

Vision to Vision: An Accessible Healthcare Approach to Standard Ophthalmic Exam

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GANTT CHART

TASKS	DECEMBER	JANUARY	APRIL	JUNE	JULY	AUGUST
TASK 1	Research					
TASK 2	Development of app					
TASK 3	Data Collection					
TASK 4	Data Analysis					
TASK 5	Introduction and methodology					
TASK 6	Conclusion					
TASK 7	Finalizing the paper					

Outline

- Introduction
- Eye Care and Visual Impairment
- The Vision to Vision App
- Methodology
- Results and Discussion
- Conclusion

Introduction

- Eye health is an important aspect of overall well-being, yet millions worldwide suffer from untreated vision problems.
- According to the World Health Organization (WHO), over 2.2 billion people globally are visually impaired, and many of these conditions could have been prevented or treated.
- This presentation talks about Vision to Vision, an app designed to make vision tests more accessible, especially for children in underserved areas.

Eye care and Visual impairment

- Myopia and Hypermetropia are common but often go undiagnosed, especially in children from underprivileged backgrounds.
- Many children in low-income communities lack access to basic eye care services, leading to undetected visual impairments that hinder their education and quality of life.
- Early detection is critical, but traditional eye exams can be expensive and difficult to access in these regions.

The vision to vision app

- The Vision to Vision integrates the widely used Snellen chart into mobile phones, enabling users to test their eyesight at home. Utilizing XML and Java, the app features an interactive UI with voice recognition technology.
- **Features:**
- **Bilingual:** The app offers the tests in both Hindi and English which caters to a broader audience, ensuring accessibility across different linguistic groups.
- **Optotype size calculation:** The app automatically adjusts the size of the letters as the test progresses to assess vision. Used the formula- $w=2d\tan(\varphi/2)$, d is the distance (0.40 m or 40 cm) and φ is the angle subtended by the optotype, for 20/20 vision it's $\pi/2160$ radians.
- **Voice recognition:** Interactive voice recognition allows users to speak their responses.
- The app offers a easy-to-use solution which is **affordable** compared to traditional eye tests, and **accessible** even in regions with limited eye care infrastructure.
- The app displays the eye power within the following ranges: (0), (-0.5 to -0.75), (-1 to -1.25), (-1.5 to -1.75), (-1.75 to -2), (-2.25 to -2.5), (> -2.5).

Methodology

- Data collection- The data was collected by conducting eye tests for through doctors in 11 different government schools for 86 (50 male, 30 female) students in classes 6-8 .
- The app's accuracy was compared with results from traditional eye tests to validate its effectiveness.
- The error (difference between eye power through test and eye power through app) was noted for both eyes across the upper and lower limits of the range.
- The mean errors for the upper and lower limits were calculated.
- The data was then analyzed and compared across different age groups, genders, and classes.
- Using the formula $\text{Accuracy} = 100\% - \text{Error Rate}$, where $\text{Error Rate} = \frac{|\text{Observed Value} - \text{Actual Value}|}{\text{Actual Value}} \times 100$, the accuracy of the app was calculated.

Results

- The Vision to Vision app demonstrates high accuracy with mean errors as low as 0.13. The mean upper limit error for all students is notably precise at 0.1279 and the mean lower limit error for all students is 0.1512 indicating strong reliability in assessing eye power ranges.
- The app showcases fairness across demographics, showing no biases based on gender, age.
- The accuracy of the app was found out to be 88%

Conclusion

- Through our research, It was found that the Vision to Vision app was accurate in determining eye power in 88% of cases, making it a valuable tool for conducting eye tests at home.
- It can inform individuals about their current eye health and aid in the early detection of eye conditions.
- The project successfully demonstrated the app's high accuracy, proving it can be used on a large scale to provide eye tests for people in underprivileged communities who lack access to healthcare facilities and cannot afford regular visits to the doctor.

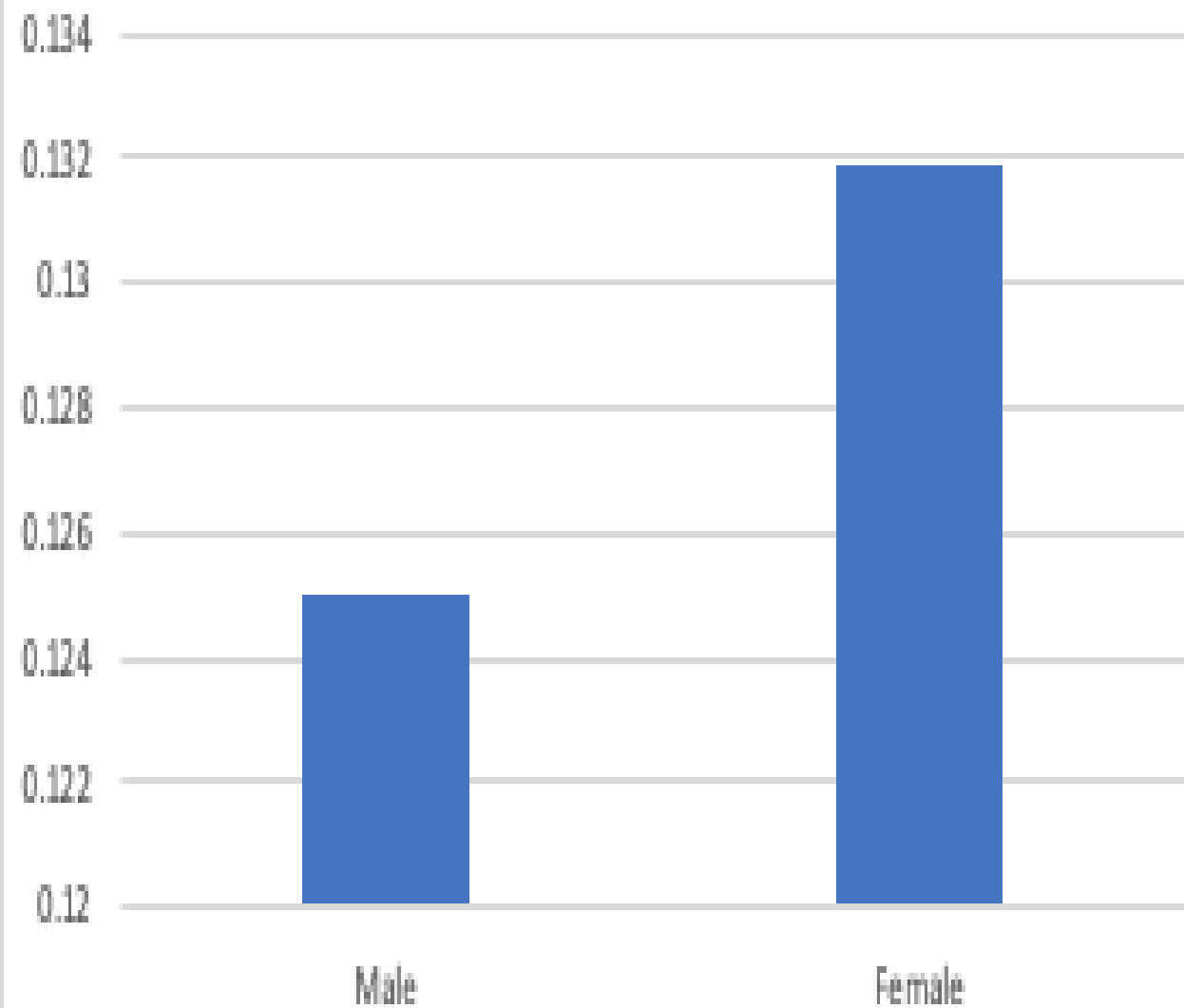
Tables

Gender	No of students	Mean upper limit error	Mean lower limit error
Male	50	0.125	0.155
Female	36	0.1319444 4	0.1458333 3

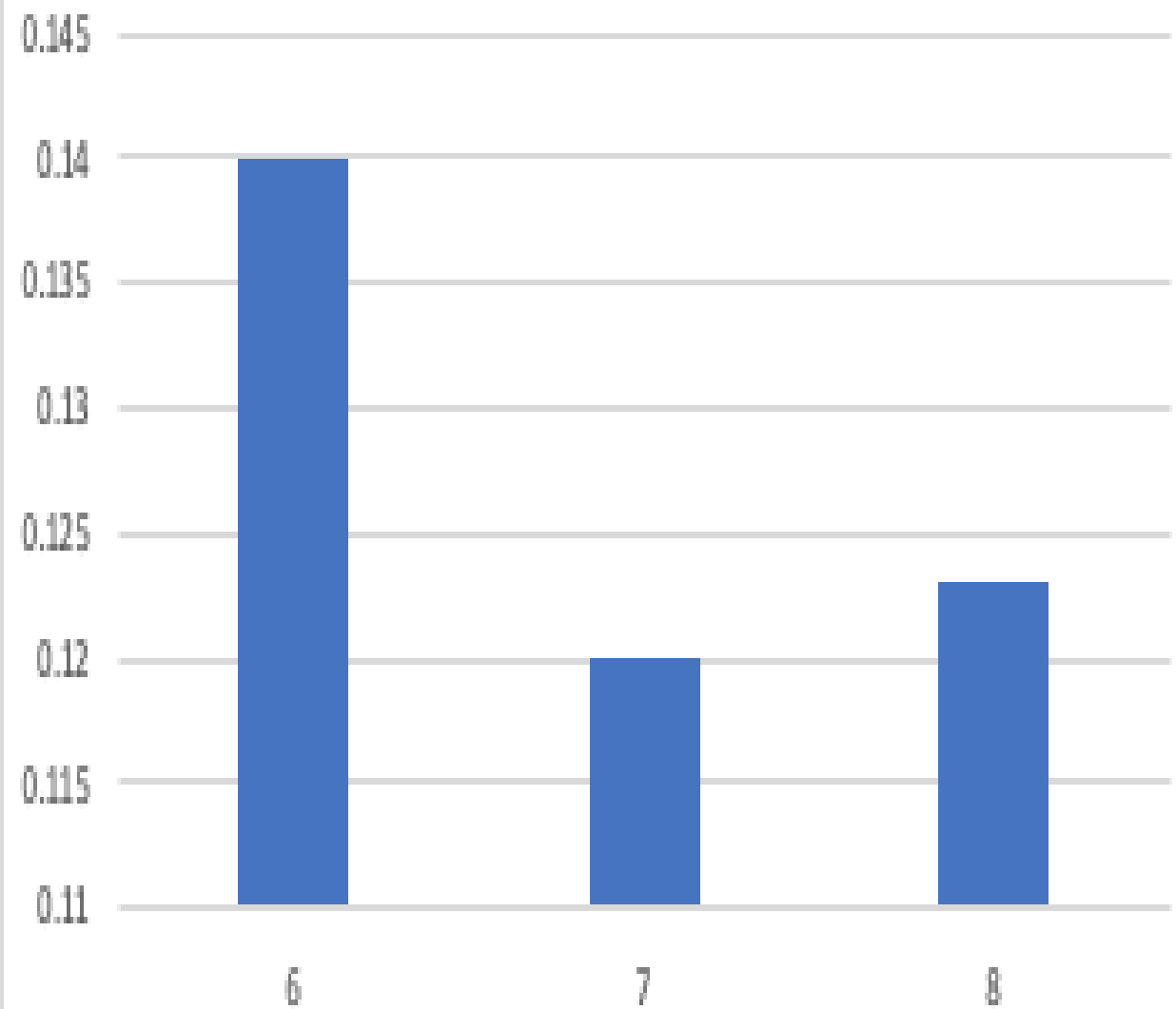
Class	No of students	Mean upper limit error	Mean lower limit error
6	22	0.136363 6	0.085227 3
7	22	0.119318 2	0.204545 5
8	42	0.127976 2	0.157738 1

Age	No of students	Mean upper limit error	Mean lower limit error
11	10	0.1	0.075
12	22	0.1647727	0.1477273
13	24	0.109375	0.171875
14	23	0.1086957	0.1467391
15	6	0.17	0.25

Comparison in mean upper limit error for males and females



Comparison in mean upper limit error for students from classes 6-8



Appendix

- All eye tests were conducted by certified doctors from the India Vision Institute team. The Vision to Vision app was designed under the guidance of medical professionals from the India Vision Institute to ensure its effectiveness.
- The app includes a disclaimer stating that the test results may not be 100% accurate and should not replace professional medical advice. All data collection was carried out with the informed consent of both students and their parents, ensuring compliance with ethical standards.
- Additionally, all safety protocols were strictly followed throughout the process to maintain the highest standards of care and protection for participants.
- App link- <https://play.google.com/store/apps/details?id=com.hridaan.visiontovision>

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