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Early Skin Cancer Detection System Using Deep Learning

A Project Proposal by

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ABSTRACT

Skin cancer is one of the most prevalent cancers in the world, and hence early detection is crucial to improve patient outcomes. Traditional diagnosis methods such as visual examination and biopsies can be subjective, invasive, and not accessible in developing countries. In this paper, a deep learning web application for early skin cancer detection is presented. The model features advanced convolutional neural networks (CNNs) like VGG16, ResNet18, and ResNet50 to classify skin lesions into seven classes: actinic keratoses, basal cell carcinoma, benign keratosis-like lesions, dermatofibroma, melanoma, melanocytic nevi, and vascular lesions.

The project is accuracy, usability, and clinical-relevance-oriented. A huge database of dermatoscopic images was trained using data augmentation methods to overcome class imbalance issues and improve generalizability. Accuracy, precision, recall, and F1-score were chosen as key performance metrics for evaluating the models. Explainable AI features like confidence scores provide transparent predictions to clinicians, thereby being more trustable and usable.

A user-friendly web interface, developed with React.js and Flask, enables seamless integration into clinical workflows. The application enables physicians to upload images, receive real-time classifications, and leave feedback for continuous model improvement. Validation testing confirmed system reliability, with fast response times and adherence to data privacy standards such as HIPAA and GDPR.

This research advances AI-assisted dermatology by closing gaps in multi-class skin cancer classification, increasing accessibility, and encouraging transparency. Mobile deployment, electronic health record (EHR) integration, and increased coverage of the dataset for less-studied skin types are avenues for future enhancements. By making early diagnosis easier and reducing healthcare costs, this system can have the potential to enhance patient outcomes worldwide.

Subject Descriptors:

- Computing methodologies → Machine learning → Machine learning approaches → Classification and regression trees

Keywords: Skin cancer detection, VGG16, ResNet18, ResNet50, Deep learning, CNN, Dermatology, Image classification, Healthcare technology, Early detection, Accuracy