Project Proposal

**Abstract**

According to WHO’s World Report on Vision 2019 highlights the global prevalence of vision impairment. Currently there are at least 2.2 billion people around the world. Out of the 2.2 billion, there are at least 1 billion cases preventable or yet to be addressed. This points to a significant, urgent need for improved eye care services worldwide. Challenges include geographical disparities of eye care access and a good quality diseases prevention, treatment, rehabilitation service. Additionally, some vision impairment also indicates some early signs of diverse range of other condition non-relating to ocular diseases.

To address the gap, there is a call for improved, accessible for medical image analysis. A major factor that could mitigate these challenges is the early detection and diagnosis of ocular diseases, which can prevent further visual impairment. We hope to leverage deep learning to classify common ocular diseases automatically while also exploring biomarkers that could aid in the early detection of these conditions, specifically, DR (Diabetic Retinopathy), MH (Media Haze), ODC (Optic Disc Cupping), TSLN (Tessellation), DN (Drusen), MYA (Myopia), ARMD (Age-related Macular Degeneration), and Normal. By combining classification with biomarker analysis, we hope to address both immediate diagnostic needs and the potential for proactive healthcare.

**Reference:**

* [**https://ieeexplore.ieee.org/document/10493693**](https://ieeexplore.ieee.org/document/10493693)
* [**https://www.who.int/publications/i/item/9789241516570**](https://www.who.int/publications/i/item/9789241516570)
* [**https://www.mdpi.com/2075-4418/13/6/1081**](https://www.mdpi.com/2075-4418/13/6/1081)

**Data Set**

* **Retinal Fundus Multi-Disease Image Dataset (RFMiD):** 3203
  + **Train:** 1921
  + **Validation:** 641
  + **Test:** 641
  + **Diseases:** 45

**State-of-the-Art**

* EyeDeepNet: a customed CNN the extracts features from images to identify patterns associated with various retinal diseases and classification.
* Data Type Conversion
* Normalization: 0-255 -> 0-1
* Shuffling
* Train-Test-Split
* Augmentation: image rotation, shearing, and horizontal flipping

**Proposed Plan (Comparing the result with different systems and approaches, ultimately to improve the result from the previous paper)**

* Model vs. Model:Unet vs State-of-the-art
* Data Type Conversion
* Resizing:512 x 512
* Normalization:0-255 -> 0-1
* Augmentation:
  + Image rotation
  + Shearing
  + Horizontal flipping
  + Histogram equalization: Contrast Limited Adaptive Histogram Equalization (CLAHE)
  + Discrete Wavelet Transform (DWT) Transformation
* Shuffling

**Potential Risks**