Meta-Heuristic Feature and Deep Learning Based Skin Diseases Diagnosis

A Dissertation submitted in partial fulfillment of the Requirements for the Degree

of

Master of Technology

(Information Technology)

(Session 2024-2025)

Submitted By

NANCY TANDAN

Roll No.: 21037102

Enrollment No.: GGV/21/01852

Under the Supervision of

DR.AMIT KUMAR KHASKHALAM

Associate Professor

And

DR. AGNIVESH PANDEY

Assistant Professor

Department of Information Technology
School of Studies of Engineering And Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
(A Central University established by the Central Universities Act 2009 No. 25 of 2009)

CERTIFICATE OF THE GUIDE

This is to certify that the thesis entitled **"Meta-Heuristic Feature and Deep Learning Based Skin Diseases Diagnosis"** is a record of work carried out by **NANCY TANDAN (Enroll No.- GGV/21/01852)** under my guidance and supervision for the award of the Degree of **M.Tech** (Master of Technology), **Guru Ghasidas Central University Bilaspur (C.G.).**

To the best of my knowledge and belief of the thesis

i) Embodies the work of the candidate herself, and has not been submitted for the award of any degree.

ii) Has duly been completed.

iii) Fulfills the requirement of the Ordinance relating to the Master of Technology degree of the University and

iv) It's up to the desired standard in respect of contents and is being referred to the examiners.

Signature of the Guide
Dr. Amit kumar Khaskhalam
(Asso. Professor) Dept. of IT

Signature of the Guide
Dr. Agnivesh Pandey
(Assist. Professor) Dept. of IT

Abstract

Abstract— Skin cancer is a major global health concern, with melanoma representing its most aggressive type. Traditional diagnostic methods relying on dermoscopic inspection are time-intensive and prone to human error. To address these challenges, this research proposes a Modified Image-based Deep Spiking Neural Network (MIDSNN) framework for automated detection and classification of skin lesions.

The model incorporates a robust preprocessing pipeline for noise reduction and contrast normalization, followed by feature extraction using Co-occurrence Matrix (CCM) and histogram descriptors. A Genetic Algorithm (GA) is used for metaheuristic optimization of feature selection and model parameters. The extracted features are processed through the MIDSNN, which mimics the temporal dynamics of biological neurons to improve learning and classification efficiency.

Experiments conducted on HAM10000 and ISIC 2019 datasets show that MIDSNN outperforms baseline models such as CNN, SVM, and hybrid ensembles, achieving 22.19% higher accuracy and a 21% improvement in F-measure. The model demonstrates strong resilience to dataset imbalance, lighting variation, and lesion complexity, highlighting its applicability in clinical dermatology.

This work presents a scalable and interpretable solution for early skin cancer detection and provides a foundation for future expansion into color image compression, video-based lesion monitoring, and integrated CAD applications.

Keywords— Skin lesion classification, MIDSNN, genetic algorithm, deep learning, medical imaging, dermatology.