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AgriSense: AI- Powered Disease Diagnosis and Fertilizer Recommendations: A Review

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ABSTRACT: Earlier as well as nowadays also, the doctors/farmers are using trial and error approach for predicting the diseases based on clinical investigations available. To predict the diseases is one of the major challenges in past years and today also. There is great need of some system that predicts the diseases early on the basis of available symptoms of plants and animal. Because of this it will become possible to cure the plants and animal from diseases which may lead the humans and animal to death. We are a proposing system which is based on combination of different locations, disease symptoms and disease treatment that are useful to predict the disease. The disease states can be finding out by formalizing the disease based on symptoms of the plant and animal before recommending treatments for the prevailing diseases by using Classification techniques respectively. The basic aim of our system is to assist doctors in diagnosing the plant and animal by analyzing disease symptoms and relevant information. As our project's main focus is providing medical assistance to farmer and animal.

KEYWORDS: Animal disease, plant disease, classification, machine learning.

I. INTRODUCTION

Farmers' economic growth depends upon the quality of the product that they grow, which is directly dependent on the plants' growth and yield they get. Plants are attacked by the different diseases that target different parts of plant body such as leaf, stem, seed, and fruit and so on. To solve this problem machine learning seems to be a better option. Various machine learning techniques are recently proposed for identification and classification of plant disease from plant images and animal disease from symptoms. Many crops, most importantly cash crops play a dominant role in the Industrial and Agriculture Economy of the country. India provides direct livelihood to 6 million farmers.

Various image processing concepts such as image filtering, segmentation, image feature extraction have emerged to detect the leaf diseases. There are various image segmentation methods available such as k-means clustering, Canny and Sobel segmentation, and Otsu thresholding. Techniques such as Support Vector Machine (SVM), Neural Network (NN), and Homogeneous Pixel Counting technique for Cotton Diseases Detection (HPCCDD) can be used for classification. Features play an important role in the classification process. Previous proposed works for detecting disease have some limitations such as low resulting accuracy and less number of images used to detect disease. The main source for the disease is the leaves of the plant. About 80 to 90 % of disease on the plant is on its leaf. Hence, the study of interest is the leaf of the tree rather than whole plant. The leaves are mainly suffered from diseases like insecticide (turdude, mawa), fungus, foliar leaf, and Alternaria leaf spot.

The introduction serves as a gateway into the critical realm of animal disease detection, where the well-being of animals intertwines with human health and the stability of agricultural ecosystems. In this interconnected web, the timely and accurate identification of diseases in animals emerges as a pivotal factor in preventing not only economic losses but also potential zoonotic threats. The landscape of animal health is multifaceted, involving a spectrum of traditional and contemporary methodologies for disease detection. As the world grapples with evolving challenges, from emerging diseases to global connectivity, the need for robust diagnostic tools becomes increasingly apparent.

This introduction sets the stage for an exploration into the methodologies, advancements, and limitations in the field of veterinary diagnostics. Amidst this backdrop, the significance of early disease detection cannot be overstated. Beyond the economic implications, the health of animal populations directly influences the ecological balance and, consequently, human welfare. This introduction aims to highlight the urgency for effective disease detection, paving the way for a comprehensive examination of existing approaches and the innovative technologies driving the future of veterinary diagnostics.

II. LITERATURE SURVEY

The main aim of the AgriSense project is to provide an AI-powered solution for detecting plant and animal diseases and recommending appropriate fertilizers and medicines. This project uses Convolutional Neural Networks (CNN) for plant disease detection and Random Forest for animal disease detection. Based on the detection results, the system suggests suitable fertilizers for plants and medicines for animals.

This approach ensures efficient and accurate support for farmers in managing crop and livestock health. By automating the diagnosis process, it reduces the reliance on manual inspections and expert intervention. The proposed survey gives us an idea to research on the same.

Enhanced Crop Disease Detection With EfficientNet Convolutional Group-Wise Transformer: In this paper, crop diseases are identified as a major challenge in global agriculture, leading to significant yield reduction and food supply issues. Traditional methods, which rely on visual inspections and expert experience, are often subjective and resource-intensive. By leveraging advancements in artificial intelligence, IoT, and cloud computing, real-time monitoring and automatic detection of crop diseases have become possible. Paper proposes the EfficientNet Convolutional Group-Wise Transformer (EGWT) architecture, where EfficientNet extracts local features from crop leaf images, followed by a group-wise transformer that enhances feature attention. This process allows for more accurate and efficient identification of diseases. The proposed model achieves remarkable performance, with 99.8 percent accuracy on the PlantVillage dataset, 86.9 percent on the cassava dataset, and 99.4 percent on the Tomato leaves dataset, all with only 23.04M parameters. Compared to other CNN, transformer, and hybrid models, our EGWT architecture offers the best accuracy and optimal model complexity, making it highly effective for crop disease detection.

Algorithm for Crop Disease Detection Based on Channel Attention Mechanism and Lightweight Up-Sampling Operator: In this paper, crop diseases and pests are highlighted as significant causes of economic losses in agriculture, making accurate identification crucial. Traditional methods are time-consuming, but computer vision and AI enable automated detection for real-time control and prevention. An improved crop disease and pest recognition model was developed based on YOLOv5. Key enhancements include the integration of the SE module for better feature distinction, the CARAFE module for improved feature extraction, the EIou loss function for higher detection accuracy, and the Ghost Convolution module to reduce model complexity. Experiments showed 90.0 percent accuracy, 91.4 percent recall, and mAP@.50 of 92.1 percent, outperforming YOLOv5, YOLOv7, and YOLOv8. The model reduces parameter count by 23.9 percent and computational load by 31.2 percent, making it suitable for real-world crop management.

Companion Animal Disease Diagnostics Based on LiteralAware Medical Knowledge Graph Representation Learning: This paper explores the use of Knowledge Graph (KG) embeddings to improve the diagnosis of diseases in companion animals by analyzing electronic medical records (EMRs), such as veterinary notes and reports. Traditional approaches focus on preserving graph structures around target nodes but often neglect the importance of incorporating various literal information. We introduce a model called LiteralKG, which effectively integrates literal data and graph structures into unified representations. The knowledge graph is built from EMRs and literal data collected from animal hospitals, while gate networks are employed to combine different entities and node features. Additionally, a self-supervised learning task is used to capture the graph structure for multiple downstream tasks. Experimental results from link prediction tasks show that our model outperforms state-of-the-art methods.

Machine Learning and Deep Learning for Plant Disease Classification and Detection: This paper emphasizes the rise of precision agriculture, a rapidly evolving area aimed at ensuring agricultural sustainability, with machine learning playing a pivotal role in disease identification and classification. The review focuses on how machine learning and deep learning methods have been applied in precision agriculture, particularly for detecting and classifying plant diseases. A new classification approach is introduced, grouping studies into two key methodologies: classification and object detection. Additionally, the paper discusses the datasets available for plant disease detection. A detailed computational analysis is carried out on five advanced object detection algorithms and eighteen classification algorithms, leveraging the PlantDoc dataset. The results indicate that YOLOv5 provides excellent accuracy in object detection, while ResNet50 and MobileNetv2 offer the best balance between accuracy and training duration for image classification tasks.

A Machine Learning and Optimization Framework for the Early Diagnosis of Bovine Respiratory Disease: In this paper, Bovine Respiratory Disease (BRD) is addressed as a leading cause of antimicrobial use and calf mortality, significantly impacting farm economics. Early diagnosis is crucial, but it requires specialized labor, which is often scarce. Precision IoT technologies, such as automatic feeders, scales, and accelerometers, can detect behavioral changes before clinical signs appear, enabling early treatment and faster recovery. We propose a framework for BRD diagnosis and early detection using machine learning and a cost-sensitive feature selection method called Cost Optimization Worth (COW), which maximizes accuracy within a budget. To solve the NP-Hard COW problem, we introduce an efficient heuristic, Cost-Aware Learning Feature (CALF). Validation on a dataset of 159 calves shows that our approach outperforms existing methods, achieving 88 percent accuracy in labeling sick and healthy calves, predicting 70 percent of sick calves four days prior to diagnosis, and detecting 80 percent of persistency status calves within the first five days.

Plant Disease Classifier: Detection of Dual-Crop Diseases Using Lightweight 2D CNN Architecture: In this paper, tomatoes and cotton are highlighted as vital crops globally, with diseases significantly impacting their productivity. Early detection of these diseases is crucial. The study proposes a lightweight 2D CNN architecture for classifying 14 classes of tomato and cotton crops, including 12 diseased and 2 healthy classes. The model is implemented in an Android app called "Plant Disease Classifier" for smartphone-assisted diagnosis. Experimental results show the proposed model outperforms pre-trained models like VGG16, VGG19, and InceptionV3, achieving 97.36 percent accuracy, with precision, recall, and F1-score of 97 percent, and an AUC score of 99.9 percent. Class activation maps (Grad-CAM) were used for visual explanations of disease detection, and the app classified diseases quickly, with an average time of 4.84 ms.

III. GAP ANALYSIS

The above survey of various researchers on different algorithms for plant and animal disease detection highlights the effectiveness of machine learning and deep learning techniques in improving agricultural sustainability. The EfficientNet Convolutional Group-Wise Transformer (EGWT) architecture demonstrates exceptional performance in real-time disease monitoring, achieving 99.8 percent accuracy on the PlantVillage dataset while utilizing fewer parameters than existing models. Additionally, a comprehensive review of machine learning in precision agriculture reveals that YOLOv5 excels in object detection accuracy, while ResNet50 and MobileNetv2 provide an optimal balance between accuracy and training time for image classification tasks.

The framework for diagnosing Bovine Respiratory Disease (BRD) emphasizes the use of IoT technologies and introduces the Cost Optimization Worth (COW) model for efficient feature selection, achieving an 88 percent accuracy in classifying sick and healthy calves, with significant early detection capabilities. Moreover, a knowledge graph embedding model (LiteralKG) is proposed to aid in the diagnosis of animal diseases by effectively integrating various types of literal information and graph structures, outperforming state-of-the-art models in link prediction tasks.

Furthermore, the lightweight 2D CNN architecture for classifying diseases in tomato and cotton crops within the "Plant Disease Classifier" app showcases an impressive average accuracy of 97.36 percent and rapid processing time of about 4.84 ms, outperforming several pre-trained models. Overall, these findings underscore the potential of integrating advanced algorithms and IoT technologies for enhancing early disease detection and management in both crops and livestock, thereby contributing to improved yield and economic viability in agriculture.

- The evaluation metrics for these kind of tasks are not properly defined.
- Very limited dataset is available for training.
- The task we are performing is very domain specific so a very limited amount of study is done on the topic.

IV. CONCLUSION

The field of animal disease detection has witnessed notable advancements in recent years, driven by technological innovation, collaborative research, and a commitment to addressing global health challenges. The integration of blockchain, IoT, and wearable devices has enhanced traceability and real-time monitoring, providing valuable insights into the health of animal populations. Machine learning and AI algorithms have proven instrumental in analysing complex datasets, predicting disease outbreaks, and facilitating accurate diagnostic models. Despite these strides,

challenges persist, including issues related to cost, infrastructure, and the invasive nature of certain diagnostic procedures. The ongoing evolution of pathogens and the variability in disease manifestations underscore the need for continuous research and adaptability in diagnostic approaches. Ethical considerations, economic impacts on farmers, and environmental consequences further emphasize the multifaceted nature of the field.

REFERENCES

- [1] Jing Feng, Wen Eng Ong, Wen Chean Teh, and Rui Zhang. “Enhanced Crop Disease Detection With EfficientNet Convolutional Group-Wise Transformer” In 2024
- [2] Wei Chen, Lijuan Zheng, and Jiping Xiong. “Algorithm for Crop Disease Detection Based on Channel Attention Mechanism and Lightweight UpSampling Operator” In 2024
- [3] Van Thuy Hoang, Thanh Sang Nguyen, Sangmyeong Lee, Jooheo Lee, Luong Vuong Nguyen, and O-Joun Lee (Member, IEEE). “Companion Animal Disease Diagnostics Using Literal-Aware Medical Knowledge Graph Representation Learning” In 2023
- [4] Casella (Member, IEEE), Melissa C. Cantor, Megan M. Woodrum Setser, Simone Silvestri (Senior Member, IEEE), and Joao H. C. Costa. “A Machine Learning and Optimization Framework for the Early Diagnosis of Bovine Respiratory Disease” In 2023
- [5] Vasileios Balafas, Emmanouil Karantoumanis, Malamati Louta (Senior Member, IEEE), and Nikolaos Ploskas. “Machine Learning and Deep Learning for Plant Disease Classification and Detection” In 2023
- [6] Hasibul Islam Peyal, Md. Nahiduzzaman, Md. Abu Hanif Pramanik, Md. Khalid Syfullah, Saleh Mohammed Shahriar, Abida Sultana, Mominul Ahsan, Julfikar Haider, Amith Khandakar, and Muhammad E. H. Chowdhury. “Plant Disease Classifier: Detection of Dual-Crop Diseases Using Lightweight 2D CNN Architecture” In 2023
- [7] Wei-Jian Hu, Jie Fan, Yong-Xing Du, Bao-Shan Li, Naixue Xiong and Ernst Bekkering. “MDFC-ResNet: An Agricultural IoT System to Accurately Recognize Crop Diseases” In 2020
- [8] Yong Ai, Chong Sun, Jun Tie and Xiantao Cai. “Research on Recognition Model of Crop Diseases and Insect Pests Based on Deep Learning in Harsh Environments” In 2020.



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