COMP6016 Mid-Project Report

AI-based Skin Cancer Image Dataset Classification

Zhe Cheng 21022098
Supervisor: Dr. Senjian

Overview

This project, titled “AI-based Skin Cancer Image Dataset Classification”, aims to classify skin cancer images through advanced AI methods, reducing stress on dermatologists. In developed countries, the incidence rate of skin cancer continues to rise. Early and accurate detection as an efficient method can significantly reduce the death rate of skin cancers. Although the traditional manual classification method is still effective, the limitation is that the traditional classification method relies on the specialized knowledge of dermatologists. Nowadays, the shortage of experienced dermatologists brings a challenge because these classification tasks need dermatologists who have professional knowledge and experience in the skin cancer field.

To solve the shortage of experienced dermatologists, this project will explore the potential of AI-aided diagnostic technology and focus on applying convolutional neural networks (CNN) to classify skin cancer images. Although the effectiveness of the technology has been proven to improve the speed and accuracy of dermatological diagnosis, AI-aided diagnostic technology is still restricted in the application of clinical practice. One of the primary barriers to its widespread use is the distrust from the dermatological community, mainly presenting the lack of basic AI knowledge.

Therefore, this project involves developing and updating CNN skin cancer image methods and tries to develop innovative feature extraction techniques that dermatologists can understand. This innovation will significantly improve the reliability and accuracy of skin cancer image classification, thereby bridging the gap between advanced AI technology and its application in dermatology.

Progress to Date

Finding Projects (Week 1 - 2)

In the first two weeks, the research direction of this semester was determined with the supervisor's guidance based on the COMP6015 project.

Proposal and scoping report (Week 3 - 5)

It took three weeks to finalize the project details with the supervisor, including the time of weekly meetings and how documents would be delivered.

Data pre-processing and training a linear classifier (Week 6 - 7)

Split the images into corresponding folders

The original image dataset contains seven categories of skin cancers, and they have not been classified into corresponding subfolders. Based on an acquired list of labels, images from the disordered original image dataset are moved to corresponding labeled folders.

Divide the train set and test set

The train set and test set have been divided from the original dataset at a ratio of 8:2.

Define a simple linear network to classify seven category images

By defining a simple linear classifier to classify seven category images, the best accuracy obtained on the test set is 67 percent.

Build and configure a CNN model through the “Inception v3” architecture (Week 7)

A CNN model has been built by importing the “Inception v3” model from the “torchvision” library. The best accuracies obtained are 99 percent and 80 percent on the train and test sets.

Upcoming Tasks

Training a resnet-18 model on the train set and test its accuracy on the test set (Week 8)

In week 8, followed by the supervisor’s instructions, the plan will include re-splitting the dataset in the ratio of 7:2:1 and training a resnet-18 model on the train set, then testing the model performance on the test set. The plans for the next few weeks are pending.

Challenges and Issues

Lack of model training resource

Due to the medical dataset containing 10,000 images, training this dataset requires much time and computational resources. I have already bought an additional 100

computation units on Google Collab to work on this project, and I may spend more money on computational units in the future.

Data Management

Data Management During the Project

This project will use GitHub for version control to ensure all code updates are tracked and retrievable.

Data Handover at Project Completion

The code will be submitted to the appointed repository on GitHub, which will become the archival location for the final submission. In addition, all the project documents, including the reports written in Google Docs, will be submitted to the repository on GitHub as copies when they have been finished. It will allow the supervisor to access and review the information anytime.