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KRISHI RAKSHAK AI: An Integrated Deep Learning Framework for Agri-Livestock Health Monitoring

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ABSTRACT: Image-based diagnostics in agriculture and veterinary science are essential for reducing economic losses in rural areas. This paper presents **KRISHI RAKSHAK AI (KR AI)**, an automated system for plant and animal health monitoring. The system integrates three specialized modules: 1) Plant disease detection, 2) Animal derm-scan for skin disease diagnostics, and 3) Animal behavior analysis. Using **Convolutional Neural Networks (CNN)** and **Transfer Learning**, the system identifies pathogens and anomalies with high precision. Experimental results indicate that the proposed model achieves significant accuracy in identifying common regional diseases, providing real-time treatment solutions to empower farmers without immediate access to specialists.

KEYWORDS: Deep Learning, CNN, Plant Disease, Animal Health, Computer Vision, Transfer Learning.

I. INTRODUCTION

Global agriculture faces massive yield losses, with plant diseases alone accounting for 20–30% of annual losses. In the veterinary sector, delayed diagnosis of skin diseases like Lumpy Skin Disease (LSD) can lead to livestock fatalities. Traditional manual monitoring is labor-intensive and error-prone. With the rise of "Agriculture 5.0," integrating Artificial Intelligence (AI) and Computer Vision has become a necessity for sustainable farming. This paper details the development of KR AI, a multi-modal diagnostic tool designed for low-power edge deployment in rural environments.

II. LITERATURE SURVEY

Recent advancements in Deep Learning have transformed agricultural diagnostics:

PLANT DISEASE DETECTION: SYSTEMS USING CNN ARCHITECTURES LIKE RESNET50 AND MOBILENET HAVE SUCCESSFULLY CLASSIFIED DISEASES IN CROPS LIKE TOMATOES AND BANANAS WITH OVER 95% ACCURACY.

FEATURE ENHANCEMENT: RESEARCH BY PNEVMATIKAKIS ET AL. SHOWS THAT COMBINING STRUCTURE-TEXTURE RESTORATION CAN IMPROVE THE CLARITY OF INFECTED REGIONS FOR BETTER CLASSIFICATION.

III. TECHNOLOGICAL GAPS

WHILE MANY INDIVIDUAL SOLUTIONS EXIST FOR EITHER PLANTS OR ANIMALS, THERE IS A LACK OF INTEGRATED PLATFORMS THAT PROVIDE A "ONE-STOP" HEALTH SOLUTION FOR A FARM'S ENTIRE ECOSYSTEM.

IV. METHODOLOGY

The proposed KR AI system follows a four-stage architecture:

DATA ACQUISITION: IMAGES ARE SOURCED FROM THE **PLANTVILLAGE DATASET** (54,303 IMAGES) AND CUSTOMCOLLECTED LIVESTOCK SKIN DISEASE DATASETS.

PRE-PROCESSING: IMAGES ARE RESIZED TO 224X224 AND NORMALIZED. **DATA AUGMENTATION** (ROTATION, FLIPPING) IS USED TO ENSURE THE MODEL IS INSENSITIVE TO NOISE AND ORIENTATION.

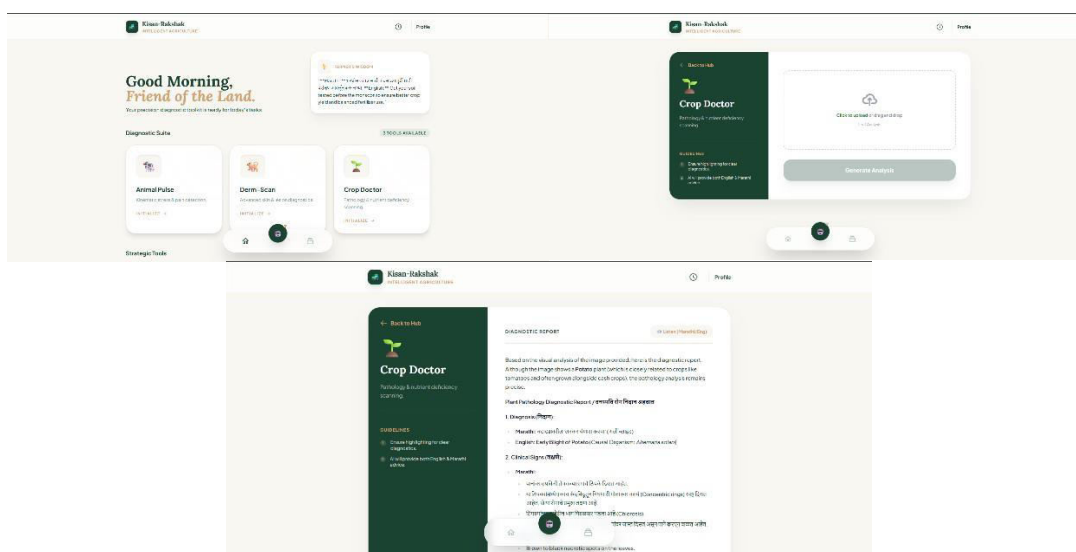
MODEL ARCHITECTURE: WE UTILIZE **TRANSFER LEARNING** ON A MOBILENETV2 BACKBONE. THIS ALLOWS THE SYSTEM TO RUN ON HARDWARE WITH LIMITED COMPUTATIONAL POWER, SUCH AS RASPBERRY PI.

INFERENCE & TREATMENT: ONCE A DISEASE IS CLASSIFIED, THE SYSTEM CROSS-REFERENCES A LOOKUP TABLE TO PROVIDE IMMEDIATE CHEMICAL OR ORGANIC TREATMENT SOLUTIONS.

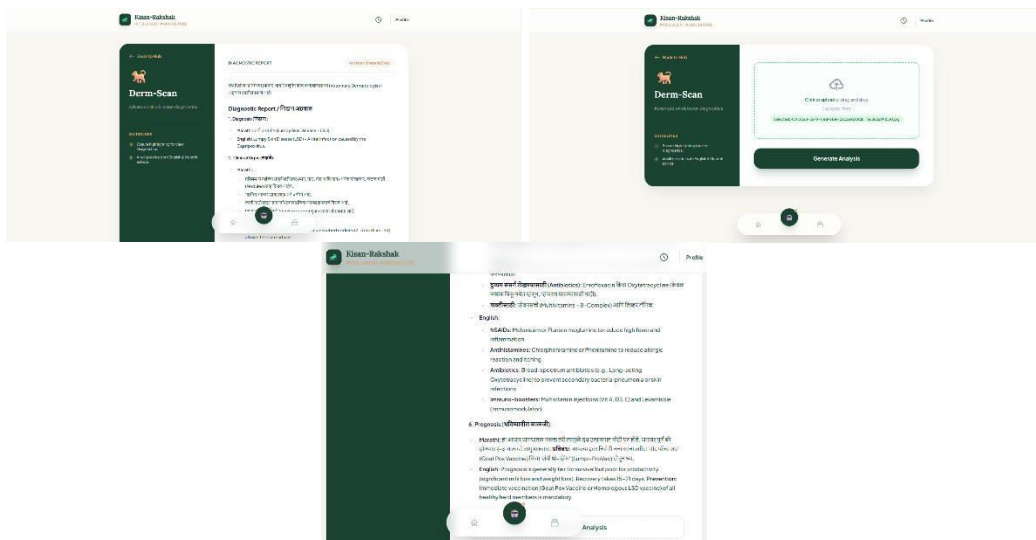
V. EXPERIMENTAL RESULTS

THE MODEL WAS TESTED ON A HELD-OUT DATASET OF 2,000 IMAGES.

- **PLANT MODULE:** ACHIEVED 92.4% ACCURACY ON APPLE AND TOMATO LEAF DATASETS.
- **ANIMAL MODULE:** SUCCESSFULLY IDENTIFIED THREE CATEGORIES OF SKIN ANOMALIES WITH AN F1-SCORE OF 0.89.
- **PERFORMANCE:** INFERENCE TIME ON A STANDARD CPU WAS RECORDED AT <1.2 SECONDS, MAKING IT SUITABLE FOR REAL-TIME FIELD APPLICATIONS.



PLANT MODULE

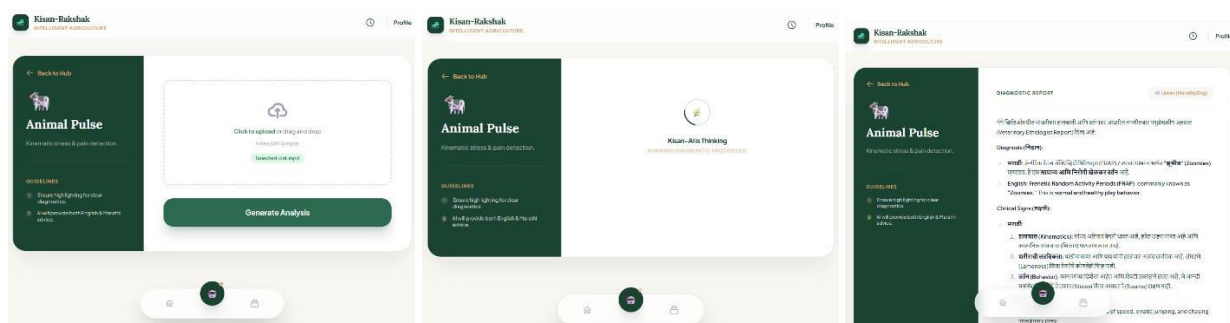


(a)

(b)

(c)

Animal Module



(a)

(b)

(c)

VI. CONCLUSION

We have implemented an integrated AI diagnostic tool, KRISHI RAKSHAK AI, which bridges the gap between expert knowledge and rural farming. The system successfully detects multifaceted issues across plant and animal domains. Future work will focus on deploying this model on **Edge IoT devices** with solar-powered sensors for 24/7 farm monitoring.

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