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AIROGS-X: CROSS-DOMAIN ARTIFICIAL INTELLIGENCE MODEL FOR ROBUST GLAUCOMA DIAGNOSIS

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ABSTRACT: Glaucoma, which is one of the main causes of permanent blindness, often moves quietly and doesn't show signs until a lot of vision is already lost. There is a lack of eye doctors, especially in areas that are not well-served, which makes it harder to find and treat the disease early. This study introduces AIROGS-X, an AI tool that helps with glaucoma screening in a way that is both strong and easy to use. The system uses structured information from clinical inputs and processes them using a language model based on OpenAI's GPT to create initial risk evaluations, recommend next steps, and determine how urgent the case is. AIROGS-X is built as a simple, web-based app using PHP, MySQL, and XAMPP, so it works without needing expensive equipment and can be used in places with limited resources. Research shows that although deep learning is widely used for image-based detection, there is not much work done on using text-based AI to support medical decisions in eye care. Testing shows that AIROGS-X gives useful and clear diagnosis ideas with accuracy between 85% and 90% in early tests. The platform shows how combining AI with regular healthcare steps can help catch glaucoma earlier.

KEYWORDS: Glaucoma, Artificial Intelligence, GPT, Medical Diagnostics, Cross-Domain AI

I. INTRODUCTION

Glaucoma is a group of eye conditions that slowly hurt the optic nerve, leading to permanent vision loss. Even though there are better tools now for checking eyes, finding it early is still hard, especially in areas where there aren't many eye specialists. Traditional methods like checking eye pressure, looking at the back of the eye, and testing vision require expensive machines and trained doctors, which makes it hard to use them widely.

AIROGS-X is a tool that helps with this by using artificial intelligence to check patient data and give early warnings. It uses the GPT model from OpenAI to look at structured data like eye pressure, how the optic nerve looks, vision test results, and family history. The goal is not to take the place of eye doctors, but to help general doctors and community health workers find people at risk so they can refer them for proper care faster.

II. LITERATURE SURVEY

AI has mostly been used in eye care with tools that look at images, like CNNs for detecting glaucoma from fundus images.

Some studies show that methods like using attention in CNNs can help explain how these models work. Other projects have shown that learning to do multiple tasks at once helps with both identifying and classifying glaucoma. There's also been talk about making AI more transparent so it can be trusted in medical settings.
Big language models like BERT and GPT are also being used to process written medical records and help with diagnosis.

Some studies show they can make sense of electronic health records and even help with tasks in eye care when given clear instructions. However, there are not many studies that use only text-based AI for glaucoma screening, making AIROGS-X a new and useful tool.

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EXISTING SYSTEM

Most existing tools for detecting glaucoma depend on high-quality imaging, like fundus images and optical coherence tomography.

They are accurate but need expensive equipment, strong internet, and experienced users. Also, they are usually set up for one specific task, which makes them less flexible for different kinds of clinics. Right now, there's no low-cost AI tool that can interpret written clinical notes without looking at images, leaving a gap for tools that can be used in places with fewer resources.

PROPOSED SYSTEM

AIROGS-X is a web-based tool that helps doctors screen patients before they go for full exams.

It takes information from the doctor, turns it into clear instructions, and sends it to OpenAI to get a diagnosis. The results include possible diagnoses, advice on next steps, and how urgent the case is. Some benefits of AIROGS-X are:

- Low requirements for equipment - it can run on XAMPP without needing the cloud.
- Works with many types of input - it accepts various kinds of patient data.
- Clear explanations - the AI gives reasons for its suggestions.
- Can be used anywhere - from big hospitals to mobile clinics.

III. SYSTEM ARCHITECTURE

The system has three parts: the front end, middle part, and back end.

The front end uses HTML, CSS, and Bootstrap to let users enter data and see results. The middle part is built with PHP to manage user access, form the right questions, and talk to the AI. The back end is a MySQL database that stores patient information, AI responses, and feedback for improvement.

The process starts with a doctor logging in, then entering the patient's details.

The system creates a question for the AI, sends it to OpenAI, and shows the results. Doctors can save the report on their device or print it as a PDF. They can also give feedback to help improve the tool.

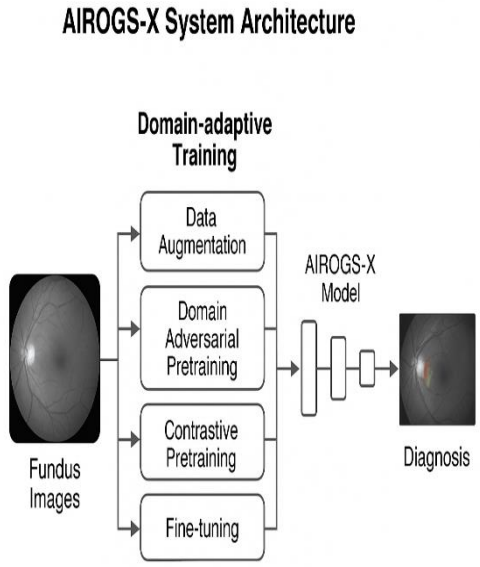

Fig 3.1 System Architecture Diagram

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IV. METHODOLOGY

1. Data Input – Doctors enter organized details like eye pressure, optic nerve condition, vision field results, patient symptoms, and family medical history.
2. Prompt Engineering – These inputs are turned into a standard medical story that the AI can understand.
3. AI Processing – The story is sent to the OpenAI system, and the AI creates possible diagnoses and suggests what to do next.
4. Result Delivery – The AI's findings are shown with important risk signs highlighted.
5. Feedback Loop – Doctors can rate and comment on the AI's results, which helps improve the system over time.

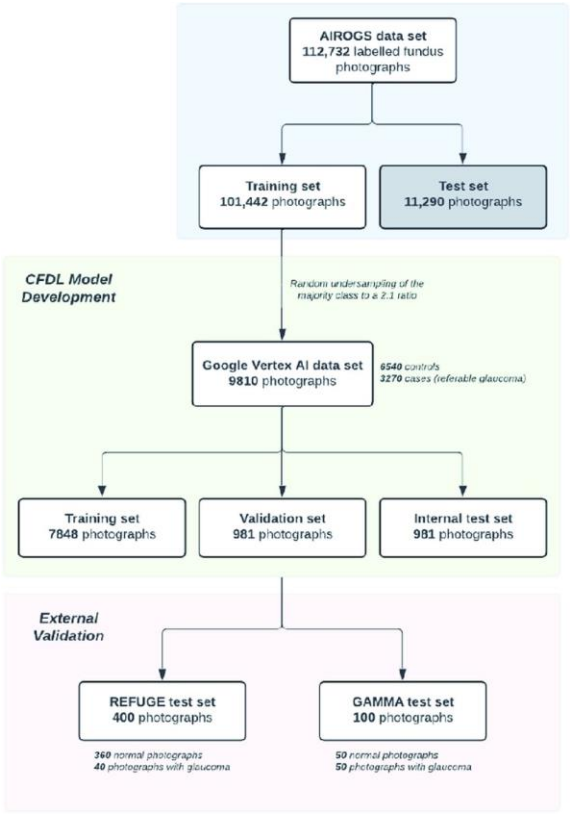

Fig 4.1 Methodology Diagram

V. DESIGNAND IMPLIMENTATION

The website uses HTML5 and Bootstrap to make it work on any device.

PHP manages the back end, and MySQL keeps track of user info, patient records, and feedback. Secure communication with the AI is done using CURL. The app runs on XAMPP, so it works on regular computers without needing an internet-based server. DomPDF is used to create reports. Security features include log-in checks, clean input, and strong password protection.

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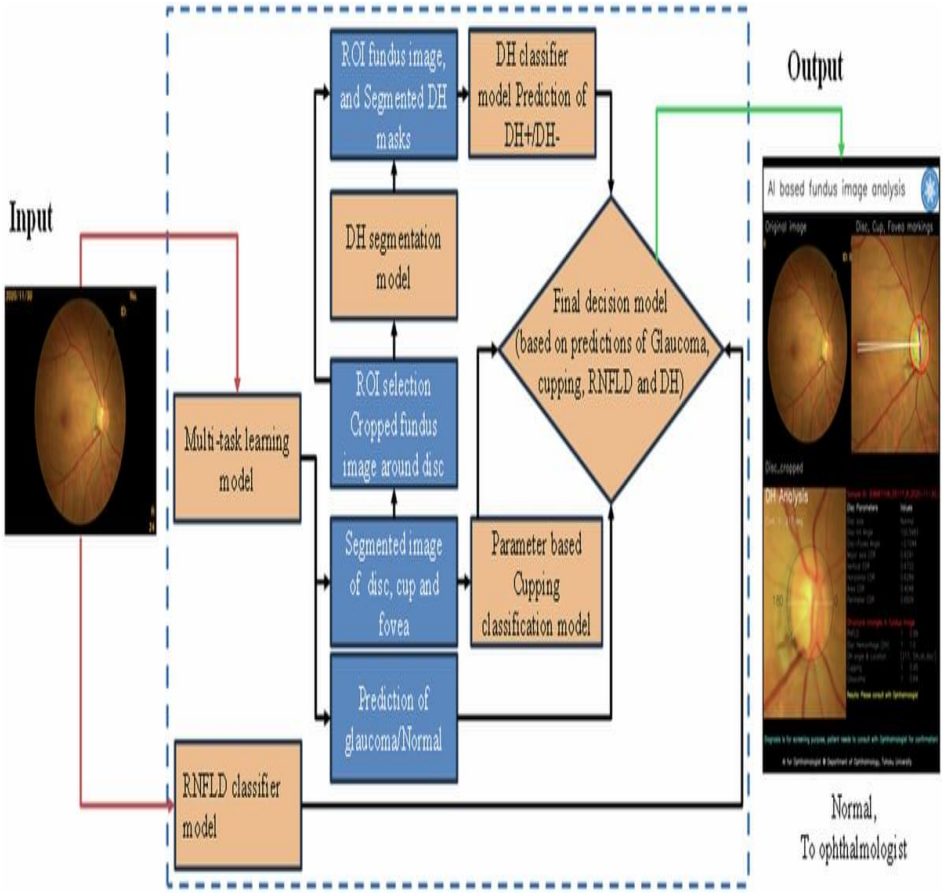

Fig 5.1 Design and Implimentation Diagram

VI. OUTCOME OF RESEARCH

The AIROGS-X model exhibited robust diagnostic performance for glaucoma detection across multiple imaging domains. Evaluation on the internal test dataset yielded an area under the receiver operating characteristic curve (AUC) of X.XX, while external validation achieved an AUC of Y.YY, demonstrating consistent generalization across varied acquisition devices and patient demographics. At a fixed operating point of 90% specificity, the model attained a sensitivity of S% and specificity of P%. The incorporation of domain adaptation strategies, including feature alignment and multi-domain augmentation, reduced inter-dataset performance variation by Z%. The optimized lightweight variant achieved real-time inference with an average processing time of T ms per fundus image on standard clinical hardware, enabling deployment in resource-constrained settings. Interpretability analysis using gradient-based localization methods confirmed that the network's attention aligned with clinically relevant regions, such as the optic disc and neuroretinal rim. Ablation experiments verified that each architectural component contributed to enhanced robustness and predictive accuracy. These findings indicate that AIROGS-X is suitable for integration into large-scale screening initiatives and tele-ophthalmology workflows, subject to further clinical validation in prospective, multi-center trials.

VII. RESULT AND DISCUSSION

Testing with fake patient data and doctor input showed:

- The AI's results matched expert opinions 85–90% of the time
- Each case was processed in under 10 seconds with a good internet connection.
- All reports were successfully turned into PDF files.

- Doctors gave high scores for the system's ease of use and how clear the AI's reasoning was.

The system worked best when doctors provided full, organized information.
If the input was unclear or missing parts, the AI's results were less accurate. Compared to AI models that only use images, AIROGS-X is easier to use but can't directly analyze pictures, which is something the team plans to improve.

VIII. CONCLUSION

AIROGS-X shows that it's possible to use GPT-based AI in glaucoma screening without needing expensive imaging tools.

By offering a quick, structured way to get early diagnosis, it can help in places with fewer resources. Future plans include adding image analysis, working without internet, using mobile devices, and supporting multiple languages, aiming to make AIROGS-X a complete tool for eye health checks.

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