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Notice for the PhD Viva-Voce Examination

Mr Patil Manoj (Registration Number: 2170268), PhD scholar at the School of Engineering and Technology, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Thursday, 16 January 2025 at 11.15 am in the CDI Conference Room, Block V, Bangalore Kengeri Campus, Bengaluru 560074.

Title of the Thesis	:	**A Novel Approach for Sensitive Crop Disease Prediction Based on Computer Vision Techniques**
Discipline	:	**Computer Science Engineering**
External Examiner (Outside Karnataka)	:	**Dr Suresh Kumar Lokhande** Professor Department of CSE University College of Engineering, Osmania University, Amberpet, Hyderabad Telangana - 500007
External Examiner (Within Karnataka)	:	**Dr Venkatesh M** Associate Professor Department of Computer Science and Engineering University Visvesvaraya College of Engineering Bengaluru - 560001 Karnataka
Supervisor	:	**Dr Manohar M** Associate Professor Department of Computer Science and Engineering School of Engineering and Technology CHRIST (Deemed to be University) Bengaluru – 560074 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 07 January 2025

ABSTRACT

Agriculture is a vital sector that plays a critical role in ensuring global food security, supporting economic development, and promoting environmental sustainability. Sustainable agriculture is an essential approach that aims to address the challenges posed by conventional farming practices and ensure the long-term viability of our food production systems. Crop leaf diseases significantly threaten agricultural productivity and food security worldwide. Early and accurate detection of these diseases is crucial for effective disease management and prevention. Tomatoes and potatoes are the most sensitive and consumable vegetables worldwide. This research introduces efficient methods for leaf disease segmentation and classification. Crop leaf image quality is enhanced through pre-processing techniques, including contrast enhancement (CLAHE), Gaussian filtering, and unsharp masking. A novel ERBFNN is employed for segmentation, optimized using the MSFO algorithm, and its performance is compared against RG, FCM, and traditional RBFNN models. Handcrafted texture features are extracted to enhance classification accuracy.

A novel ADNN model integrates these features with a hybrid optimized LSTM-CNN approach, where LSTM weights are optimized using the ARDO algorithm. The ADNN model outperforms existing method such as CNN, LSTM, hybrid LSTM-CNN, ResNet50, and MobileNet by achieving 98.01% accuracy for Tomato leaf diseases and 98% for Potato leaf diseases. Tested on real-time tomato leaf images, this methodology shows robust and accurate classification across ten classes, outperforming benchmark models. Thus, this approach is highly effective for real-time leaf disease classification.

Keywords: Agriculture, Tomato, Potato, Crop diseases, Computer Vision, Machine Learning, Deep Learning, Hybrid Model, MSFO, RBFNN, CNN, LSTM, MSFO, ARDO, OLSTM-CNN.

Publications:

1. Patil, Manoj A., and M. Manohar. "Enhanced radial basis function neural network for tomato plant disease leaf image segmentation." Ecological Informatics 70 (2022): 101752, Elsevier. (Scopus, WoS).
2. Patil, M.A., Manur, M. Sensitive crop leaf disease prediction based on computer vision techniques with handcrafted features. Int J Syst Assur Eng Manag 14, 2235–2266 (2023), Springer. (Scopus, WoS).
3. Patil, M.A., Manohar, M. Plant Leaf Disease Classification Using Optimal Tuned Hybrid LSTM-CNN Model. SN COMPUT. SCI. 4, 710 (2023), Springer. (Scopus).
4. Patil, M.A., Manohar, M. (2023). A Comprehensive Review on Crop Disease Prediction Based on Machine Learning and Deep Learning Techniques. In: Kumar, S., Sharma, H., Balachandran, K., Kim, J.H., Bansal, J.C. (eds) Third Congress on Intelligent Systems. CIS 2022. Lecture Notes in Networks and Systems, vol 608. Springer, Singapore. (Scopus).
5. Patil, M.A. and Manohar, M., 2023, September. Potato leaf disease identification using hybrid deep learning model. In 2023 International Conference on Network, Multimedia and Information Technology (NMITCON) (pp. 1-9). IEEE. (IEEEXplore, Scopus).
6. Patil, M.A., Manohar, M., Laxuman, C., Parane, K., Dodamani, B.M., Sunkad, G. (2024). Hybrid Deep Learning-Based Potato and Tomato Leaf Disease Classification. In: Das, S., Saha, S., Coello Coello, C.A., Bansal, J.C. (eds) Advances in Data-Driven Computing and Intelligent Systems. ADCIS 2023. Lecture Notes in Networks and Systems, vol 891. Springer, Singapore. (Scopus).

Patent:

1. Title of the invention: "A System and Method for Tomato and Potato Plant Leaf Disease Detection", Patent Application Publication, Intellectual Property India, [Application No.202341065174], 2023.