

# Animal Safety and Welfare Using IOT

**Prof. Suhas Chavan<sup>1</sup>, Sakshi Jagtap<sup>2</sup>, Pratham Sampat<sup>3</sup>,  
Anjali Rangapure<sup>4</sup>, Parth Sawant<sup>5</sup>**

<sup>1</sup>Assistant professor and Guide, Vishwakarma University, Pune, B.TECH in Computer Engineering  
<sup>2,3,4,5</sup>Student, Vishwakarma University, Pune, B.TECH in Computer Engineering

## Abstract

The increasing need for animal welfare and conservation has led to the development of various technologies to monitor and manage animals. This research paper proposes a mobile application that integrates safety, adoption, foster, and IoT features to enhance animal welfare and conservation. The safety features include a reporting system for animal sightings, emergency alerts, information on local wildlife rehabilitation centres, and public education on animal welfare. The adoption and foster features provide a searchable database of adoptable animals and foster families, online applications and screening processes, in-app communication with shelter staff, and the ability to make donations to animal shelters. The IoT feature incorporates smart collars with sensors to monitor the animal's location, health metrics, and behaviour patterns, providing real-time notifications to the animal owner or caregiver when the animal requires attention or care. The application also includes analytics and data visualization to provide insights into the animal's overall health and behaviour patterns for proactive care. The proposed web application aims to promote animal welfare, conservation, and coexistence with wildlife, ultimately improving the overall well-being of animals.

## Introduction

The world's animal population faces numerous challenges today, including habitat destruction, human-wildlife conflict, and neglect. Animal welfare organizations, shelters, and rescue groups around the globe have been working tirelessly to address these issues. However, despite their efforts, many animals still require urgent assistance. To help fill this gap, we propose a comprehensive animal welfare and conservation platform that leverages the latest technology to provide solutions for safety, adoption, foster care, and IoT-based tracking.

Our platform aims to create a centralized hub for animal welfare, making it easy for concerned citizens, animal lovers, and pet owners to access critical information and services. The platform consists of multiple modules, including safety, adoption, foster, and IoT-based tracking, each of which addresses specific challenges facing the animal welfare community. The safety module enables reporting and mapping of animal emergencies, incidents, and wildlife sightings, while the adoption module facilitates pet adoptions and promotes animal welfare. The foster module connects animal shelters and rescue organizations with foster families, and the IoT module provides real-time monitoring and analytics for pets' health and behaviour.

In this research paper, we discuss the features and benefits of each module in detail and how they integrate to create a powerful and comprehensive animal welfare and conservation platform. We also highlight the potential impact of our platform on animal welfare, conservation efforts, and public education. By

leveraging technology and innovation, we aim to create a world where animals are safe, healthy, and well-cared for.

### **Problem Statement**

Animal welfare is an important issue in many countries, including India. However, there are several challenges that make it difficult for animal welfare organizations and individuals to provide the care and support that animals need. One of the major challenges is the lack of reporting mechanisms for animal abuse or neglect. Many cases of animal cruelty or neglect go unreported, making it difficult for authorities to take action to protect animals.

Another challenge is finding homes for animals in need. Animal shelters and rescue organizations often struggle to find adopters or foster families, leaving many animals without a permanent home. Additionally, there is limited visibility into animal health and behaviour, making it difficult for owners and caregivers to monitor their animals' well-being and take action quickly if necessary.

To address these challenges, the smart collar and web application developed in this research project includes features such as an animal safety reporting mechanism, adoption and foster platforms, and real-time monitoring of animal health and behaviour. The overall goal of the app is to improve animal welfare by providing a centralized platform for reporting, adoption, fostering, and real-time monitoring, making it easier for people to take action to protect and care for animals in need.

### **Motivation**

India is home to a large population of street animals, including dogs, cats, and cows, that face significant challenges in their daily lives. These animals often struggle to find food, water, and shelter, and are vulnerable to various dangers such as road accidents, cruelty, and disease. While there are many individuals and organizations working tirelessly towards the welfare of these animals, there is still a lack of awareness and resources to provide them with the care they need.

In this context, a smart collar and web application that monitors the health and activity of street animals can provide a potential solution to improve their welfare. This technology can help animal welfare organizations and individuals keep track of the animals they care for and provide them with the necessary medical attention and care.

The overall goal of this project is to enhance the welfare of street animals in India and provide them with better care and opportunities for adoption. By using this technology, animal welfare organizations and individuals can collaborate and work towards a common goal of providing better lives for street animals in India.

### **Literature Review**

Over the past few years, the issue of animal welfare has garnered significant attention in India due to the large population of stray animals and the prevalence of animal cruelty and neglect. Animal welfare organizations have recognized the potential of technology to improve the conditions of these animals and have initiated various innovative projects in this regard.

One such initiative is the "Street Dog Watch App" developed by "The Welfare of Stray Dogs," [9] which provides users with a platform to report incidents of animal abuse or neglect, locate nearby animal shelters or veterinary services, and connect with volunteers for support. The app also includes a section for

adoption and fostering of street dogs. This mobile application is just one example of how technology can be used to provide better care and support for animals in need.

Another mobile-based platform, "PetKonnnect," [7] is another example of the integration of technology in animal welfare. This app connects pet owners with veterinarians, pet groomers, and other pet-related services, allowing users to schedule appointments, purchase pet products, and receive notifications on their pet's health and wellness. By providing pet owners with easier access to pet care, this platform can help improve the overall wellbeing of pets.

Furthermore, IoT technology has also been implemented in animal welfare with the development of the "SmartVet" collar. This collar utilizes sensors and a mobile app to monitor an animal's health, including temperature, heart rate, and activity level. Although primarily designed for livestock animals, this innovation has potential applications for pets as well.

## Methodology

1. Data collection: The study will collect data on the features of the proposed web application through a combination of online surveys, focus groups, and interviews. Participants will include animal shelter staff, veterinarians, animal welfare organizations, pet owners, and potential adopters and foster families.
2. Analysis of data: The collected data will be analysed using qualitative and quantitative methods. The qualitative data from interviews and focus groups will be analysed through content analysis, while the quantitative data from surveys will be analysed through statistical software.
3. Development of the web application and IOT: The study will use the data collected to develop the web application and IOT, incorporating the features identified in the introduction. The development process will involve collaboration between software developers, animal welfare organizations, and pet owners.
4. Pilot testing: The developed web application will be pilot tested with a group of pet owners, animal shelter staff, and veterinarians to evaluate its usability and effectiveness. Participants will be asked to provide feedback on the features of the application, as well as their overall user experience.
5. Data analysis: The data collected during the pilot testing will be analysed through qualitative and quantitative methods to evaluate the effectiveness of the application. The results will inform any necessary modifications to the application before its release.
6. Release and evaluation: The final version of the web application will be released to the public, and its usage and impact will be evaluated through data analytics and user feedback. The study will assess the effectiveness of the application in achieving its objectives, including improving animal safety, adoption, and fostering, and its potential to contribute to the field of animal welfare and conservation.

## Impact

The impact of a smart collar and web application for street animals in India can be significant. By providing animal welfare organizations and individuals with a tool to monitor the health and activity of these animals, the overall welfare of street animals can be improved. The data collected through the collar and application can be used to identify animals in need of medical attention or intervention, reducing suffering and increasing the chances of survival for sick or injured animals.

In addition to improving the welfare of street animals, the smart collar and web application can also have a positive impact on human health. By reducing the number of sick or injured animals on the streets, the risk of zoonotic diseases spreading to humans is decreased. This is especially important in densely

populated urban areas, where the presence of street animals can pose a significant health risk. Furthermore, the web application can facilitate the adoption of street animals by providing a searchable database of adoptable animals and an online application and screening process for potential adopters. This can lead to more street animals finding permanent homes and fewer animals living on the streets. Overall, the implementation of a smart collar and web application for street animals in India has the potential to improve the welfare of animals, reduce the spread of zoonotic diseases, and increase the number of animals finding permanent homes. This can have a positive impact on both animal and human populations in India.

### Technologies Used

The animal smart collar application utilizes a range of software and hardware technologies to monitor an animal's health, behaviour, and location. On the software side, the application is built using React.js and Express.js, which are popular web development frameworks. The application uses MongoDB, a NoSQL database, to store and manage data related to the animal's health, behaviour, and location. Additionally, the application's user interface was designed using Figma, a popular design tool.

On the hardware side, the application utilizes several sensors, including the NodeMCU, MAX30100, MPU6050, DHT11, and NEO 6M GPS. The NodeMCU serves as the central controller in the animal smart collar application, managing the sensors, processing data, and communicating with the remote server or application. It collects data from the sensors, processes it using algorithms, and communicates the results to a remote server or application using Wi-Fi or cellular networks.

The MAX30100 is a pulse oximeter and heart rate sensor that is used to measure the oxygen saturation in the blood and the heart rate of the animal. This data is valuable for monitoring the animal's health and detecting potential health problems.

The MPU6050 is an accelerometer and gyroscope that is used to measure the animal's movement and orientation. This data can be used to track the animal's activity level and monitor its behaviour.

The DHT11 is a temperature and humidity sensor that is used to measure the temperature and relative humidity of the animal's environment. This data is valuable for monitoring the animal's comfort level and detecting potential health problems related to extreme temperatures or humidity levels.

Finally, the NEO 6M GPS is a GPS receiver that is used to provide accurate location data for the animal. This data is valuable for tracking the animal's location and ensuring that it does not wander too far from its designated area.

Overall, the animal smart collar application is a complex system that utilizes a range of software and hardware technologies to monitor an animal's health, behaviour, and location. The application's design and functionality make it a valuable tool for animal welfare organizations, veterinarians, and pet owners alike, and it has the potential to improve the lives of animals and their owners in numerous ways. The below figures show the circuit diagram and block diagram of our smart collar.

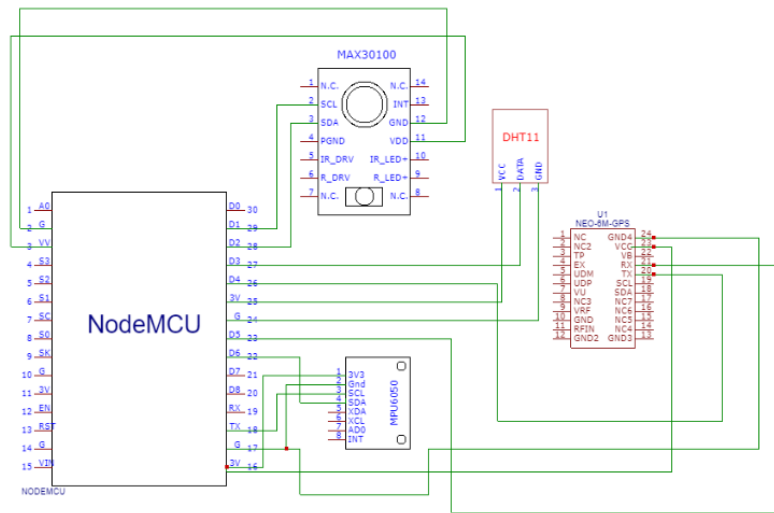


Fig 1.1 Circuit diagram of smart collar

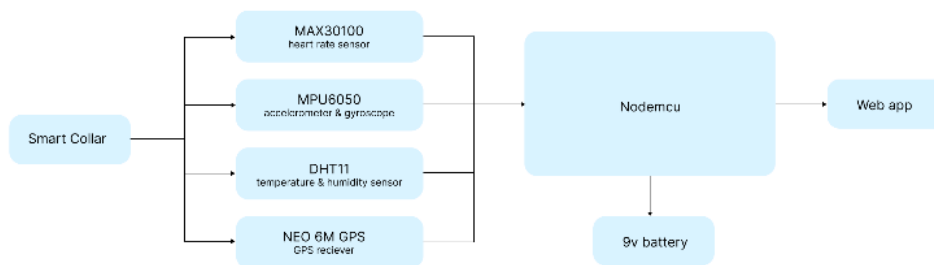


Fig1.2 Block Diagram

### Conclusion

In conclusion, the use of technology in animal welfare has the potential to significantly improve the quality of life for animals and increase efficiency for caregivers and organizations. Through our research, we have explored the various technologies used in animal welfare, including mobile apps, IoT devices, and other software and hardware tools. These technologies have been shown to help address key challenges in animal welfare, such as reporting animal abuse or neglect, finding homes for animals, and monitoring animal health and behaviour.

However, there are still limitations and challenges that need to be addressed, such as the cost of implementing these technologies, privacy concerns around data collection, and ensuring that these tools are accessible to all organizations and communities. Nevertheless, the benefits of technology in animal welfare are clear, and we believe that continued investment and research in this field will lead to significant improvements in the lives of animals and the people who care for them.

Overall, we hope that our research serves as a starting point for further exploration and development of technology in animal welfare. By working together, we can create a more compassionate and sustainable future for animals and humans alike.

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