**Biweekly Report: Diagnosis of Diabetic Retinopathy - Chenyu Huang**

**Total Work Hours: 15 hours [3.24 - 4.6]**

**Work Overview**

The past two weeks mainly focused on the understanding and reproduction of the paper [APTOS Diabetic Retinopathy (EDA & starter)](https://www.kaggle.com/code/tanlikesmath/intro-aptos-diabetic-retinopathy-eda-starter) in the *Kaggle* competition, which completed the exploratory data analysis (EDA) and baseline model building for the APTOS diabetic retinopathy (DR) competition data set. My work mainly concentrated on Paper Understanding, Data Preprocessing and Model Reproduction.

**Task Progress**

1. **Paper Reading**: The idea of data processing and model training in this paper is basically understood, which provides a reference for the research of this project.
2. **Exploratory Data Analysis (EDA)**:  
    First, perform descriptively analysis to the data set. The data set contains 3662 fundus images and the corresponding DR severity labels (0-4 levels). The categories are significantly unbalanced (mild cases account for a high proportion).  
    Then, image standardization, image enhancement, label distribution correction (by oversampling to balance the category distribution) and other strategies are adopted to preprocess the data.  
    Finally, visually analyze the images, understanding the difference between healthy and pathological fundus, basically completed EDA.
3. **Model Reproduction**:  
    Based on the pre-trained *Resnet50* architecture, transfer learning is carried out to adapt to DR (Diabetic Retinopathy) classification tasks.  
    The training strategy adopts *Adam* O*ptimizer* (the initial learning rate is 0.001) with *ReduceLROnPlateau* in *Pytorch* to dynamically adjust the learning rate.  
    The evaluation index is mainly the *Rectangular Weighted Kappa* (QWK), taking into account the accuracy and confusion matrix.  
    At last, the final model in the paper is basically reproduced.

**Key challenges and Solutions**

1. **Compute resource limits**: The local GPU memory is insufficient, so I use the *AutoDL* platform GPU resources, and optimize the batch size (from 32 to 16).
2. **Inconsistent data annotation**: Some image labels are different from the description in the paper. Through validation of the *Kaggle* discussion area, 5% abnormal labels are corrected.