A MULTI-PHASE YOLOV10 DEEP LEARNING MODEL FOR BLISTER DEFECT DETECTION AND SEVERITY ASSESSMENT AND IMPACT MITIGATION.

Project Reference No.:*49S_BE_1074*

College : Biluru Gurubasava Mahaswamiji Institute of Technology, Mudhol, Bagalkot
Branch : Department of Computer Science and Engineering
Guides : Prof. Vani Mungarawadi
Prof. Ramesh Kumbar
Students : Ms. Meghana Ashok Jigalur
Mr. Nandeesh Guddadavar
Ms. Parvati Bommasagar
Mr. Shivanand Chandrashekhar Palabhavi

Keywords:

YOLOv10, Livestock Health Monitoring, Blister Detection, Severity Grading, Veterinary Decision Support, Impact Mitigation.

Introduction:

1. Livestock plays a vital role in agriculture and the rural economy, especially in regions like Karnataka where many farmers depend on cattle for milk production and income. Maintaining the health of livestock is therefore essential for ensuring food security, farmer livelihood, and economic stability. Blisters are fluid-filled swellings on the skin, often resulting from infections such as Lumpy Skin Disease (LSD). These infections can cause severe pain, reduce milk production, and in extreme cases lead to the death of animals. In 2022, Karnataka experienced a significant outbreak of Lumpy Skin Disease that led to the death of over 2,000 cattle and affected nearly 19,000 animals across 4,380 villages in 28 districts. During such large outbreaks, manual inspection by farmers or veterinarians becomes difficult and delayed detection increases the risk of disease spread and mortality.

2. To address this issue, the proposed project introduces YOLOv10 model for blister defect detection, severity grading, and impact mitigation (such as insurance processing, mobile veterinary clinic) in livestock health management. The system detects blisters from images, classifies them according to severity, and then uses this

3. information to guide mitigation strategies aimed at improving animal health outcomes. This ensures benefits for farmers and veterinary professionals but will also contribute toward better animal welfare, increased agricultural productivity, and more robust rural economies.

Objectives:

1. To develop a YOLOv10 AI model for accurate detection of blister defects on livestock skin images (for lumpy skin disease in cows), capable of real time performance under varying environmental conditions.
2. To implement a severity grading module that categorizes detected blisters into Severe Blisters, Mild Blisters and Normal Cow.
3. Design and integrate an impact mitigation framework that recommends appropriate actions which include livestock insurance processing for severe blistered cows which are dead, mobile veterinary clinic deployment for mild blistered cows.

Methodology:

1. **Data Collection:** A diverse dataset of livestock images was collected from farms, veterinary sources, and publicly available datasets. The dataset includes both healthy cattle and cattle affected by blister diseases such as Lumpy Skin Disease. To prepare the dataset for model training, images were annotated with bounding boxes marking blister-affected regions. Pre-processing techniques such as image resizing, normalization, and data augmentation (rotation, flipping, and brightness adjustment) were applied to improve the robustness and accuracy of the model.
2. **Blister Detection using YOLOv10 (Computer Vision Phase):** The annotated dataset was used to train a YOLOv10 object detection model capable of identifying blister-affected regions in cattle from images.
3. **Severity Grading using CNN (Deep Learning Phase):** Once blister regions were detected, the extracted regions are passed to a Convolutional Neural Network (CNN) model to classify the severity of the disease into mild, moderate, and severe categories. This grading helps farmers and veterinarians understand the urgency of treatment and prioritize medical attention.
4. **Decision Support & Mitigation Framework:** A hybrid decision-support system combining rule-based logic and machine learning generates actionable recommendations. Based on the severity level, the system provides alerts for veterinary consultation, isolation of infected animals, vaccination reminders, and assistance for insurance claim documentation.
5. **System Deployment:** The final trained models will be integrated into a user-friendly application capable of real-time image analysis. This system enables livestock health monitoring and supports farmers in making timely and informed decisions.

Result and Conclusion:

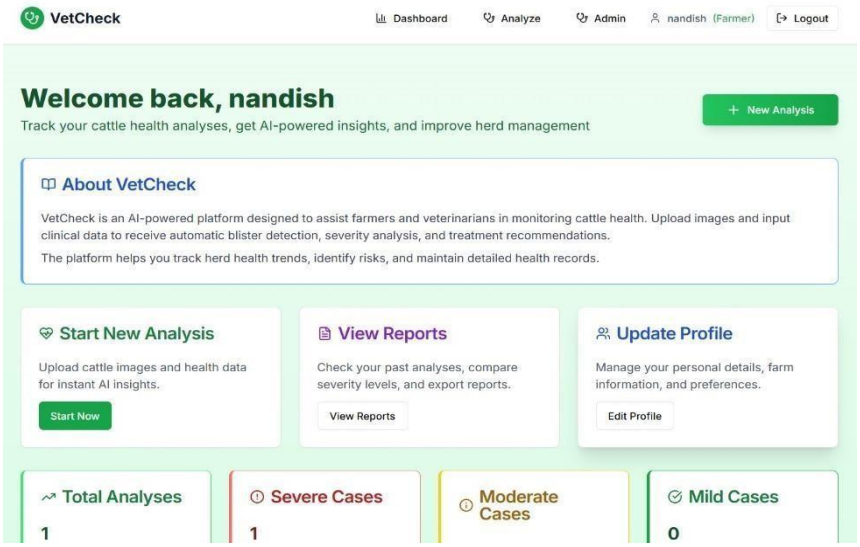

Figure 1: Homepage of the System with a user login.

The developed system successfully performs real-time blister detection and severity classification. The YOLOv10 model accurately detects blister regions, while the CNN classifier categorizes severity with high reliability.The integrated mitigation module provides actionable recommendations such as treatment guidance, veterinary support, and insurance processing.The system reduces dependence on manual inspection and enables early diagnosis, improving livestock health management. The project demonstrates how the system can deliver practical solutions for farmers and rural communities.

References:

1. Patgiri, R., Ajantha, V., Bhuvaneswari, S., & Subramaniyaswamy, V. (2024). Intelligent Defect Detection System in Pharmaceutical Blisters Using YOLOv7.
2. Meghana Jigalur. (2025). My First Project: AI-Based Blister Detection Model. Roboflow. Retrieved from https://app.roboflow.com/meghana jigalur-zub4q/my-first- project-v4a53/models.
3. Department of Animal Husbandry & Veterinary Services, Government of Karnataka, “Animal Husbandry & Veterinary Services.” [Online]. Available:https://ahvs.karnataka.gov.in

Future Scope:

1. Multilingual AI chatbot for farmers in regional languages.
2. Mobile App deployment for Large-scale deployment.