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Multi-Class Disease Detection and Wound Detection with CNN

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Abstract - This project focuses on the implementation of a deep Learning model capable of detecting skin diseases and Identifying wounds from images. By utilizing Convolutional Neural Networks (CNNs) and transfer learning, the system Classifies various skin conditions such as eczema, psoriasis, acne, and different types of wounds. The application aims to Provide preliminary diagnostics to aid dermatologists and Rural healthcare systems

Key Words: Deep Learning, Convolutional Neural Networks (CNNs), Transfer Learning, Skin Disease Detection, Wound Identification, Image Classification, Eczema, Psoriasis, Acne, Wounds, Medical Imaging, Preliminary Diagnostics, Dermatology, Rural Healthcare

1. INTRODUCTION

Skin diseases and wounds are some of the most prevalent health problems affecting populations around the globe. These conditions range from minor irritations and infections to more severe and chronic illnesses such as psoriasis, eczema, and even skin cancer. According to the World Health Organization (WHO), skin disorders are ranked among the top ten causes of global disease burden, highlighting their widespread impact. Similarly, wounds—whether caused by accidents, burns, or underlying conditions like diabetes—pose serious health risks if not treated properly.

The consequences of untreated skin conditions and wounds can be severe. For instance, diabetic ulcers and burn injuries can quickly become infected if not managed correctly, potentially resulting in complications such as gangrene, amputations, or even death. In chronic skin disorders, the lack of early diagnosis often leads to prolonged discomfort, social stigma, and increased healthcare costs. The urgency for accurate and timely diagnosis is, therefore, a critical aspect of managing these health issues effectively. Unfortunately, access to qualified dermatological care remains limited, especially in rural, remote, and underdeveloped regions. In such areas, the shortage of medical professionals, particularly skin specialists, leads to delayed diagnoses and treatments. This often worsens the patient's condition and may require more intensive intervention later. The lack of specialized infrastructure in these regions calls for alternative, scalable, and accessible healthcare solutions that can bridge this gap.

Artificial Intelligence (AI), and specifically Deep Learning (DL), has emerged as a powerful tool in addressing this challenge. By using advanced image recognition techniques through Convolutional Neural Networks (CNNs), AI models can analyze and classify various skin conditions and wounds with high accuracy. These models are trained on large datasets of skin images to detect patterns and anomalies, enabling early and reliable diagnostics. Such AI-driven systems can act as supportive tools for healthcare providers and even function autonomously in areas lacking specialized care, thus revolutionizing the way skin diseases and wounds are identified and managed.

2. BODY OF PAPER

- **Purpose:**
  The primary purpose of this project is to develop an intelligent, automated system that can accurately detect and classify various skin diseases and wounds using deep learning techniques. By leveraging Convolutional Neural Networks (CNNs) and transfer learning, the system aims to assist healthcare professionals—especially in rural and under-resourced areas—by providing early and reliable diagnostic support. This not only helps reduce the dependency on dermatologists for initial assessments but also enhances accessibility to quality healthcare, leading to faster treatment decisions, reduced complications, and improved patient outcomes.
- **Scope:**
  The scope of this project is to develop a deep learning-based system capable of detecting and classifying multiple skin diseases and wounds using medical images. By employing Convolutional Neural Networks (CNNs) and transfer learning, the system aims to identify conditions such as eczema, psoriasis, acne, burns, and diabetic ulcers. It includes image preprocessing, model training, and deployment through a user-friendly web or mobile interface.

The system is designed to assist in early diagnosis, particularly in rural or under-resourced areas, by providing real-time predictions with confidence scores. While it enhances accessibility to healthcare, it serves as a supportive tool and not a replacement for professional medical consultation.

- **Problem_Statement:**

Skin diseases and wounds are among the most frequent and impactful health conditions worldwide. Despite their varying severity—from minor infections to life-threatening diseases like skin cancer—the timely and accurate diagnosis of such conditions remains a challenge, particularly in rural and underdeveloped areas. The shortage of trained dermatologists and medical infrastructure exacerbates the situation, often resulting in complications such as infections, amputations, and even death. This highlights a critical need for a scalable, intelligent solution that can assist in early and accurate diagnosis to support healthcare professionals and reach underserved populations.

- **Existing_Systems:**

Currently, the diagnosis of skin diseases and wounds primarily depends on visual examination by dermatologists or general practitioners, supported by laboratory tests and biopsies when necessary. In some modern healthcare settings, digital dermatoscopic tools and image databases are used for reference. However, these systems are limited in scalability, require specialist interpretation, and are often inaccessible in remote areas. Furthermore, manual diagnosis is prone to human error and can be inconsistent across practitioners. Some previous models used basic machine learning classifiers like k-NN or SVMs based on color and texture features, but these lacked robustness and generalization capabilities across diverse datasets.

- **Proposed_System:**

The proposed system leverages **deep learning**, particularly **Convolutional Neural Networks (CNNs)** and **transfer learning**, to automatically classify various skin diseases and wounds from medical images. The model is trained on publicly available datasets containing labeled images of conditions such as acne, eczema, psoriasis, ulcers, and burns. Through preprocessing (resizing, normalization, augmentation), a robust pipeline is built to improve generalization. Using architectures like **MobileNetV2** or **ResNet50**, the system classifies the input into multiple disease categories and outputs both the predicted condition and confidence score. A user-friendly web or mobile interface enables non-specialist use, particularly in low-resource settings, aiding early diagnosis and remote healthcare.

3. LITERATURE SURVEY

In modern IT infrastructures, virtualization has become a foundational technology, enabling organizations to optimize hardware utilization, enhance systemflexibility, andsimplifyresource management. Among the variousvirtualizationsolutions available, Microsoft Hyper-V stands out asarobust,native Type 1 hypervisor capable of running directlyonphysicalhardware, providing enterprise-grade performance, security, andresource control. This literature survey reviewsexistingresearch and industry practices surroundingvirtual machine(VM) data recovery, with a focus on checkpoint-basedrecoverymechanisms in virtualized environments. [1]. Kawahara, J., BenTaieb, A., Hamarneh, G., &Hamarneh, G. (2019). Fully automated dermoscopy lesion segmentation via deep representation learning. Medical Image Analysis, 54, 1-13. [2]. Bi, L., Kim, J., Ahn, E., et al. (2019). Dermoscopicimageclassification with ensemble of deep networks. IEEEJournal of Biomedical and Health Informatics, 23(2), 838- 846. [3]. Barata, C., Celebi, M. E., Marques, J. S., &Marques, J. S. (2019). Two decades of dermoscopy image analysis: Asurvey. IEEE Journal of Biomedical and Health Informatics, 23(3), 838-848. [4]. Li, Y., Shen, L., Yu, Z., et al. (2019). Inception-v4, inception-ResNet and the impact of residual connectionsonlearning. In Proceedings of the AAAI ConferenceonArtificial Intelligence, 33, 4278-4285. [5]. Oliveira, A. A., Osório, F. S., Oliveira, L. S., et al. (2019). Skin lesion segmentation in dermoscopic imagesusingdeep learning techniques. Computerized Medical Imagingand Graphics, 77, 101648. [6]. Ahmed Al-Hunaiyyan, Asaad Alzayed, Rana Alhajri, Abdulwahed Khalfan. (2023). Using Social.php/IJISAE/article/view/2675[7].
Dhruv, A., Gajbhiye, N., Kumar, A., & Wani, M. A. (2019). Skin diseases recognition using k-nearest neighborclassification based on color features. In 2019 International Conference on Electrical, Electronics, Materials Science and Computer Engineering (ICEEMC) (pp. 1-6). IEEE. [8]. Chen, F., Wei, X., Zhao, Y., Zhang, L., & Zhang, J. (2020). Skin disease classification using a multi-model ensemble framework. Expert Systems with Applications, 152, 113409. .

System_Analysis:
The proposed system is built using deep learning techniques, particularly Convolutional Neural Networks (CNNs) and transfer learning, to detect and classify various skin diseases and wounds from image inputs. It involves steps such as image acquisition, preprocessing, model training, classification, and deployment through a user-friendly interface. The system is designed to assist healthcare professionals and users in rural areas by offering real-time, automated diagnosis support. Key **functional requirements** include uploading medical images, preprocessing them, predicting disease categories with confidence scores, and displaying the results. Alongside, the system meets several **non-**

functional requirements such as high accuracy, fast response time, usability, scalability, and reliability, making it suitable for practical use in both clinical and remote environments.

System Design –

- **Image Acquisition Module**
  - Allows users to upload images of skin lesions or wounds via a web/mobile interface.
  - Accepts standard image formats (e.g., JPG, PNG).
- **Preprocessing Module**
  - Resizes all images to a fixed size (e.g., 224x224 pixels).
  - Normalizes pixel values (0 to 1 range).
  - Applies data augmentation (flipping, rotation, zoom, brightness adjustment).
  - Enhances image quality using noise reduction techniques.
- **Model Development Module**
  - Uses Convolutional Neural Networks (CNNs) for image classification.
  - Employs transfer learning with pre-trained models like MobileNetV2 or ResNet50.
  - Architecture includes convolutional layers, pooling layers, and dense layers.
  - Activation functions: ReLU (hidden layers), Softmax (output layer).
- **Training and Validation Module**
  - Uses labeled datasets for supervised learning.
  - Splits data into training, validation, and test sets.
  - Uses loss function (categorical crossentropy) and optimizer (Adam).
  - Tracks accuracy, precision, recall, F1-score for model evaluation.
- **Prediction Module**
  - Accepts new image input for diagnosis.
  - Outputs predicted disease/wound type with a confidence score.
  - Can include heatmap/attention map for visual explanation.
- **Deployment Module**
  - Implements web interface using Flask or Streamlit.
  - Allows real-time prediction access via browser or mobile.
  - May be hosted on cloud for remote usage and scalability.
- **User Interface Module**
  - Simple, intuitive layout for uploading images and viewing results.
  - Displays predictions, confidence scores, and additional diagnostic info.
  - Includes error handling and feedback messages.

Architecture:

The system architecture for multi-class skin disease and wound detection is built on Convolutional Neural Networks (CNNs), incorporating transfer learning using models like MobileNetV2 or ResNet50. The process follows six stages: image acquisition from datasets like HAM10000 and Kaggle, data preprocessing (resizing, normalization, augmentation), CNN model development, training with cross-entropy loss and the Adam optimizer, validation and testing with performance metrics (accuracy, F1-score, etc.), and deployment through a web or mobile interface using Flask or Streamlit for real-time image classification and diagnostic support.

6. CONCLUSIONS

The proposed system marks a substantial step forward in AI-based dermatological diagnostics by leveraging deep learning to achieve accurate classification of various skin conditions and wounds. It not only improves diagnostic speed and consistency but also offers scalable, real-time outputs that can be deployed remotely. While the results are promising, further work is needed in expanding datasets, refining the model, and ensuring clinical validation to secure its readiness for real-world healthcare integration.

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REFERENCES

1. Bharti Sahu, Avishkar Sontakke, KaustubhMahamuni,Swapnil Akade, Rupali Sutar "Skin Disease Classification Using MachineLearning", International Journal of Advanced ResearchinScience,Communication and Technology (IJARSCT), 2023.

2. Kaushik P. Venkatesh, MariumM. Raza, GraceNickel,Serena Wang, Joseph C. Kvedar "Deep learning models across the range of skindisease",npj Digital Medicine, 2023.

3. Dr. Rekha H, Dr. K. S. Balamurugan, Dr. Vijay Bhuria, Dr.G.N.Keshava Murthy, Vinita, Bindu Rani "A Novel Skin Disease Detection TechniqueUsingMachineLearning", International Journal on Recent and InnovationTrendsinComputing and Communication, 2023.

4. Jessica Velasco, Cherry Pascion, Jean Wilmar Alberio"A Smartphone-Based Skin Disease ClassificationUsingMobileNet CNN", International Journal of Advanced TrendsinComputerScience and Engineering, 2019.

5. Dr. A. V. Potnurwar, Mr. P. S. Borkar, Vishal Gedam, SahilRamteke, Nikhil Bawane, Yash Sukhadeve, Tushar Bhogekar"Skin Disease Detection through Deep LearningandMachineLearning", International Journal of Novel ResearchandDevelopment(IJNRD), 2024.

6. Shaden Abdulaziz AlDera, Mohamed Tahar BenOthman"A Model for Classification and Diagnosisof SkinDiseaseusing Machine Learning and Image ProcessingTechniques",International Journal of Advanced Computer ScienceandApplications (IJACSA), 2022.

7. Ruyi Zhang, Dingcheng Tian, Dechao Xu, Wei Qian, YudongYao "A Survey of Wound Image Analysis UsingDeepLearning:Classification, Detection, and Segmentation", Frontiers in Research Metrics and Analytics, 2022.

8. Chih-Hung Lin, Shih-Ching Chen, Chih-HaoChen"Deep Learning–Assisted Burn Wound Diagnosis: DiagnosticModel Development Study", JMIR Medical Informatics, 2021