

Teeth Diseases Classification Using Convolutional Neural Network

Abstract

This project focuses on developing a deep learning model using Convolutional Neural Networks (CNNs) to classify seven different types of teeth diseases. The dataset consists of images divided into training, validation and testing sets. The approach includes preprocessing, data augmentation to improve generalization, visualization, model training and evaluation to achieve a reliable and high accuracy classification for teeth disease images.

Problem Definition

In real-world, Teeth diseases are common and aren't often detected in early stages due to limited access to dental professionals. Automating the process using deep learning and computer vision can help in early detection and reducing diagnostic error.

Objectives

Our goal is to develop a comprehensive teeth classification solution that includes preprocessing and visualizing dental images, and a robust computer vision model capable of accurately classifying teeth into seven distinct categories.

Methodology

The project was implemented in various Steps. These steps include **Data Preprocessing**, **Data Augmentation** by applying random rotation, zoom and horizontal flip for increasing diversity, **Visualizations** exploring class distributions and the effect of augmentation, **Building a custom CNN Model**, **Training** the Model using Adamax optimizer and early stopping to train efficiently and **Evaluation** using metrics such as accuracy, precision, recall and AUC.

Conclusion

The CNN-based model successfully learned to distinguish between seven types of teeth diseases with high training accuracy. While some overfitting was observed initially, architectural simplifications, stronger regularization, data augmentation, and class weighting significantly improved the model's generalization. This work demonstrates the feasibility of using deep learning for Teeth disease classification and sets the foundation for future improvements.

Research

The seven diseases we are trying to classify refer to various teeth and gum diseases.

1. **OC** refers to oral cancer.
2. **CoS** indicates Cold sores which are like some kind of lip rash.
3. **CaS** indicates Canker Sores.
4. **Gum** indicates gum disease (periodontal disease).
5. **MC** refers to Mouth Cancer.
6. **OLP** denotes oral lichen planus.
7. **OT** that stands for oral thrush, aka oral candidiasis

These conditions represent a range of issues, from minor irritations to serious diseases, some of them need to be diagnosed early.