

Skin Lesion Detection and Classification using Deep Learning Techniques

Project Proposal

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# **ABSTRACT**

Recent technologies of machine learning, especially deep neural networks have made many breakthrough in different fields. One important field where these techniques can be applied is digital image processing in medical domain. To detect and classify skin lesion in images using machine learning techniques is a crucial task to assist physician in decision making related to patient health.

This work focus on skin lesion classification and detection in images using deep learning techniques. In first stage Convolution Neural Network (CNN) is used to classify melanoma images of benign and malignant tumours. In second stage we will use the same technique to detect cancerous lesion in melanoma images. This Tumour detection model is basically an expert system built to detect skin cancer in patients. The model is trained on images using deep learning techniques. Initial results obtained using above mentioned technique has 78% accuracy. The aim is to improve accuracy to more than 90%.

# **INTRODUCTION**

Deep learning is a piece of a more extensive group of machine learning. It is based on learning data representations rather than task-specific algorithms. In Image Processing different algorithms are applied to images to analyse and extract the required results.

The purpose of this project is to build a model that aid doctors in diagnostics. It can be quite difficult to detect a disease as positive or negative and being humans, doctors naturally require an additional opinion at times to help or confirm their diagnostic. The model is hence intended to initially serve as a second opinion to a doctor’s diagnosis.

To build our expert system, we will be using a Convolution Neural Network and some deep learning techniques. The model takes an image as input and detects skin lesion in the person. Upon positive results, the model further classifies the tumor as ‘Benign’, ‘Malignant’ or ‘Unknown’.

Models detecting and classifying Skin Tumor detection have been built previously but we aim to use better and more efficient algorithms in our model to improve the accuracy that has been achieved up till now.

The dataset that is used for classification is taken from ISIC Archive [[6]](#_REFERENCES). Models detecting and classifying Skin Tumour detection have been built previously but we aim to use better and more efficient algorithms in our model to improve the accuracy that has been achieved up till now.

# **GOALS AND OBJECTIVES**

1. Classify positive skin cancer results as ‘Benign’, ‘Malignant’ or ‘Unknown’ using CNN
2. Skin Lesion Detection using CNN

# **PROJECT SCOPE**

In first phase we will train convolution neural network to classify skin melanoma images into ‘Benign’, ‘Malignant’ or ‘None’. In second phase our model will detect skin cancerous lesion using the same approach, to train the convolution neural network. In the end we will try to make our own neural network using hyperparameter.

# **WORK DONE SO FAR**

So far we have studied various research papers on the subject and taken online tutorials on Machine Learning and Deep learning. The research papers we read had used insufficient data which is not enough for an unbiased analysis and can lead to model under fitting. In paper [[1]](#_REFERENCES) we found out that some machine learning models implemented before have classification accuracy of 85% using Support Vector Machine and 95% using Back-Propagation Neural Network. They have trained the model on only 100 images and their accuracy results too are based on a very small chunk of test data i.e. one hundred images.

In research paper [[1]](#_REFERENCES) hybrid (combination of BNN and SVM) model approach has been used to classify skin cancer as benign or malignant only. They have not handled unlabelled during training and testing phase. By using hybrid approach and increasing feature vector size twice to improve accuracy from 70% to 95%, they have also increased the complexity of the Neural Network Model. Under fitting has also resulted due to small size of dataset used for training and testing. Moreover, it was also stated in the paper that these results are initial and not final.

Although a high accuracy has been achieved in [[1]](#_REFERENCES), paper[[3]](#_REFERENCES) mentions that accuracy may not always be a good measure of evaluating a models performance. Other factors need to be considered too. A model for example trained on uneven data with a majority of one class maybe correctly able to identify only that class. Now when the test data containing a higher proportionality of the same class comes, with minimal or no test data belonging to other classes, the model will give a very high accuracy rate since the test data is mostly composed of the class it classifies correctly.

In [[4]](#_REFERENCES) Image processing, techniques are applied in which Images were enhanced using Gabor filter and FFT. Then it was segmented using threshold and Watershed segmentation approach. As a result, features are extracted using binarization and masking approach, the true acceptance rate (TAR) of this method is (85.7%) and false acceptance rate (FAR) is (14.3%) without using any deep learning techniques.

Using deep learning techniques we aim to achieve more than 90% accuracy with models that are defined in project scope. We have also built a first draft version of our model which classifies the tumour with an accuracy of 78%. In the upcoming weeks we will work on training and testing our neural network with complete dataset from [[6]](#_REFERENCES), improving its accuracy, handle unlabelled data by better pre-processing and extracting useful features. We will improve our algorithm to classify more efficiently.

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