

RETINAL FUNDUS MULTI-DISEASE IMAGE CLASSIFICATION

PROJECT PROPOSAL

Introduction

- ▶ We are making an image classification model for the detection of a set of retinal/eye diseases using retinal fundus images.
- ▶ A large portion of our population suffer from eye diseases at some point of their lives. These diseases are widespread across India in both rural and urban areas. Unfortunately, India has a scarcity of trained doctors that could diagnose these diseases, with their availability being highly concentrated in urban areas.
- ▶ The goal of our project is to explore the possibility of making a working model that could substitute the availability of doctors by making accurate predictions for these diseases.

Data

- ▶ Thus far, we have obtained 3200 retinal fundus images from kaggle with 46 labels. These are divided into Train, Validation and Test set in a 2:1:1 ratio.
- ▶ Medical data is usually hard to obtain requiring some paperwork. We are in contact with associate dean of academic affairs to correspond with eye hospitals for the same.
- ▶ For transfer learning with our own source data, we have access to 35K+ images for Diabetic Retinopathy diagnosis and other datasets available on Kaggle.

Baselines to implement

- ▶ Our first approach would be through convolutional neural networks (CNNs) for image classification.
- ▶ We will then use some pretrained models for inductive transfer learning and see if we get more accurate results.

Teamwork division

- ▶ Saksham will look after data management, exploratory data Analysis of target variables and statistical test on the results.
- ▶ Deependra will look after model making, coding and fine tuning, etc.
- ▶ Report making part will be done by both.

What is to be done by midway

- ▶ Cleaning and processing of the images. Augmenting the images if possible to obtain more data for their application in a model.
- ▶ Learn more about ANN and CNN, and apply them using different python libraries like tensorflow for the same. And move to deep transfer learning.
- ▶ Get more domain knowledge about diagnosis of these diseases and see if it can be applied on our model for some extra explorations.

Expected Result

- ▶ We expect to effectively apply our model on the dataset and strive to achieve close to 90% accuracy with results.
- ▶ We also expect the accuracy to improve using pretrained models for transfer learning.

Related Papers

- ▶ Dong, L., He, W., Zhang, R., Ge, Z., Wang, Y. X., Zhou, J., ... & Wei, W. B. (2022). Artificial intelligence for screening of multiple retinal and optic nerve diseases. *JAMA Network Open*, 5(5), e229960-e229960. (Paper on Data collection and CNN)
- ▶ Kim, K. M., Heo, T. Y., Kim, A., Kim, J., Han, K. J., Yun, J., & Min, J. K. (2021). Development of a fundus image-based deep learning diagnostic tool for various retinal diseases. *Journal of Personalized Medicine*, 11(5), 321. (More detailed paper also with information on heat map generation)
- ▶ Das, A., Giri, R., Chourasia, G., & Bala, A. A. (2019, July). Classification of retinal diseases using transfer learning approach. In 2019 International conference on communication and electronics systems (ICCES) (pp. 2080-2084). IEEE. (On Transfer learning)