Research Question

Is it possible to create an app that can detect cataracts using machine learning and will the app be effective in providing an early diagnosis of cataracts?

Purpose:

The purpose of this project was to create an app with a machine learning model that can identify and classify front-view retinal images as cataract eyes or normal eyes. In addition, the app should have minimal technological attachments in order to be implemented in areas where the technological infrastructure is not developed yet.

Problem Statement:

Cataracts, which can cause blindness if failed to be detected early, require expensive technology for detection which is not available to less developed countries. Currently, there is no cost-effective way to detect cataracts which can lead to the prolongment of the disease.

Methodology

Data Collection:

- A total of 2912 retinal images were collected

Pre-processing the Data:

- The images were resized to 256px by 256px
- Data augmentation done by “ImageDataGenerator” class

Building the Model:

- The amount of retinal images in each dataset was recorded
- A CNN Model was built using the features:
  - Batch Normalization
  - Max Pooling
  - Padding
  - Flatten
  - Dense

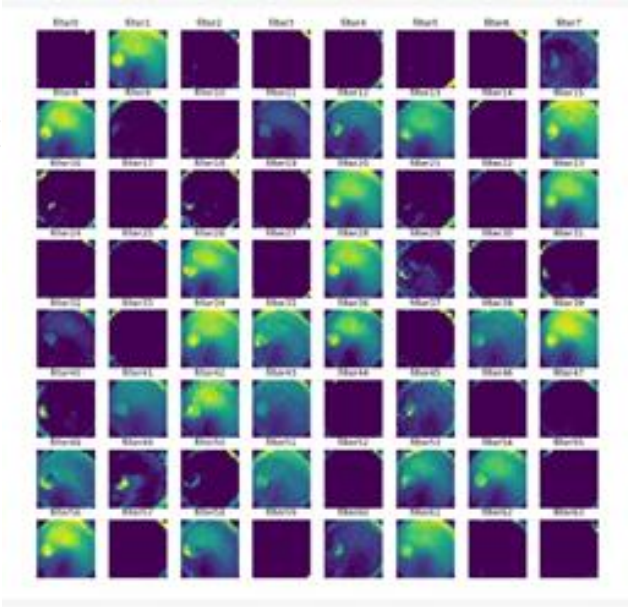
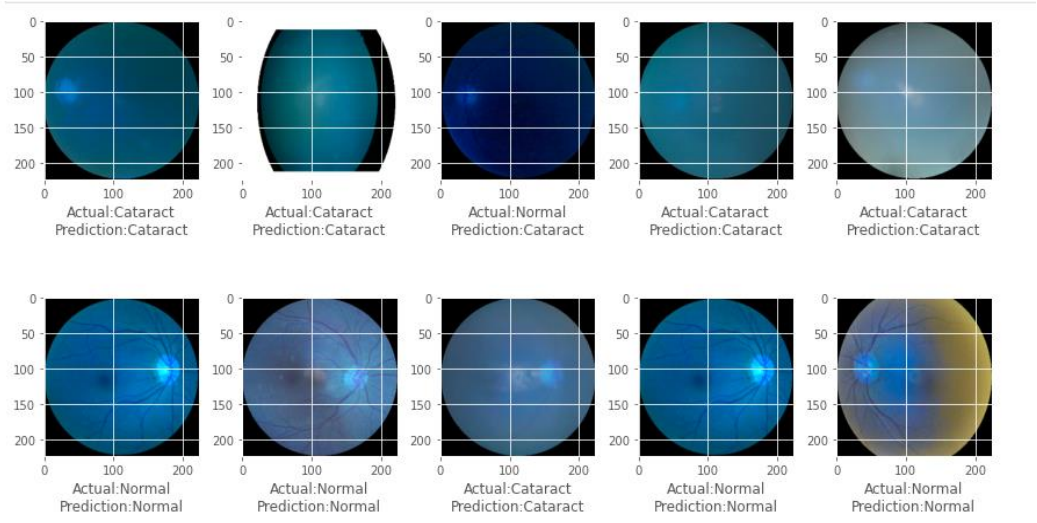


Image provided by author

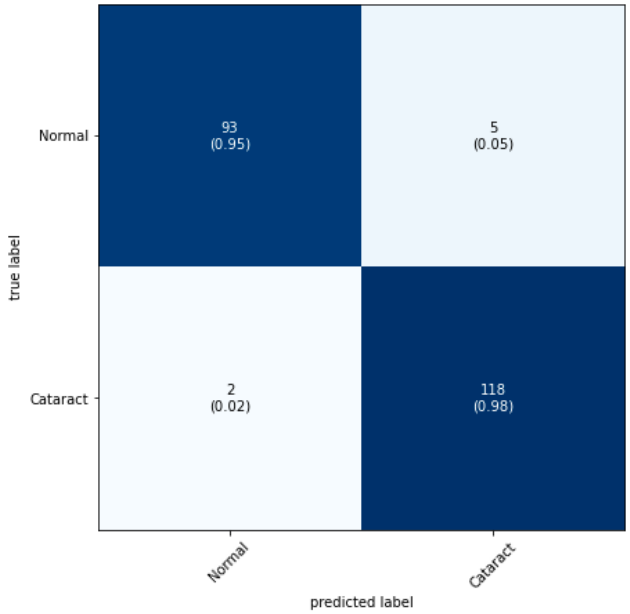
Creating the App:

Model was converted to a tflite file and deployed to Android Studio

Data Analysis and Results



- Model had accuracy of 92.09%
- The model was also able to identify and classify random images from the dataset during testing accurately
- 5 false positives and 2 false negatives



Interpretations and Conclusions

Overall:

- A model was built using CNNs to detect cataracts from front-view retinal images.
- The accuracy of the convolutional neural network model was observed as the model underwent training.
- An app was successfully built to classify and identify cataracts and healthy eyes from a retinal image.

Advantages:

- Healthcare mobile apps offer easy medical availability to less developed areas or countries.
  - Convenient, reliable, and handy

Disadvantages:

- The model can be very expensive to train, as it requires a very large amount of data in order to perform accurately.
- Implementing machine learning models on a larger scale can be expensive due to GPUs and machines that are required.