Team SRM

Mid Status Report

Introduction

By providing a tool that can segment retinal nerve fibers more precisely and quickly than manual techniques, this project looks for to greatly improving the analysis of retinal images. By doing this, it helps ophthalmologists examine the retina in detail and makes it easier to conduct research and studies on a condition called and other retinal diseases.AI solutions offer the potential to automate and improve the precision of data processing. This project aims to build an AI model leveraging neural networks to address this challenge effectively.

Related Literature

1. **Paper/Study 1**

   https://pmc.ncbi.nlm.nih.gov/articles/PMC8300062/

   OCT provides detailed 3D imaging for diagnosing eye and neurodegenerative diseases but struggles with smaller murine eyes. Deep learning automation solves this, enabling faster, accurate retinal analysis for research.

2. **Paper/Study 2**: https://www.sciencedirect.com/science/article/pii/S2772442523001284
   Visual impairment affects 2.2 billion people, with glaucoma, cataracts, and diabetic retinopathy as leading causes. Early detection using tools like retinal fundus imaging can prevent many cases by identifying damage to eye structures.

3. **Paper/Study 3**: https://www.tandfonline.com/doi/full/10.1080/21681163.2024.2350508
   Glaucoma, a major cause of blindness, is diagnosed using optic nerve and fundus imaging. A proposed CNN model enhances detection by focusing on key features, achieving 93.75% accuracy.

Progress Summary

Achievements

1. Developed initial components of the AI model, including data preprocessing pipeline, basic model architecture.

2. Initial results indicate an accuracy of X% in early tests.

Challenges and Workarounds

1. **Challenge 1**: Limited Labeled Data for Training
   Problem: The dataset available lacked sufficient labeled examples for effective training, leading to potential model underperformance.
   Workaround: Implemented data augmentation techniques such as oversampling, SMOTE (Synthetic Minority Oversampling Technique), or back-translation to generate additional labeled data. Additionally, explored transfer learning by leveraging pre-trained models to reduce reliance on large datasets.

2. **Challenge 2**: Overfitting on Training Data
   Problem: The model exhibited strong performance on training data but poor generalization on test data.
   Workaround: Introduced regularization techniques, such as dropout layers and L2 regularization, and conducted k-fold cross-validation to ensure the model generalized well across unseen datasets.

Refinement and Experimentation

Currently conducting experiments to refine the model by fine-tuning hyperparameters, testing alternate architectures. Comparative results with baseline expectations are being recorded for analysis.

GitHub Repository

https://github.com/nallapanenisasidhar/DEEP-LEARNING-BASED-ON-RETINAL-NERVE-FIBER-.git