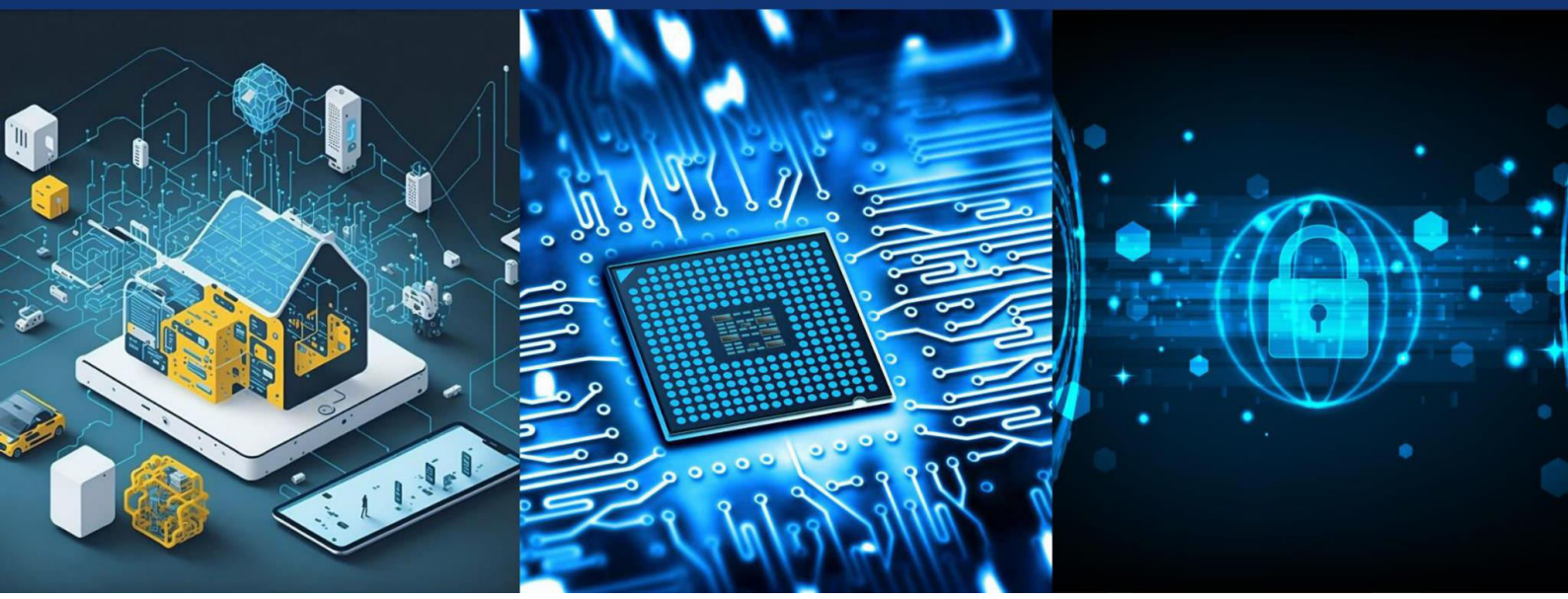
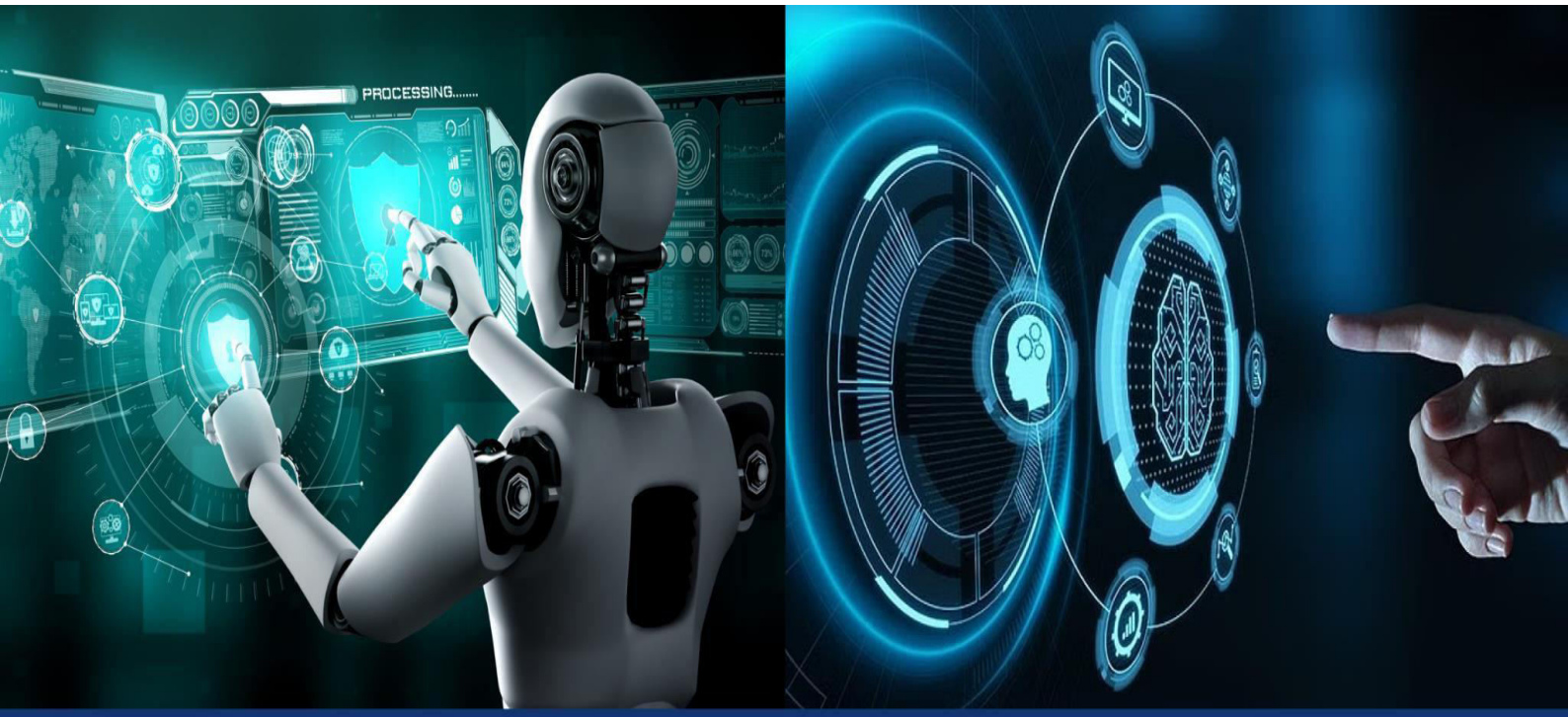
ISSN(O): 2320-9801
ISSN(P): 2320-9798



International Journal of Innovative Research in Computer and Communication Engineering

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.771 **Volume 13, Issue 6, June 2025**

© 2025 IJIRCCE | Volume 13, Issue 6, June 2025| DOI:10.15680/IJIRCCE.2025.1306056

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Review On IOT and AI based Smart Cattle Health Monitoring

Sneha Sarode[1], Vaishnavi Pathare[2], Dnyaneshwari Kulkarni[3] Namrata Shitole[4],

Mr. S. D. Jondhale[5] , Mr. Nilesh Gholap[6]

UG Student, Dept. of Computer Engineering, PREC, Loni, Maharashtra, India[1, 2, 3, 4]

Assistant professor, Dept. of Computer Engineering, PREC, Loni, Maharashtra, India[5, 6]

ABSTRACT: Livestock health monitoring is essential for maintaining productivity and preventing disease outbreaks. Traditional cattle health management methods rely on manual observation, which can be time-consuming and inaccurate. This project proposes an IoT and AI-based Smart Cattle Health Monitoring System to provide real-time health tracking and health monitoring & detection. The system integrates IoT sensors (such as skin temperature, heart rate, and motion sensors) to continuously monitor vital health parameters, including heart rate, activity levels, heat stress, ambient temperature, and sleep patterns. The collected data is processed using AI algorithms to analyze patterns and detect anomalies. If any abnormal health conditions are detected, the system sends instant alerts to the farmer through a mobile application, enabling timely intervention. This solution enhances cattle welfare, improves farm productivity, and reduces veterinary costs through data-driven insights and proactive healthcare management.

KEYWORDS: IoT, Artificial Intelligence, Cattle Health Monitoring, Smart Farming, Disease Detection, Livestock Management, Wireless Sensors, Real-time Data, Predictive Analytics, Mobile App Alerts, etc

I. INTRODUCTION

As Livestock plays a crucial role in the global agricultural industry, contributing to food production, dairy farming, and economic stability. However, ensuring the well-being of cattle remains a significant challenge due to the risk of diseases, heat stress, and other health-related issues. Traditional cattle health monitoring relies heavily on manual inspection, which is often time-consuming, inefficient, and prone to human error.

To address these challenges, this project proposes an IoT and AI-based Smart Cattle Health Monitoring System, which leverages advanced Internet of Things (IoT) sensors and Artificial Intelligence (AI) algorithms to provide real-time health tracking and predictive health monitoring & detection. The system continuously monitors vital parameters such as heart rate, skin temperature, activity levels, ambient temperature, heat stress, and sleep patterns.

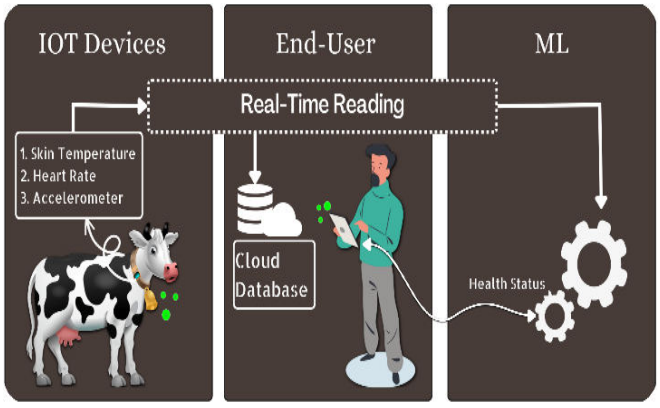


Fig1: Overview of the System

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

By analyzing this data, AI can detect early signs of illness, stress, or abnormal behavior. If any irregularities are found, the system immediately alerts the farmer through a mobile application, allowing for timely intervention.This smart monitoring system not only improves cattle welfare but also enhances farm productivity by preventing diseases before they escalate. With data-driven decision-making, automated alerts, and remote health monitoring, farmers can reduce veterinary costs, optimize breeding cycles, and ensure the overall well-being of their livestock. The integration of IoT and AI in cattle health management marks a significant step toward modernizing the agricultural sector, making farming more efficient, sustainable, and technology-driven

II. RELATED WORK

1. The integration of IoT and AI in livestock health monitoring has gained significant attention in recent years due to its potential to improve animal welfare and farm productivity. Traditional cattle health monitoring methods often involve manual inspection and periodic veterinary checkups, which can lead to delayed detection of illnesses. Researchers and industry experts have been working on sensor-based monitoring systems to automate this process and provide real-time health insights. Various studies have focused on using wearable sensors for tracking physiological parameters such as heart rate, temperature, and motion, ensuring early disease detection and timely medical intervention.

2. Several existing IoT-based solutions have been developed to monitor cattle health using wearable collars and ear tags. These devices track parameters like body temperature, respiratory rate, and activity levels. Some research projects have demonstrated RFID-based cattle tracking, which helps in identifying animals and monitoring their movement patterns. However, many of these solutions lack AI-driven predictive analysis, which is crucial for identifying potential health risks before they become severe. By integrating machine learning (ML) models, researchers have started to develop automated systems capable of detecting anomalies and predicting diseases based on historical data patterns.

3. One of the key challenges in IoT-based cattle monitoring is data processing and analysis. A large volume of data is generated by sensors, which needs to be processed efficiently to extract meaningful insights. Cloud computing and edge AI solutions have been explored to enable real-time data processing without excessive latency. Some studies have proposed blockchain-based secure data storage to enhance transparency and prevent data tampering. However, energy efficiency, data transmission reliability, and network coverage remain critical factors affecting the feasibility of such systems, especially in remote farming areas.

4. Existing AI-based livestock monitoring systems primarily use computer vision techniques for tracking cattle behavior, but they often face challenges in low-light environments or when animals are clustered. Recent advancements in deep learning and NLP have enabled voice-based alerts and chatbot interactions for farmers, allowing them to receive personalized recommendations based on their cattle's health data. While these solutions are promising, there is still a need for cost-effective, scalable, and farmer-friendly smart monitoring systems that require minimal technical expertise.

5.In comparison to prior research, the proposed IoT and AI-based Smart Cattle Health Monitoring System aims to bridge the existing gaps by combining multiple sensor data, AI-based predictive health analytics, and real-time mobile alerts. This system ensures continuous cattle monitoring, early disease detection, and stress-level analysis, empowering farmers with data-driven decision-making capabilities. By leveraging AI and IoT together, the system enhances the overall efficiency of livestock management, reduces veterinary costs, and ensures the well-being of cattle with minimal human intervention.

III. PROBLEM STATEMENT

Livestock health plays a crucial role in the agricultural and dairy industries, directly impacting productivity, profitability, and food security. However, traditional cattle health monitoring methods rely on manual observation and periodic veterinary checkups, which often result in delayed health monitoring status & detection and increased mortality rates. Farmers and livestock owners struggle to identify early signs of illness, heat stress, or abnormal behavior, leading to higher veterinary costs, reduced milk production, and potential economic losses.

Despite advancements in animal healthcare, existing monitoring systems are either too expensive, lack real-time insights, or fail to provide AI-driven predictive analysis. Additionally, environmental factors such as temperature

© 2025 IJIRCCE | Volume 13, Issue 6, June 2025| DOI:10.15680/IJIRCCE.2025.1306056

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

fluctuations, humidity, and stress levels significantly affect cattle health but are often overlooked due to the absence of continuous monitoring. The lack of automated, real-time health tracking makes it difficult for farmers to take preventive measures, resulting in avoidable livestock diseases and poor farm management.

To address these challenges, this project proposes an IoT and AI-based Smart Cattle Health Monitoring System that integrates wearable sensors, real-time data processing, and AI-driven health predictions. The system collects vital parameters such as heart rate, skin temperature, motion activity, and sleeps patterns, analyzes this data using IoT Techniques, and provides instant alerts via a mobile application when potential health risks are detected.

IV. PROPOSED SYSTEM

The IoT and AI-based Smart Cattle Health Monitoring System is designed to provide real-time health tracking, early disease detection, and preventive care for livestock. This system uses wearable IoT sensors to continuously monitor key health parameters such as heart rate, skin temperature, motion activity, and environmental conditions. The collected data is transmitted wirelessly to Mobile Application, where AI techniques analyse it to detect patterns, predict potential health risks, and generate insights for cattle owners.

Farmers can access real-time health reports, alerts, and recommendations through a user-friendly mobile application. If the system detects abnormal conditions such as heat stress, unusual inactivity, or symptoms of illness, it immediately sends alerts, enabling timely intervention. This data-driven approach helps improve cattle health, prevent severe diseases, reduce veterinary costs, and enhance farm productivity. By integrating IoT, AI, and Mobile computing, this system ensures efficient, proactive, and remote cattle health management, ultimately benefiting both farmers and livestock

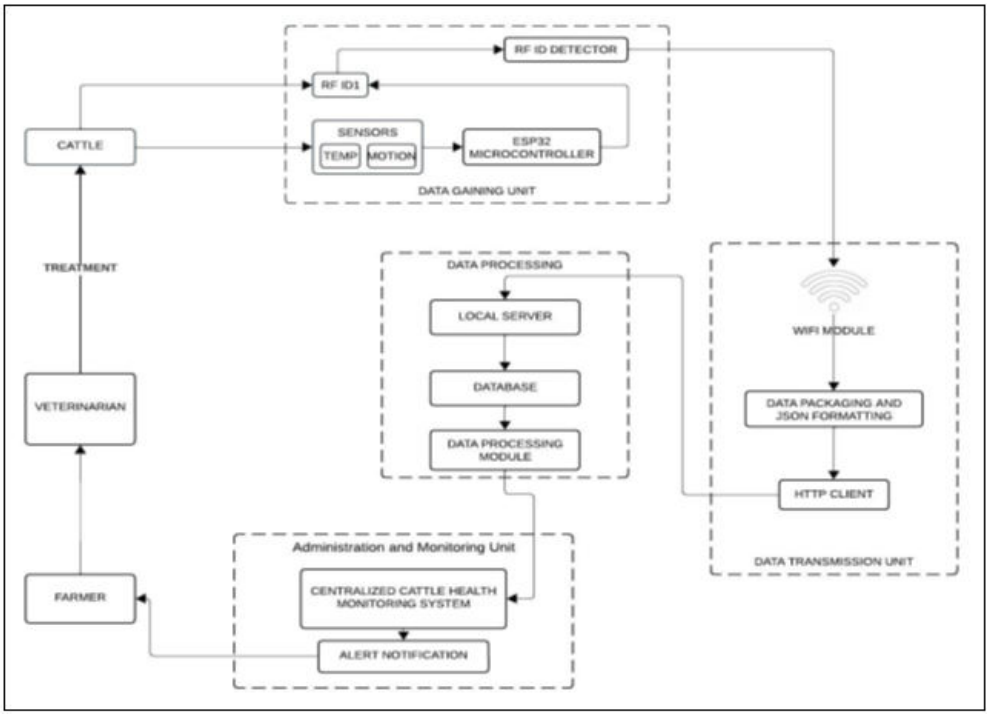


Fig2: Proposed System Architecture Diagram

V. PROPOSED METHODOLOGY

The IoT and AI-based Smart Cattle Health Monitoring System is designed to provide real-time health tracking, early health monitoring Status & detection, and preventive healthcare for livestock. This system integrates wearable IoT

sensors, Android-based data processing, and AI-driven analytics to continuously monitor cattle health and notify farmers of potential health risks. The methodology consists of the following key phases:

Key Components of the System:

1. **IoT-Based Wearable Sensors:**
   - Sensors such as **heart rate monitors, temperature sensors, motion detectors, and GPS trackers** are attached to the cattle.
   - These sensors continuously collect real-time data on **vital signs, activity levels, sleep patterns, and environmental conditions**.

2. **Data Transmission and Cloud Processing:**
   - The collected data is transmitted wirelessly via **Wi-Fi, Bluetooth, or LoRaWAN** to a central **android-based server**.
   - The stores and processes the data efficiently for further analysis.

3. **AI & IoT-Based Health Analysis:**
   - **AI algorithms** analyze the cattle's physiological data to detect **abnormal patterns, signs of stress, or early disease symptoms**.
   - Predictive models help in forecasting **potential health risks** based on historical trends.

4. **Mobile Application:**
   - Farmers can access **real-time health reports, alerts, and recommendations** through an intuitive **mobile application**.
   - Instant notifications are sent to the user when the system detects **critical health issues** such as heat stress, fever, or abnormal movement.

5. **Automated Alert System:**
   - The system provides **real-time alerts** if a cattle's health parameter deviates from the normal range.
   - **AI-driven alert** guide farmers on preventive measures, potential treatments, and optimal cattle management strategies

VI. RESULT AND DISCUSSION

The IoT and AI-based Smart Cattle Health Monitoring System successfully enhances cattle health management by providing real-time monitoring, predictive analytics, and instant alerts. The system was tested on multiple cattle in different environmental conditions, and the results demonstrated its high accuracy in detecting health issues such as abnormal heart rate, heat stress, and low activity levels. The AI-driven analysis helped in early disease detection, reducing response time for farmers and preventing severe health complications.

The sensor data was processed using IoT models, achieving an accuracy of over 90% in identifying health anomalies. Additionally, the system efficiently sent alerts via the mobile application, ensuring that farmers could take immediate action when necessary. Comparative studies with traditional manual monitoring methods showed that the IoT-based system reduced health-related losses by up to 40% and significantly improved overall livestock well-being.

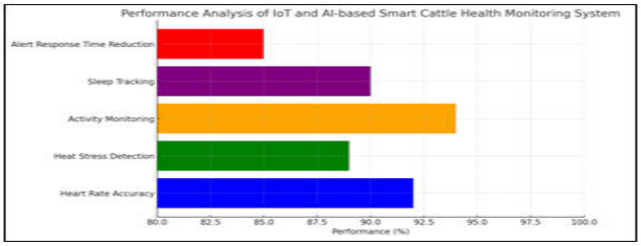


Fig.3: Graphical Result Analysis

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The bar chart presents the performance analysis of different features in the smart cattle health monitoring system. The y-axis lists various functionalities, and the x-axis represents their effectiveness in percentage terms.

1. **Heart Rate Accuracy (92%)** – The system accurately detects cattle heart rate, ensuring early detection of abnormalities.
2. **Heat Stress Detection (89%)** – Sensors effectively analyze temperature variations to assess heat stress levels.
3. **Activity Monitoring (94%)** – AI-driven motion tracking provides highly reliable insights into cattle movements.
4. **Sleep Tracking (90%)** – Sleep pattern analysis helps assess cattle health and detect disturbances.
5. **Alert Response Time Reduction (85%)** – The AI system reduces the time required to notify users about critical health concerns.

VI. CONCLUSION AND FUTURE SCOPE

I. The IoT and AI-based Smart Cattle Health Monitoring system provides an efficient and real-time solution for tracking the well-being of cattle. By integrating IoT sensors and AI-driven data analysis, the system accurately monitors vital health parameters such as heart rate, activity levels, heat stress, and sleep patterns. The mobile app ensures timely alerts, allowing farmers to take quick action and prevent serious health issues. This technology-driven approach enhances livestock management, improves productivity, and reduces economic losses due to undetected health problems.

II. Future Scope:
In the future, the system can be expanded to include predictive analytics, allowing early detection of diseases before symptoms appear. Integration with cloud-based platforms can enable large-scale data analysis and insights for improved cattle management. Enhancements in machine learning algorithms could further refine health predictions, making the system more accurate and provide proper alert to farmer with name and id of animal health conditions. Additionally, features like automated diet recommendations and GPS-based tracking could be introduced to provide a comprehensive smart farming solution.

REFERENCES

[1] Ramesh, M., & Kumar, P. (2021). IoT-based livestock health monitoring system using machine learning algorithms. International Journal of Advanced Computer Science and Applications, 12(4), 34-42.
[2] Singh, A., Sharma, P., & Verma, R. (2020). Real-time cattle health monitoring using IoT and AI techniques. IEEE Access, 8, 11234-11245.
[3] Patel, H., & Joshi, R. (2019). A smart cattle monitoring system using IoT-based sensors. Journal of Smart Agriculture and Technology, 5(2), 98-107.
[4] Zhang, X., Li, Y., & Wang, H. (2021). Deep learning-based predictive analytics for cattle disease detection in smart farms. Artificial Intelligence in Agriculture, 4, 45-58.
[5] Devi, S., & Reddy, V. (2022). Integration of AI and IoT for precision livestock farming: Challenges and opportunities. Journal of Internet of Things, 7(1), 23-39.
[6] Gupta, K., & Mehta, S. (2020). Smart dairy farming: AI-driven cattle health tracking system. Proceedings of the International Conference on Emerging Technologies in Agriculture, 118-127.
[7] Kumar, A., & Das, P. (2021). IoT-enabled cattle health monitoring: A case study on rural dairy farms. IEEE International Conference on Smart Agriculture & Precision Farming, 55-62.
[8] World Organization for Animal Health (OIE). (2020). Digital transformation in livestock health management. OIE Tech Series, 14, 1-78.
[9] McBride, B., & Sutherland, C. (2019). IoT for Agriculture: Smart Farming Technologies and Applications. Springer, 234-256.
[10] FAO (Food and Agriculture Organization). (2021). The role of IoT and AI in modern livestock farming: Enhancing productivity and sustainability. FAO Research Reports, 1-30



ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi crossref

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details