Project Name: Diagnosis of diabetes retinopathy

Project Stakeholders

Name	Role	Position	Email
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Project Description

Background

Diabetic Retinopathy (DR) is a common complication among diabetic patients, and early detection is crucial to prevent vision loss. Currently, DR detection relies on manual analysis of retinal images, which is inefficient and prone to errors.

Challenge or Opportunity

Although professional ophthalmologists manually analyze fundus images accurately, the efficiency is low and the cost is high, especially in rural areas and areas with scarce medical resources and personnel. We hope to use AI technology to assist doctors in making more efficient judgments of lesion areas, handling more cases in a timely manner, and providing time for treatment

Desired Impact（goal）

1. AI systems can quickly process a large number of fundus images, improve diagnostic efficiency, shorten patient waiting time, and automatically generate reports.
2. AI can achieve remote diagnosis through mobile devices, greatly increasing the popularity of DR screening and reducing reliance on professional medical

personnel.

Measurable Organizational Value

(For reference only, it will be updated according to the actual situation)

Metric	Target Value	Measurement Method
Detection Accuracy	≥85%	Validation through test datasets
System Response Time	≤3 seconds	Performance testing
User Satisfaction	≥90%	User surveys

Project Scope

In Scope

- Develop a deep learning-based DR detection algorithm.

- Design and implement user interfaces for doctors and patients.

- Provide lesion grading and treatment recommendations.

Out of Scope

- Does not include hardware development.

- Does not include large-scale clinical trials.

Project Schedule

- **Project Start Date**: March 24, 2025

- **Project End Date**: June 15, 2025

Key Milestones:

- Complete data cleaning and preprocessing for different datasets

- Reproduction of Deep Learning Model Code in Papers on Kaggle Website

- Testing system accuracy and exploring higher accuracy models

- Improve and optimize the code, write the front-end UI.

Project Budget Summary (need discussing)

Quality Issues

The system has a high recognition accuracy, can distinguish different types of lesions and annotate them clearly, can quickly process single images, has a friendly UI interface, has certain interactive functions, and supports the input of multiple images.

Resources Required

People

- Data Scientists: 1

- Software Developers: 1

- Clinical Consultant: 1

- Quality Assurance Manager: 1

Technology, facilities and other

- Deep learning frameworks (e.g. PyTorch, ResNet)

- Cloud computing resources (e.g., AutoDL)

- Retinal image dataset

Assumptions and Risks

1.Capable of obtaining sufficient quantity and quality of ophthalmic image data.

2.Develop effective deep learning algorithms for identifying DR lesion features.

3.The hardware and software resources required for system development can be guaranteed.

4.Data privacy and security issues need to be safeguarded.

5. The generalization ability of the model is insufficient, and the accuracy needs to be clinically tested.

6.The training and optimization of deep learning models require a large amount of computing resources and have certain economic costs.

Project Administration

- Weekly project team meetings.

- Monthly stakeholder updates.

- Regular code reviews and testing.

- Perform a project summary and evaluation after closure.

Acceptance and Approval

Name Signature

Beining Wang   *Chenyu Huang*   *Zhengyu Zhou*   *Peijin Chen*

References

- Robert K. Wysocki. Effective Project Management: Traditional, Agile, Extreme, Hybrid, 8th ed., John Wiley & Sons, 2019.

- Roger Pressman, Bruce R. Maxim. Software Engineering A Practitioner's Approach, 9th ed., McGrawHill Education, 2020.

- William G. Sullivan et al. Engineering Economy. 17th ed,. Pearson Education, 2020.

Terminology or Glossary

- **DR**: Diabetic Retinopathy

- **MOV**: Measurable Organizational Value

- **ROI**: Return on Investment

Appendices

- Appendix A: RBS and WBS

- Appendix B: Project Team Gantt charts and total working hours

Appendix A

A Brief Requirement Breakdown Structure

1. Overall project objective

    1.1 Develop an effective early detection system for diabetes retinopathy, realize automatic detection of diabetes retinopathy through artificial intelligence technology, reduce manual intervention, improve detection efficiency, and make the accuracy no less than 85%.

    1.2 The system can classify based on the severity of the lesion, and automatically generate personalized treatment recommendations to help patients understand their own condition.

2. Functional requirements

2.1 Data Input and Enhancement Processing

Standardize the input image, further remove noise, perform pixel level annotation, brightness adjustment, etc.

2.2 Hierarchical lesion detection algorithm based on deep learning

Choose a suitable deep learning model (such as ResNet) and train the model to identify retinal lesions. It is possible to grade lesions and develop lesion grading algorithms. Model accuracy $\geqslant$ 85%, recall $\geqslant$ 80%.

2.3 Automatic detection report generation

Analyze the condition based on the test results, provide health guidance and suggestions, and provide a test report for doctors to review. The report includes the location, severity, and treatment recommendations of the lesion

2.4 User Interface

2.4.1 Doctor interface

Used to view patient test results, lesion grading, and treatment recommendations, supporting image upload, result viewing, report export, etc.

2.4.2 Patient interface

3 Non functional requirements

3.1 Performance

3.1.1 System response time

Ensure that the system can return results within a short period of time after users upload images.

3.1.2 Support high concurrency user access

The system can support concurrent access by at least 100 users simultaneously.

3.2 Security

Goal: All patient data must be encrypted during storage and transmission to ensure the security of patient information.

3.3 Maintainability

The system should adopt a modular design to facilitate future functional expansion and updates.

A Brief Work Breakdown Structure

1. Develop a project plan

Develop a detailed project plan, including a timeline, resource allocation, and risk management plan. Write a project plan document.

2 Data Collection and Processing

2.1 Collecting retinal image data

Download the open-source retinal image dataset from the internet and obtain the school's private dataset.

2.2 Data cleaning and preprocessing

Standardize the size of the collected images, remove noise and incomplete data, and perform class balance processing.

2.3 Data augmentation

Increase data diversity through data augmentation techniques such as rotation and flipping. Use the enhanced image dataset as input for system training.

3 Algorithm Development

3.1 Development of lesion grading detection algorithm

3.1.1 Choose a deep learning model (such as ResNet)

Search for suitable papers online (such as Kaggle) to study the deep learning models and attempt to reproduce and optimize them.

3.1.2 Model Training and Validation

Train the model using the dataset and perform cross validation. Analyze the results after grading and labeling, and consider which aspects can be further optimized.

4 Integration of front-end interface development and report generation functions

Attempt to develop prototype interfaces for doctors and patients, connect the front-end and back-end interfaces, design report templates that include lesion detection results, grading, and treatment recommendations, and integrate report generation functionality into the system.

5 System Testing and Validation

5.1 Unit Testing

Perform unit testing on each functional module to ensure proper functionality.

5.2 System Integration Testing

Test the integration between various modules to ensure the overall normal operation of the system.

5.3 User Acceptance Testing

Invite different users to conduct user acceptance testing to ensure that the system meets the requirements.

6 Overall project management

Regularly track project progress to ensure timely completion. Ensure effective communication between the project team and stakeholders once a week.

Appendix B

The total work hours:

Task	Start Date	End Date	Duration (Days)	Workload (Hours)
1. Develop a project plan	3 月 24 日	3 月 28 日	5	5
2.1 Collecting retinal image data	3 月 29 日	4 月 2 日	5	5
2.2 Data cleaning and preprocessing	4 月 3 日	4 月 9 日	7	15
2.3 Data augmentation	4 月 10 日	4 月 15 日	6	20
3.1.1 Choose a deep learning model	4 月 3 日	4 月 15 日	13	15
3.1.2 Model Training and Validation	4 月 16 日	5 月 16 日	31	30
4. Front-end & Report Integration	5 月 2 日	5 月 16 日	15	20
5.1 Unit Testing	5 月 17 日	5 月 26 日	10	20
5.2 System Integration Testing	5 月 27 日	6 月 5 日	10	20
5.3 User Acceptance Testing	6 月 6 日	6 月 10 日	5	20
6. Overall project management	3 月 24 日	6 月 15 日	84	10
Total estimate	\	\	84	180

Project Schedule Gantt Chart with Dependencies