# SSN COLLEGE OF ENGINEERING
# KALAVAKKAM-603110

## INTERNALLY FUNDED STUDENT PROJECT (IFSP-2023)

**Forewarning of Goat diseases diagnosis using IoMT to improve the productivity
And economy of small and big farming**

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**Budget** (in thousands)
*Twenty Thousand*

**Project Duration (in months)**
*Twelve months*

Signature of the Project Students          Signature of the Project Guide(s)

Signature of the HOD

**1. Project Title:** Forewarning of Goat diseases diagnosis to improve the productivity and economy of small and big farming

**2. Broad Subject:** The broad topic under which this project falls into is internet of things as, various wearable sensors, pi camera is going to be controlled and connected through a micro-processor raspberry pi, the data collected is also passed on to the cloud for later use or retrieval.

**3. Project Duration** *(in months)*: Eighteen months

**4. Budget** *(in thousands)*: Twenty thousand only

**5. Project Summary:**

      Goats were one of the first domesticated animals. Easier and cheaper to manage than cattle, goats are far more profitable than other animals. They prove vital for development because of their ability to convert forages, crops, and household residues into meat, milk, fibre, and skin. The foot and mouth disease is a serious and highly contagious disease that affects goats. Therefore, it needs to be continuously monitored through sensors to analyse the clinical behaviour of the goats. Multiple systems are available in an animal healthcare information system that are used for clinical usage and formulating resolutions. So far, complete data is not available for the following cases: individual goats affected by a particular disease, groups of goats affected by geolocation-based diseases, and all aspects of a goat healthcare information system.

**6. Keywords:**

      Disease pattern, continuous monitoring, goat healthcare data analytics, forewarning system, geolocation

**7. Objectives:**

- To improve the productivity and economy of small and big farming by forewarning the goat diseases and reducing the mortality rate.
- Achieving a GHC by implementing various facades of IoMT.

**8. Introduction:**

In India, disease control and management system helps to identify the symptoms in sheep and goat, such as fever, redness and swelling of nose, respiratory failure, nasal discharge accompanied by sneezing and cough, muscular stiffness and difficulty in walking, which are caused by epizootic, only through physical evaluation. The total goat population in India is around 150 million and out of which 75% is located in 6 states. In this 40% are non-descript animals and the rest comprise pure/graded, cross bred or exotic animals in Tamil

Nadu. High mortality rate in lambs (up to 40%) is a worldwide problem. The clinical disease and the spread of the outbreak in the locality identified through GIS and web-based monitoring. This provides opportunities for future disease control to enhance animal welfare and rural prosperity. To improve the productivity and economy of small and big farming by forewarning the goat diseases and reducing the mortality rate, a GHC-Goat Health Care facility incorporating IoMT is formulated. The proposed system plays the role of information agent to manage the diseases and helps provide care at any time.

## 9. Definition of the Problems

- The major diseases such as Blue Tongue, Peste-des-Perits Ruminants (PPR), ORF, and Anthrax cause mortality in goats.
- The diseases are the major cause of mortality in goats with young ones and adult goats being almost equally affected. Adult females suffered a higher mortality than males due to diseases.
- The mortality patterns were found similar in both the genders in the given time period. Gender had significant association with different age groups and diseases in terms of mortality pattern. Diagnosis of above diseases is made through appropriate laboratory investigations.

## 10. Review of status of Research and Development in the subject:

### 10.1 National Status

| [REF] / YEAR | PROBLEM | METHODOLOGY / COUNTRY |
|---|---|---|
| [1] / 2012 | Web-based software to predict livestock diseases | Project Directorate on Animal Disease Monitoring and Surveillance (PDADMAS) under ICAR has developed a Web-based interactive software to predict livestock diseases two months in advance in the country / India |
| [2] / 2019 | Spread and impact of goat pox | A detailed description of the clinical disease and the spread of the outbreak in the locality are provided. Awareness of the disease with reference to farming practices will provide opportunities for future disease control to enhance animal welfare and rural prosperity / India |
| [3] / 2016 | Different endemic infectious diseases | Prevalence, diagnosis, management and control of important diseases of ruminants with special |

| | causes significant economic loss | reference to Indian Scenario / India |
|---|---|---|
| | | |

## 10.2 International status

| [REF] / YEAR | PROBLEM | METHODOLOGY / COUNTRY |
|---|---|---|
| [1] / 2020 | The welfare of animals be continuously monitored in a real-time way | Collecting on-farm videos / School of Information and Computer Sciences, Anhui Agricultural University, Hefei, China |
| [2] / 2016 | Recent advances in wearable sensors | Nano biosensors and advanced molecular biology diagnostic techniques for the detection of various infectious diseases of cattle / Bio-Nano Laboratory, School of Engineering, University of Guelph, Guelph, Canada |
| [3] / 2011 | Analytic function of disease rate and guide goat immunization | Goat medical records subsystem / Coll. of Animal Husbandry & Veterinary Med. Shenyang Agric. Univ. Shenyang, China |
| [4] / 2009 | Human-animal interaction | Health status of animals in terms of body condition scoring, skin and hair conditions, lameness and injuries, and management practices in relation to cleanliness, animal handling and moving, milking procedures and abnormal behaviours, are proposed as potential animal-based indicators / Italy |

## 11. Novelty Importance of the proposed project in the context of current status:

- The novelty of the study is the collection of real time data continuously and updating it in the cloud periodically.
- Generally, for cattle monitoring the usage of computer vision is widespread but here the other sensors are also used for data collection, which would boost the accuracy and can predict illness in an earlier time.

## 12. Patent details *(domestic and international),* if applicable

## 13. Work plan and Detailed technical information
## 13.1 Methodology

The proposed methodology to forewarning goat disease is shown in Figure 1.

- Goat Health Care (GHC) consists of Embedded System, Wireless Technology and Machine Learning to form the IoMT-GHC.
- IoMT-GHC integrates data from sensors such as MEMS acoustic, MEMS vibration and Temperature, fixed in the nose, neck, foot and ear of goat and analyses the collected data to provide forewarning.
- In-stream analysis of data from the IoMT-GHC builds for interoperability and accelerates time for forewarning.
- The proposed IoMT-GHC system plays the role of information agent to manage the diseases and helps provide care at any time.
- A machine learning model can be made from the general response of the goats in the various sensors used, in case any variation is seen from the model, the model predicts the existence of some form of ailment in the goat.
- The variation in parameters, change in the goat's health is informed to the farm owner, nearby veterinary doctor.

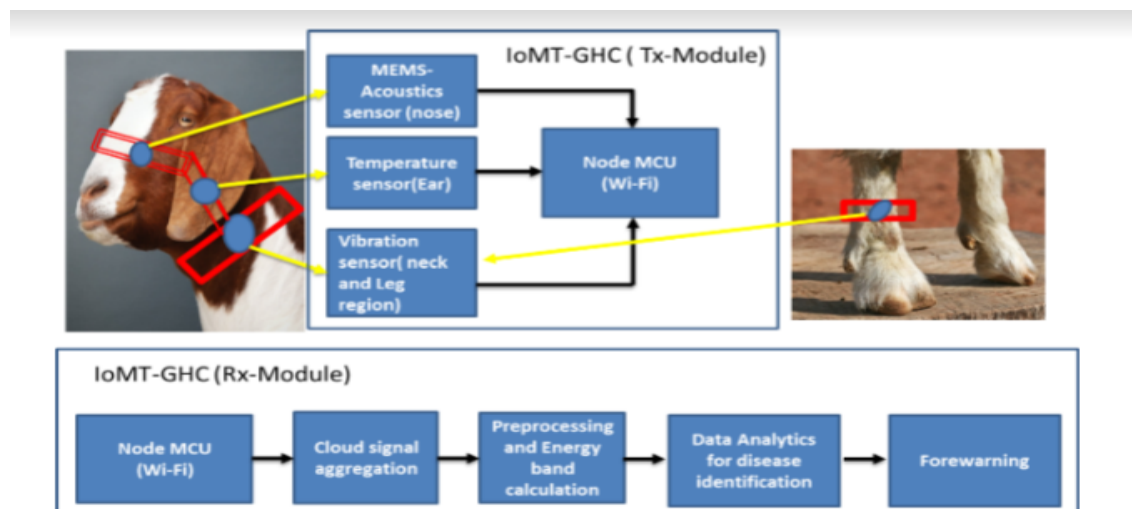The Data analytic process in identifying the disease based on geolocation is shown in Figure 2.



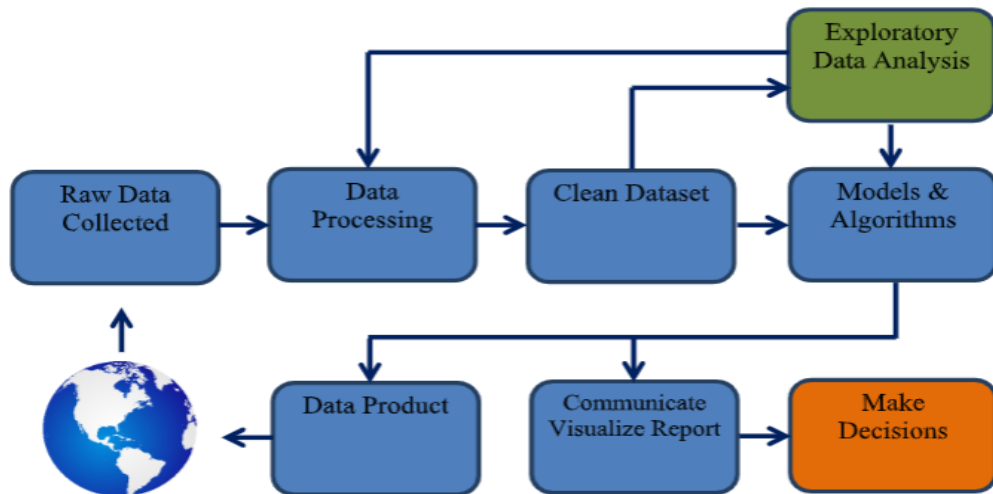Fig 1. Proposed IoMT-GHC block diagram

Figure 2. IoMT-GHC Data analytic process for Goat disease identification based on geolocation.

**14.Time schedule of activities giving milestones:**

**14.1 Time Schedule of Activities through BAR Diagram**

**c.      Time schedule of activities giving milestones:**

| Sl. No. | Activity / Milestone | 1st part (in months) | | 2nd Part (in months) | | 3rd part (in months) | |
|---|---|---|---|---|---|---|---|
| | | 1-2 | 3-4 | 5-6 | 7-8 | 9-12 | 12-18 |
| 1 | Data Collection | | | | | | |
| 2 | Process development | | | | | | |
| 3 | Evaluation and Validation | | | | | | |
| 4 | Product development | | | | | | |
| 5 | Documentation | | | | | | |

**15. Deliverables**

- Make a system that monitors the goats through computer vision and sees for any visible variation in the goats. If yes, then the people concerned are intimidated.

- A wearable belt that is worn on the goat's head which could monitor its health continuously.
- Temperature sensor like tmp 36 which would be placed near the goat's ears to note the body temperature of the goat. Most of the foot and mouth diseases, ailments lead to increased body heat in the goat.
- Vibration sensor to detect the vibration in the goats during movement and identifying the limited movement incase of illness
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## 16. Target beneficiaries of the proposed work

The target beneficiaries of the proposed word are farmers, people engaged in animal husbandry
rearing goats which could be possibly infected by diseases. It decreases the losses and setbacks in the farm,
the humans who are directly in contact with the goat who have a chance of contacting the disease.
Other goats in the farm which are in the risk of contracting the disease from the infected goat


## 17. Suggested plan of action for utilization of research outcome expected from the project

### 17.1 As journal publication
### 17.2 Patent filing
### 17.3 Project preparation for submission to external funding

## 18. References

[1] Rao Y, Jiang M, Wang W, Zhang W, Wang R. On-farm welfare monitoring system for goats based on Internet of Things and machine learning. *International Journal of Distributed Sensor Networks*. July 2020.

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[11] Kumar, S., Vihan, V.S., Deoghare, P.R., 2003.Economic implication of diseases in goats in India with reference to implementation of a health plan calendar. S. Rumin. Res. 47, 159-164.

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**19. List of facilities and Equipments available with Department for the project**

**20. Budget Estimates:**

| Microprocessor: | | |
|---|---|---|
| 1.Raspberrypi: (4b) | 1 | 8799 |
| Microcrocontroller | | |
| 1.NodeMCU (32 bit) | 1 | 794 |
| Sensors: | | |
| 1.Humidity sensor:<br>2.Vibration sensor:<br>3.temperature sensor:<br>4.Acoustics sensor:<br>5.Heart rate sensor | 1<br>1<br>1<br>1<br>1 | 499<br>38<br>153<br>176<br>219 |
| 1.Pi camera: | 1 | 361 |
| Miscellaneous<br><br>1.Testing with live samples i.e., goats<br><br>2.Making of the machinery | | 8961 |
| Total | 20,000 | |

**21. Budget Justification**

A microprocessor like raspberry pi is required to control the pi camera and take relevant  input image signals. Node MCUs are used to connect the different sensors to the cloud and use the data for future use, retrieval. A variety of sensors are needed to monitor the various parameters of the goat.