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A Machine-Learning Approach to Prevent Diabetes by Detecting *Onychomycosis*, a Common Fungal Infection

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ABSTRACT

The potential dangers posed by *Onychomycosis* - a fungal infection of the nails - are especially high among diabetic patients. Despite this risk however there currently exists no reliable means of detecting this condition or presenting information about the extent of fungal spread alongside its status. With patient outcomes at stake here it is crucial that we prioritize research towards developing superior diagnostic and tracking methods for *Onychomycosis*.

The approach taken in this research project involved the use of a light weighted pre-trained model, which was using transfer learning techniques along with hyperparameter optimization. Also, the models are trained with a maximum number of reachable real-world datasets. By leveraging the pre-trained model's learned features and architecture, the author was able to significantly reduce training time and improve the accuracy of the model. Additionally, the author utilized hyperparameter tuning to optimize the performance of the model, which involved adjusting various parameters to find the best combination for the specific use case. Overall, this approach drove the author to achieve a well-performing, light-weighted model for classifying *Onychomycosis* status along with the fungal spread percentage on the nail.

From this approach, the author was able to gain 97.53% of Accuracy along with a 0.9804 F1 score, 0.9821 Sensitivity value, 0.9690 Precision value, and 0.9921 for the AUC value from the trained InceptionV3 model along with the self-taught transfer learning. Also, for the fungal segmentation process, the author gained a 0.96 F1 score, a 0.97 Recall, a 0.94 Precision for the segmented boxes, and a 0.83 for the F1 score, Recall, and Precision for the segmented Masks. This Image Processing approach can make significant improvements in dermatology.

Subject Descriptors

- J. Computer Applications $\rightarrow$ J.3 Life and Medical Science $\rightarrow$ Health
- H. Information Systems $\rightarrow$ H.1 Models and Principals $\rightarrow$ H.1.2 User/Machine Systems $\rightarrow$ Human information processing
- Computing Methodologies $\rightarrow$ I.4 Image processing and Computer vision $\rightarrow$ I.4.7 Feature Measurement