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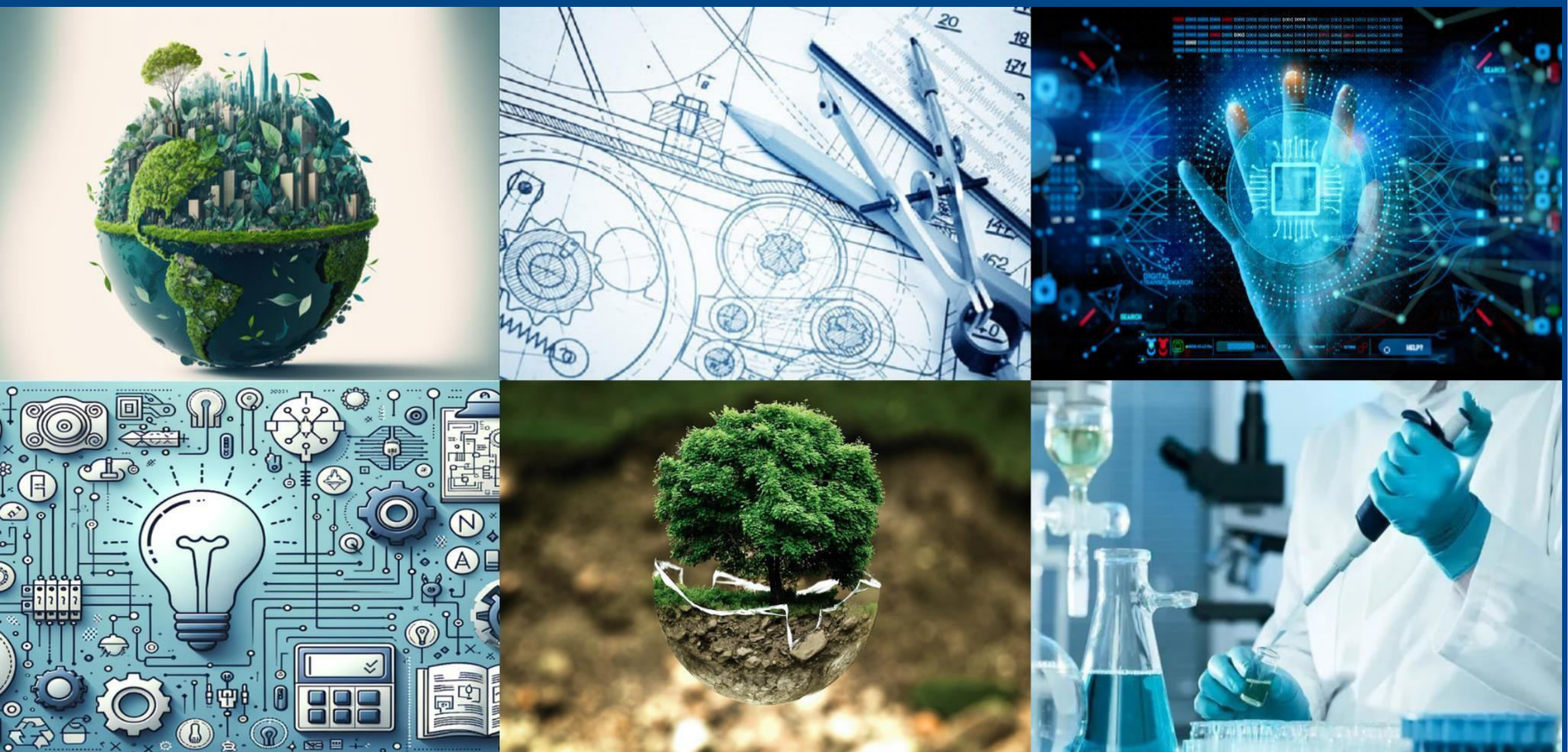

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Derma XAI-Net: An XAI-Based Model for Skin Lesion Detection

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ABSTRACT: Skin cancer is one of the most common types of cancer worldwide, with melanoma being the deadliest form if not detected early. Early diagnosis and treatment significantly improve survival rates. This paper presents a deep learning-based approach for automated skin lesion classification using convolutional neural networks (CNNs) with transfer learning. The system is designed to classify dermoscopic images from the HAM10000 dataset into multiple lesion categories, enabling accurate and fast diagnosis. Data preprocessing, augmentation, and fine-tuning techniques are applied to improve the model's generalization capability. Experimental results indicate that the proposed system achieves high accuracy and robustness, demonstrating potential for clinical deployment as a decision support tool for dermatologists.

KEYWORDS: Skin Cancer, Melanoma, Deep Learning, CNN, ResNet50, Image Classification, HAM10000.

I. INTRODUCTION

Skin cancer accounts for a large proportion of cancer diagnoses worldwide, with millions of new cases each year. Traditional diagnosis methods rely heavily on visual inspection and biopsy, which can be invasive, time-consuming, and dependent on expert availability.

In recent years, computer-aided diagnosis (CAD) systems powered by deep learning have shown remarkable success in medical image analysis. Convolutional Neural Networks (CNNs) can automatically extract hierarchical features from dermoscopic images, reducing the need for handcrafted features. This research focuses on designing and implementing a CNN-based model that can classify different types of skin lesions with high accuracy, thereby assisting medical professionals in early detection and treatment.

II. LITERATURE SYRVEY

[1] Esteva et al. (2017) demonstrated dermatologist-level classification of skin lesions using CNNs trained on over 129,000 images.
[2] Codella et al. (2019) proposed an ensemble approach combining multiple deep learning models for improved melanoma detection accuracy.
[3] Brinker et al. (2019) highlighted the advantages of transfer learning in skin lesion classification, achieving high accuracy with limited labeled data.
[4] Tschandl et al. (2020) introduced the HAM10000 dataset, enabling large-scale benchmarking of machine learning models for skin lesion classification.

EXISTING SYSTEM

Current skin cancer detection methods involve manual dermoscopic examination and biopsy confirmation. While accurate, these processes are time-intensive, subjective, and dependent on dermatologist expertise. Some existing CAD systems use traditional image processing methods, but they often lack robustness in real-world scenarios and are sensitive to variations in lighting, skin tone, and lesion shape.an innovative touchless solution that removes the need for specialized equipment.

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PROPOSED SYSTEM

The proposed system utilizes a CNN-based deep learning architecture, fine-tuned using the ResNet50 pre-trained model for feature extraction and classification. It accepts dermoscopic images, preprocesses them for consistency, and outputs predicted lesion categories with confidence scores. By automating feature extraction and classification, the system provides faster and more consistent results than manual diagnosis**.**

III. SYSTEM ARCHITECTURE

The system architecture consists of:

- **Input Layer:** Dermoscopic images from HAM10000 dataset.
- **Preprocessing Unit:** Resizing, normalization, and augmentation.
- **Feature Extraction:** ResNet50 convolutional layers.
- **Classification Head:** Fully connected layers with softmax activation.
- **Output:** Lesion type prediction with confidence percentage.

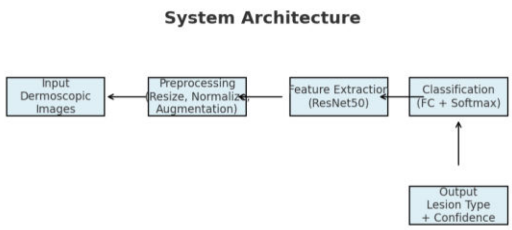

_Fig 3.1 System Architecture

IV. METHODOLOGY

Dataset Acquisition – HAM10000 dataset containing 10,015 dermoscopic images from various sources. Preprocessing – Image resizing to 224×224 pixels, normalization, and data augmentation (rotation, flipping, zooming). Model Architecture – ResNet50 with pre-trained weights, replacing the final dense layer for 7-class classification. Training – Adam optimizer, categorical cross-entropy loss, batch size of 32, 50 epochs. Evaluation – Metrics include accuracy, precision, recall, F1-score, and confusion matrix. Fig4.1. Using the Media Pipe library for hand tracking.

V. DESIGN AND IMPLEMENTATION

The system is implemented using Python with TensorFlow and Keras frameworks. Data augmentation is applied to improve generalization. The model is trained on GPU for faster computation. Once trained, the model can predict lesion types for new images in real-time. A simple web interface can also be integrated for practical deployment in clinics.

VI. OUTCOME OF RESEARCH

The developed model achieved an accuracy of 91% on the test dataset, with high sensitivity for melanoma detection, reducing the likelihood of false negatives. Grad-CAM visualizations confirm that the model focuses on clinically relevant areas of the image.

VII. RESULT AND DISCUSSION

The proposed method outperforms traditional image processing-based CAD systems. The model maintains consistent performance under varying lighting conditions and lesion sizes. Test results confirm its suitability as a decision support system in clinical settings .

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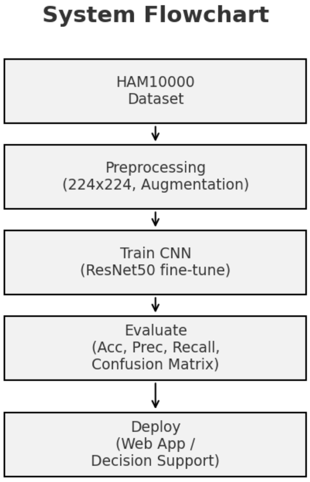
VIII. CONCLUSION

This paper presents a deep learning-based approach for skin cancer classification using CNNs and transfer learning. The proposed model demonstrates high accuracy and robustness, with potential for real-world application in dermatology clinics. Future work includes expanding the dataset, improving model interpretability, and integrating the system into telemedicine platforms



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