MINI Project (BCC351) Report

on

ABO Blood Group Detection through Image Processing Technique

Submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY

DEGREE

Session 2024-25
in

Computer Science & Engineering

By

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(Formerly UPTU)

STUDENT'S DECLARATION

We hereby declare that the work being presented in this report entitled "ABO Blood Group Detection through Image Processing Technique" is an authentic record of our own work carried out under the supervision of Ms. Madhvi Gaur.

I have duly acknowledged all the sources from which the ideas and extracts have been taken. The report has not been submitted elsewhere for publication.

Dated: 09/01/2025 **Signature of students(s)**

Palak Sharma

Pranav Gupta

Department of
Computer Science & Engineering

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Signature of Supervisor
Miss. Madhvi Gaur
Assistant Professor
Computer Science & Engineering
Department

CERTIFICATE

This is to certify that Project Report entitled “ABO Blood Group Detection through Image Processing Technique” which is submitted by Palak Sharma & Pranav Gupta in partial fulfillment of the requirement for the award of degree B. Tech. in Department of Computer Science & Engineering of Dr. A.P.J. Abdul Kalam Technical University, formerly Uttar Pradesh Technical University is a record of the candidate own work carried out by them under my supervision. The matter embodied in this thesis is original and has not been submitted for the award of any other degree.

Supervisor **Project Coordinator** **Prof. (Dr.) Divya Mishra**

Date **HOD CSE**

ACKNOWLEDGEMENT

It gives us a great sense of pleasure to present the report of the B. Tech Project undertaken during B. Tech. Second Year. We owe special debt of gratitude to Professor Madhvi Gaur Ma'am, Department of Computer Science & Engineering, ABESEC Ghaziabad for his constant support and guidance throughout the course of our work. Her sincerity, thoroughness and perseverance have been a constant source of inspiration for us. It is only her cognizant efforts that our endeavors have seen light of the day.

We also take the opportunity to acknowledge the contribution of Professor (Dr.) Divya Mishra, Head, Department of Computer Science & Engineering, ABESEC Ghaziabad for her full support and assistance during the development of the project.

We also do not like to miss the opportunity to acknowledge the contribution of all faculty members of the department for their kind assistance and cooperation during the development of our project. Last but not the least, we acknowledge our friends for their contribution in the completion of the project.

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Date : 09/01/205

ABSTRACT

The project, *ABO Blood Group Detection through Image Processing Technique*, is an initiative to revolutionize the conventional methods of blood group identification. While blood detection traditionally requires a physical blood sample for complete accuracy, this project explores the potential of integrating advanced image processing and machine learning techniques to streamline the process. The primary objective is to provide a faster, non-invasive, and efficient alternative to conventional methods, paving the way for innovation in the healthcare diagnostics industry.

The methodology is inspired by research from the *International Journal of Scientific & Engineering Research, Volume 9, Issue 3, March 2018*, utilizing cutting-edge image analysis algorithms to detect and classify blood groups with precision. While not a replacement for traditional techniques, it serves as a step forward in enhancing accessibility, reducing time delays, and encouraging further advancements in this critical field.

Findings reveal that this approach holds significant promise, offering a blend of speed and reliability that can complement existing methods in both clinical and remote settings. In conclusion, this project emphasizes the need for continuous progress in blood diagnostics, showcasing a scalable initiative to inspire future innovations in the industry.

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1. Introduction:

Motivation:

Accurate blood group determination is critical for safe blood transfusions and organ transplants. Traditional serological methods are labor-intensive, require specialized equipment, and can be time-consuming. The motivation behind this project is to develop an automated, efficient, and user-friendly image processing technique for ABO blood group detection, thereby enhancing the accuracy and speed of the testing process.

Objective:

The primary objective of this project is to design an automated system that utilizes image processing algorithms to accurately detect ABO blood groups from blood smear images. The expected outcomes include:

- A robust classification model that achieves accuracy.
- A reduction in the time required for blood group determination.
- A user-friendly interface that can be used by non-specialists.

Scope:

This project has potential applications in various areas, including:

- Clinical laboratories for blood typing.
- Emergency medical services for rapid blood group identification.
- Forensic science for victim identification.
- Blood banks for efficient donor matching.

2. Methodology:

The project, *ABO Blood Group Detection through Image Processing Technique*, follows a structured methodology to achieve its objectives. The approach is grounded in image processing and machine learning techniques, inspired by research outlined in the *International Journal of Scientific & Engineering Research, Volume 9, Issue 3, March 2018*.

Front-End Technologies Used:

- HTML
- CSS
- Javascript
- UI/UX
- MATLAB

Back-End Technologies Used:

- Javascript
- Python
- MATLAB

Machine Learning Technologies Used:

- Image Learning Techniques
- Mathematical Expressions for Quantification

Steps Followed:

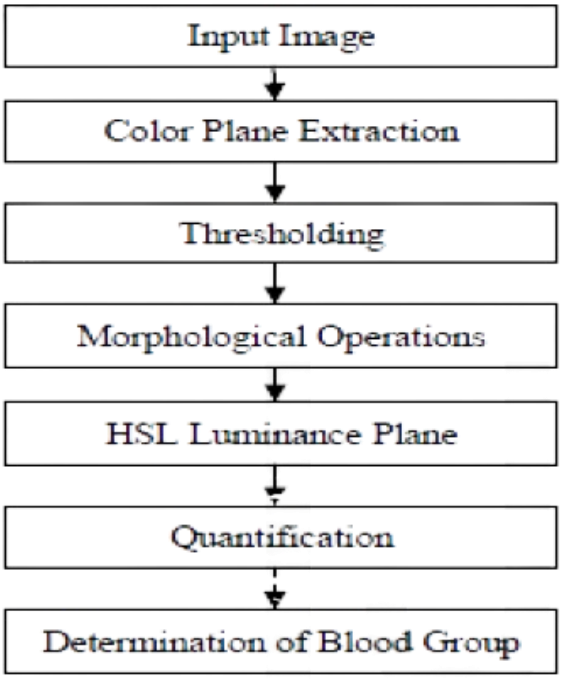
Data Collection: Images of blood samples were collected using high-resolution equipment.

Preprocessing: Images were enhanced and noise was removed using filters and normalization techniques.

Feature Extraction: Key features from the images, such as color intensity and patterns, were extracted for classification.

Model Training: Machine learning models were trained on labeled datasets to classify ABO blood groups.

Validation and Testing: The models were validated against test datasets to ensure accuracy and reliability.



3. Implementation:

The implementation of this project began with building a foundational front-end structure. HTML was utilized to create a responsive and accessible web layout, ensuring compatibility across devices. This was complemented by CSS to enhance the visual appeal, incorporating modern design principles and animations that draw the user's attention while maintaining simplicity. Minimal JavaScript was employed to add interactive elements, such as dynamic form validation and responsive navigation menus.

Given the team's intermediate expertise in web development, the primary focus was on delivering a user-friendly interface that simplifies user interaction. Efforts were made to ensure that the front-end aligns with contemporary design standards, making it intuitive for potential users in clinical, laboratory, or educational settings.

Current Progress:

At the time of this report's submission, the front-end of the project has been fully developed. It features:

- A clean and responsive design that adapts to various screen sizes.
- Smooth animations to enhance the user experience.
- Basic interactivity powered by JavaScript for functional elements like buttons and forms.

Next Steps:

The next phase involves the integration of the backend and deep learning models to achieve the core objective of ABO blood group detection. This includes:

- Image Processing Pipeline:

  Leveraging Python's OpenCV library for preprocessing blood sample images. Steps will include grayscale conversion, noise reduction, and edge detection to prepare the images for feature extraction.

- Machine Learning Model:

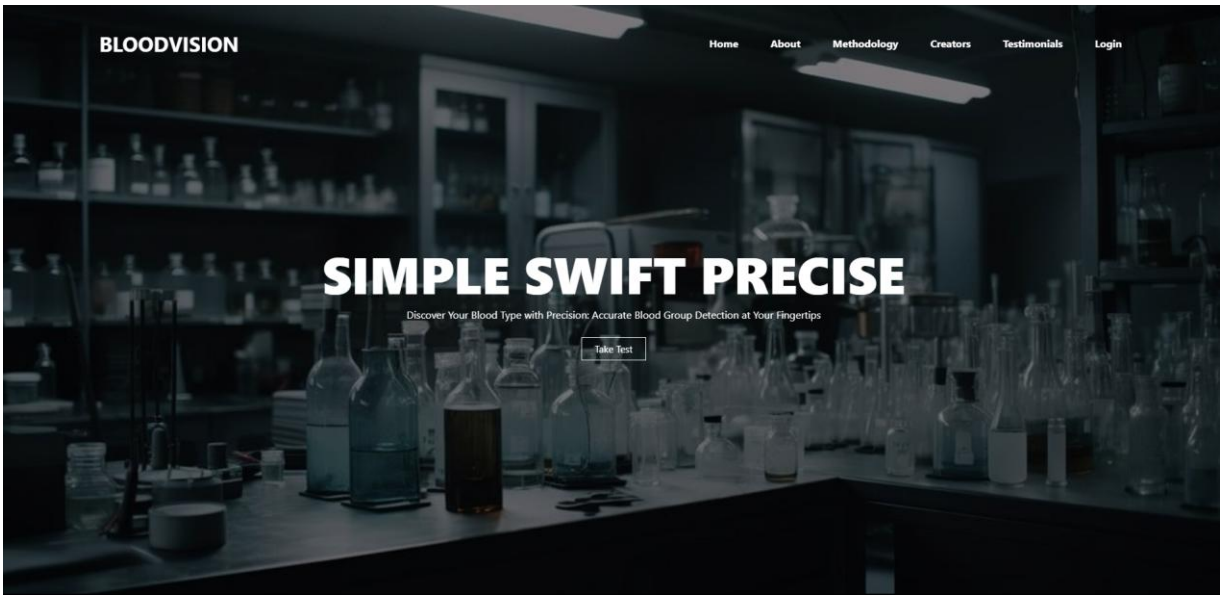
  Designing and training classification models using TensorFlow or PyTorch to identify blood groups accurately. These models will rely on features extracted during the preprocessing stage.

- MATLAB Integration:

  MATLAB will be used for advanced image analysis, ensuring the system can handle variations in blood sample quality and adapt to different imaging conditions.

Planned Features:

- A seamless connection between the front-end and back-end systems, ensuring smooth data flow.
- An intuitive dashboard for viewing detection results, complete with visual representations of processed images.
- Real-time feedback and error handling to guide users through the detection process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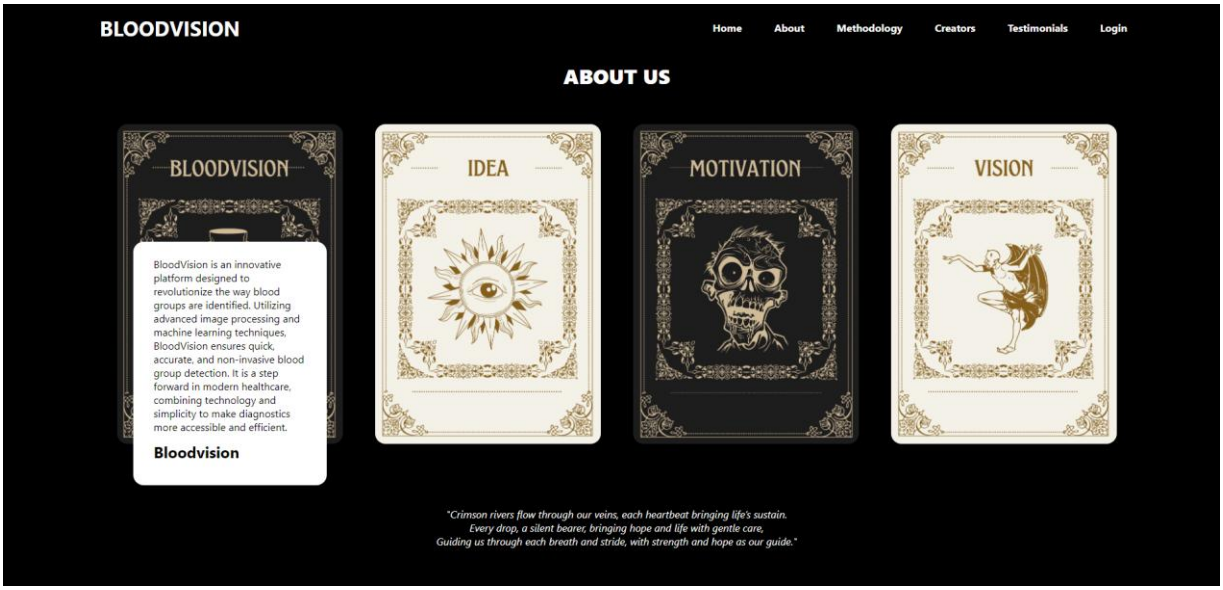
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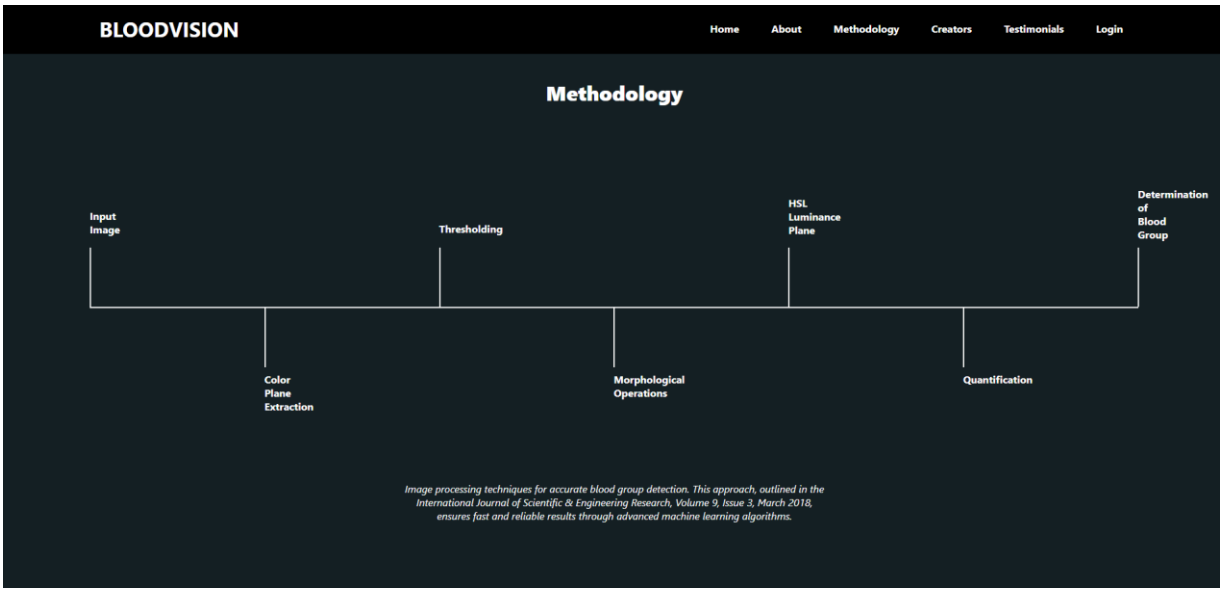
BLOODVISION
BloodVision is an innovative platform designed to revolutionize the way blood groups are identified. Utilizing advanced image processing and machine learning techniques, BloodVision ensures quick, accurate, and non-invasive blood group detection. It is a step forward in modern healthcare, combining technology and simplicity to make diagnostics more accessible and efficient.
Bloodvision
IDEA
MOTIVATION
VISION
"Crimson rivers flow through our veins, each heartbeat bringing life's sustain.
Every drop, a silent bearer, bringing hope and life with gentle care,
Guiding us through each breath and stride, with strength and hope as our guide."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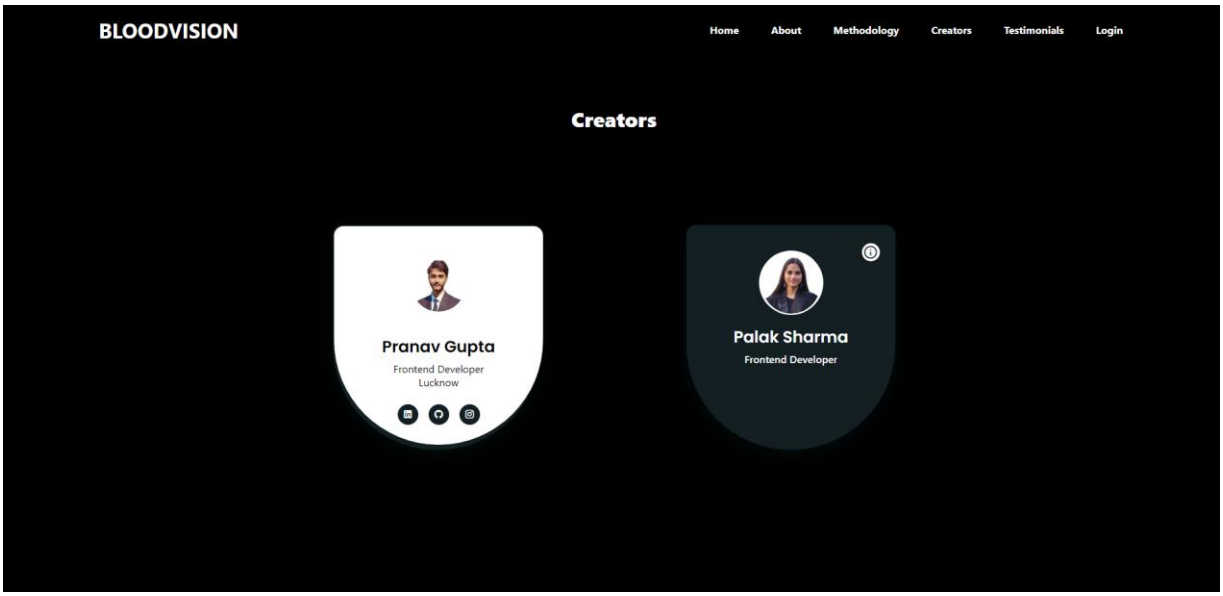
Input Image
Thresholding
HSL Luminance Plane
Determination of Blood Group
Color Plane Extraction
Morphological Operations
Quantification
Image processing techniques for accurate blood group detection. This approach, outlined in the International Journal of Scientific & Engineering Research, Volume 9, Issue 3, March 2018, ensures fast and reliable results through advanced machine learning algorithms.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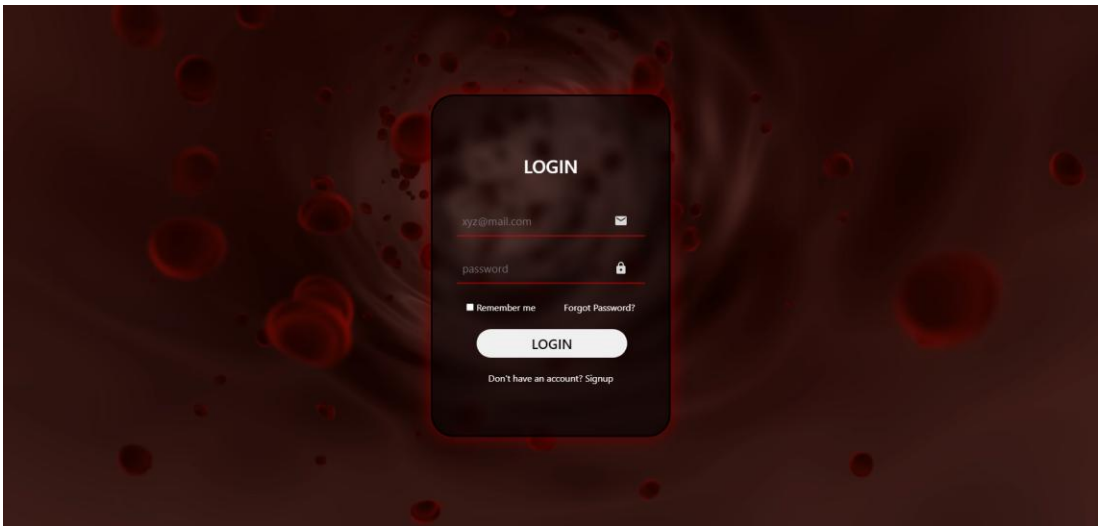
Palak Sharma
Frontend Developer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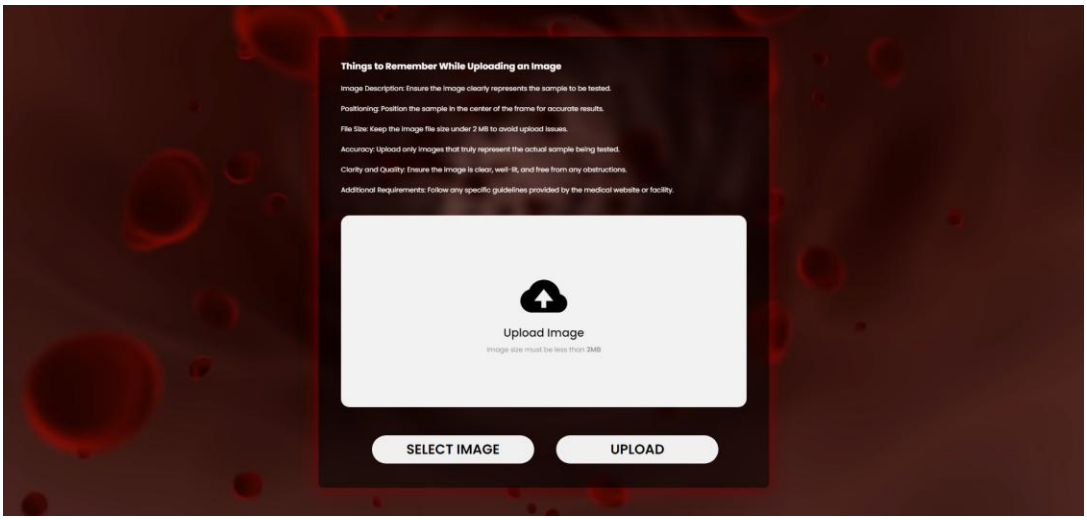
Things to Remember While Uploading an Image
Image Description: Ensure the image clearly represents the sample to be tested.
Positioning: Position the sample in the center of the frame for accurate results.
File Size: Keep the image file size under 2 MB to avoid upload issues.
Accuracy: Upload only images that truly represent the actual sample being tested.
Clarity and Quality: Ensure the image is clear, well-lit, and free from any obstructions.
Additional Requirements: Follow any specific guidelines provided by the medical website or facility.
Upload Image
Image size must be less than 2MB
SELECT IMAGE
UPLOAD

4. Results and Discussion:

Current Working Status:

The current version of the web-based application features a fully functional front-end interface. The design, developed using HTML and CSS, is visually appealing and user-friendly, incorporating animations and dynamic elements. JavaScript has been used minimally to add basic interactivity, such as responsive navigation and form validations. However, the core functionality of blood group detection through image processing has yet to be implemented. The backend integration, utilizing Python, OpenCV, and machine learning libraries, is planned for the next phase. As of now, the application provides a solid foundation for future enhancements, including the addition of the detection algorithms and a robust backend system.

Learning Outcomes:

This project has been highly meaningful in terms of learning and applying fundamental web development skills. By working on this project, the team gained hands-on experience with:

- HTML: Building the structural framework of the web application.
- CSS: Enhancing the visual design with animations, layout adjustments, and aesthetic styling.
- JavaScript: Understanding how to implement dynamic and interactive features to improve user experience.

The use of vanilla HTML, CSS, and JavaScript offered a foundational understanding of web development without relying on external frameworks or libraries. This approach fostered a deeper comprehension of core web technologies and their capabilities. The experience also highlighted the importance of clean and efficient code, responsive design, and user-centric interfaces in creating meaningful digital solutions.

Overall, the project has not only laid the groundwork for a functional blood group detection system but also provided an invaluable learning journey for mastering essential front-end development concepts.

5. Conclusion:

The *ABO Blood Group Detection through Image Processing Technique* project represents an innovative attempt to combine technology with healthcare to address the limitations of traditional blood group detection methods. Through the development of a visually appealing and functional front-end using vanilla HTML, CSS, and JavaScript, the project has established a strong foundation for future enhancements.

While the backend integration and deep learning models are yet to be implemented, the project has already demonstrated significant potential to revolutionize diagnostics by offering a faster, non-invasive, and efficient solution for blood group detection. This initiative underscores the need for continuous advancements in the healthcare industry, especially in leveraging technology for improved accuracy and accessibility.

Beyond its technical scope, the project has been a meaningful learning experience for the team. It provided a platform to grasp fundamental web development skills, problem-solving approaches, and the value of combining creativity with functionality.

Looking ahead, the project aims to complete its backend and image processing integration, paving the way for a comprehensive and user-friendly application. This work has not only added value to the current state of healthcare technology but has also inspired the team to explore further innovations in the field.

6. References:

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