Project Documentation Format

1. Introduction

Project Title:
HematoVision: Transfer Learning-Based Blood Cell Classification for Medical Imaging

Team Members:
• Vidavaluru Glory Manvitha – UI Design & Testing
• Thummala Kavya – Data Preparation
• Yaga Lakshmi - Documentation
• Saragadam Bhuvaneswari – Backend Developer

2. Project Overview

Purpose:
To develop an AI-based system that detects and classifies blood cells using image classification via a pretrained MobileNetV2 model. The goal is to assist healthcare workers and researchers in identifying blood cell types for improved medical diagnostics.

Key Features:
• Upload blood cell images using a web interface
• Predict cell type using pretrained MobileNetV2
• Display cell name and confidence score
• Lightweight, fast and user-friendly UI
• No database used; all processing is in-memory

3. Architecture

Frontend:
- HTML and CSS (via Flask templates)

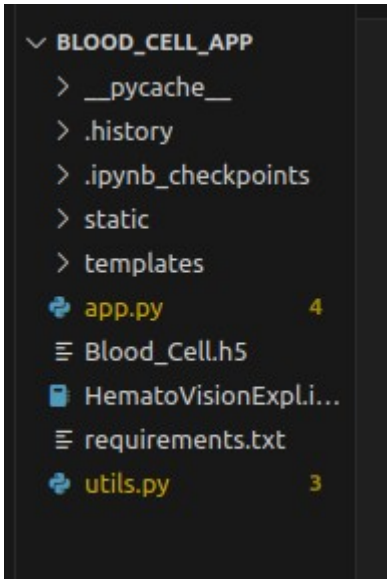
Backend:
- Flask for web framework and routing
- TensorFlow/Keras to load and run the MobileNetV2 model (Blood_Cell.h5)
- OpenCV for image processing
- Prediction logic in a separate utils.py script

Database:
- Not used; images and predictions are processed in-memory.

4. Setup Instructions

1. Install dependencies:
   pip install -r requirements.txt
2. Place the model file (Blood_Cell.h5) in the root directory.
3. Run: python app.py
4. Open your browser at http://127.0.0.1:5000/

5. Folder Structure



6. Running the Application

Run the Flask application locally with:
   python app.py
Then visit http://127.0.0.1:5000 in your browser.

7. API Documentation

Endpoint	Method	Description
`/`	GET	Home page (upload form)
`/upload`	POST	Accept image and trigger prediction
`/result`	GET	Show prediction result

8. Authentication

- No authentication is used.
- The application runs locally and is accessible via `http://127.0.0.1:5000`.

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9. User Interface

- Clean web interface built with HTML, CSS, and Flask templates.
- Simple image upload form for blood cell images.
- Results page displays predicted blood cell type along with the image preview.
- Proper error handling for invalid or missing image files.

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10. Testing

Testing Strategy:

- Manual testing was performed to ensure that each feature behaves as expected.
- Each functionality, including file upload, prediction, and error handling, was tested individually.
- Focus was on functional accuracy, UI clarity, and robustness under edge cases.

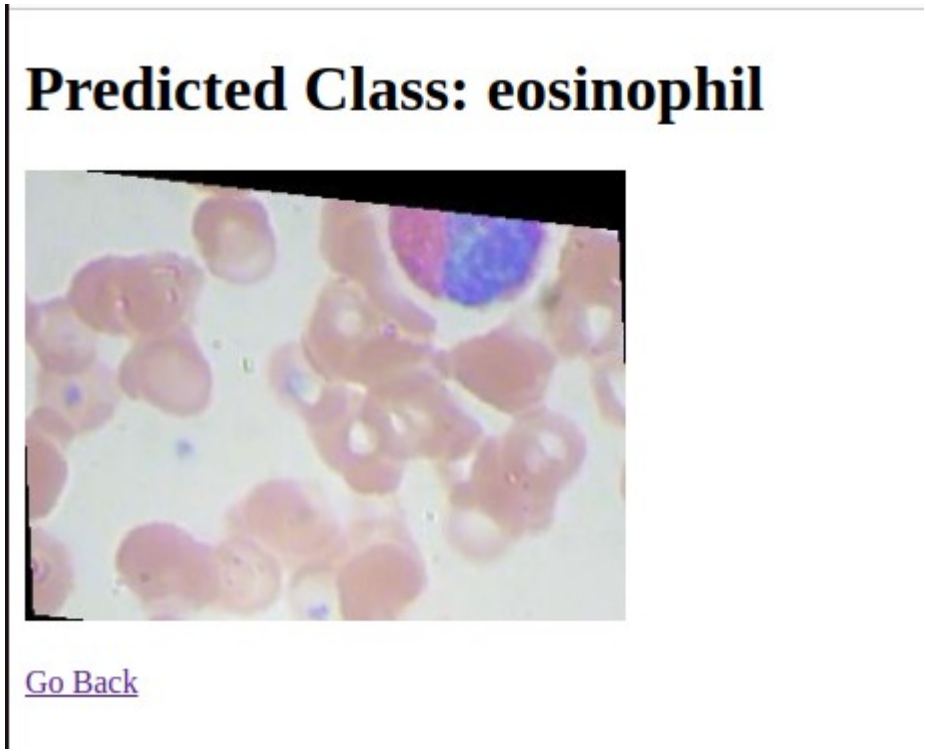
Test Cases Included:

Test Case	Expected Result	Status
Upload valid blood cell image	Displays correct cell type prediction	Pass
Upload invalid file (.txt)	Displays error message	Pass
Upload very large image	Processes and predicts without crashing	Pass
Submit with no image	Prompts user to select an image	Pass
Model response time	Returns prediction within 2–3 seconds	Pass

Tools Used:

- Web browser (Chrome/Firefox) for testing the user interface.
- Python `print` statements and `logging` for backend debugging.
- Manual uploads and form submissions to simulate user actions.

11. Screenshots or Demo



12. Known Issues

- No webcam or real-time camera support.
- Only supports the four trained blood cell classes: eosinophil, lymphocyte, monocyte, and neutrophil.
- No feedback mechanism or prediction logging.
- No user login system or prediction history tracking.

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13. Future Enhancements

- Add mobile version or responsive UI for better accessibility.
- Integrate webcam for real-time blood cell detection.
- Expand dataset to improve prediction accuracy and generalization.
- Enable multilingual interface for broader usability in diverse regions.
- Add cloud database to store user feedback and analytics.

- Support classification of additional blood cell categories beyond the current four.