi.org/10.1186/s42522-025-00170-8

Mac Loughlin, C. (2025). Harnessing the potential of AI in public health - A Narrative Literature Review of AI Applications in Zoonotic Disease Surveillance: A One Health Perspective (pp. 1–66) [Master's Thesis, Savonia University of Applied Science]. https://www.theseus.fi/bitstream/handle/10024/894003/MacLoughlin_Carolina.pdf?sequence=2

Mullick, R. K., & Mandal, R. K. (2024). An Efficient Elephant Detection Strategy using Visual Attention Network (VAN) in Custom Dataset improved YOLOv7 Model. *In DoSIER (pp. 26-39).* https://ceur-ws.org/Vol-3900/Paper3.pdf

Mullick, R. K., & Mandal, R. K. (2025). Application of Improved YOLO-LSTM with Combined MQTT-LoRaWAN for AI Surveillance in Tea Plantations to Prevent Elephant Intrusion. *International Journal of Advanced Computer Science and Applications, 16(12).* https://doi.org/10.14569/ijacsa.2025.0161212

Mullick, R. K., & Mandal, R. K. (2026). Artificial intelligence for mitigating the spread of communicable Diseases: Elephant health and population in the Dooars region of North Bengal. Zenodo (CERN European Organization for Nuclear

Research). https://doi.org/10.5281/zenodo.19274869

National Rabies Control Program. (2026). Mohfw.gov.in. https://rabiesfreeindia.mohfw.gov.in

Ojija, F., Ogwu, M. C., Ally, J., John, J. P., Stephano, A., Felix, N., & Tekka, R. (2025). Artificial intelligence-driven solutions for mitigating human–wildlife conflict in biodiversity hotspots. *Science Progress, 108(4),* 368504251394584. https://doi.org/10.1177/00368504251394584

Radhakrishnan, S., Vanak, A. T., Nouvellet, P., & Donnelly, C. A. (2020). Rabies as a Public Health Concern in India—A Historical Perspective. *Tropical Medicine and Infectious Disease, 5(4),* 162. https://doi.org/10.3390/tropicalmed5040162

Sobha Xavier, P., Joshy, J., Thayil, M. R., Nandalal, M., & Xavier, R. (2023). A Web Application for Enhancing Stray Dog Welfare: Identification and Virus Detection. 419–423. https://doi.org/10.1109/icscc59169.2023.10335055

Soumya, C., Akash Hari, K., Jose, J. K., Sunny, E., & Navaneeth Krishna, P. (2025). Real-Time Stray Animal Management System Using IoT and Computer Vision. 1–6. https://doi.org/10.1109/ciscon66933.2025.11337436

Vanak, A. T., Panchamia, N., Banerji, I., & Nair, M. (2023). A passive 'One Health' surveillance system to track canine rabies in urban India. CABI One Health. https://doi.org/10.1079/cabionehealth.2023.0022

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