Diabetic Retinopathy Detection and Classification using Different Models

Contribution Summary

Project Overview:
The project aimed to implement different models, including Decision Tree (supervised and semi-supervised), Convolutional Neural Network (CNN), and DenseNet, for Diabetic Retinopathy (DR) detection and classification. The goal was to develop accurate and efficient models to aid in the early diagnosis of DR.

Team Members:

[Rajat Sharma - 40196467] - Data Preprocessing and Decision Tree (Supervised)
[Tript Dhudi - 40248554] - Decision Tree (Semi-Supervised) and Model Evaluation
[Amanpreet Singh - 40221947] - Convolutional Neural Network (CNN) Architecture Design and Training
[Ashish Upadhyay - 40225754] - DenseNet Implementation and Model Optimization

Contribution Summary:

[Rajat Sharma]

Key Achievements:
Conducted data preprocessing and feature engineering for the DR dataset.
Implemented the Decision Tree model in a supervised setting.
Fine-tuned the Decision Tree hyperparameters to improve model performance.
Challenges Overcome:
Overcame the challenge of handling imbalanced data through appropriate sampling techniques.
Addressed feature selection and engineering to enhance the model's accuracy.
Lessons Learned:
Gained insights into the preprocessing techniques and feature engineering methods crucial for the success of the Decision Tree model.

[Tript Dhudi]

Key Achievements:
Developed a semi-supervised approach using Decision Tree for DR classification.

Integrated labeled and unlabeled data to leverage the benefits of both for model training.
Evaluated and compared the performance of the semi-supervised model with the supervised approach.
Challenges Overcome:
Addressed the challenge of utilizing the limited labeled data available by leveraging the unlabeled data effectively.
Dealt with the issue of handling a mixed dataset containing labeled and unlabeled samples.
Lessons Learned:
Gained knowledge about leveraging unlabeled data to improve model performance in semi-supervised learning scenarios.

[Amanpreet Singh]

Key Achievements:
Designed the architecture of a Convolutional Neural Network (CNN) for DR detection.
Trained the CNN model using the DR dataset and optimized its hyperparameters.
Achieved high accuracy in classifying retinal images for DR severity levels.
Challenges Overcome:
Overcame the challenge of designing a deep learning architecture suitable for the complex features in retinal images.
Addressed issues related to overfitting by implementing regularization techniques.
Lessons Learned:
Gained experience in developing and training CNN models for medical image classification tasks.

[Ashish Upadhyay]

Key Achievements:
Implemented DenseNet, a state-of-the-art deep learning model, for DR classification.
Fine-tuned the DenseNet hyperparameters and optimized the model's architecture.
Achieved excellent performance in identifying and classifying DR severity levels.

Challenges Overcome:
Dealt with the challenge of implementing a complex deep learning model and managing computational resources.
Addressed the issue of optimizing hyperparameters to achieve the best model performance.

Lessons Learned:
Gained insights into utilizing advanced deep learning architectures like DenseNet for medical image analysis tasks.
Overall Lessons Learned:
Through this project, the team learned the following key lessons:

The importance of preprocessing techniques and feature engineering in improving model performance.
The advantages of leveraging both labeled and unlabeled data in semi-supervised learning scenarios.
The challenges and considerations in designing and training deep learning models for medical image analysis.
The significance of hyperparameter optimization for achieving optimal model performance.

Conclusion:
The project successfully implemented and evaluated multiple models, including Decision Tree (supervised and semi-supervised), CNN, and DenseNet, for Diabetic Retinopathy detection and classification. The combined efforts of the team members resulted in accurate and efficient models that can aid in the early diagnosis of DR, potentially improving patient outcomes.