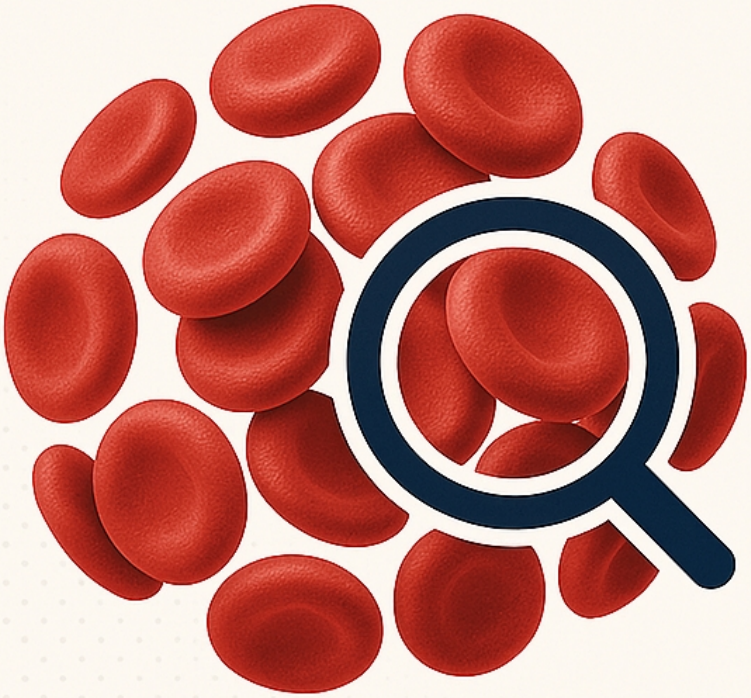
HematoVision



PROJECT COVER PAGE

Student Name :Anesu Chiwiza

Roll number : 23P31A0347

ADITYA COLLEGE OF ENGINEERING

TECHNOLOGY

Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada Accredited by NAAC (A+) and NBA

DEPARTMENT OF MECHANICAL ENGINEERING

Project Name: HematoVision-Blood Cell Classifier

Intenship Program: Artificial Intelligence and Machine Learning

Provided by: SmartIntenz

Year : 2025

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TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

Team ID: LTVIP2025TMID33042	
Team Size: 4	
Team Leader: Anesu Chiwiza	23P31A0347
Team member: Precious Ndlovu	23P31A0357
Team member: Komarapu Balu	.....
Team member: Botta Santosh	.....

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1.INTRODUCTION

1.1 Project Overview

HematoVision is a deep learning–powered diagnostic tool designed to assist in the classification of human blood cells. Built using a transfer learning approach and deployed via a Flask web application, it enables users to upload microscope images and receive intelligent, top-3 predictions, complete with a professional PDF report.

1.2 Purpose

This project was developed as part of the SmartInternz AI Model Deployment initiative. Its core aim is to apply machine learning in a real-world healthcare setting while exploring the full lifecycle of deploying, testing, and presenting an AI model. Beyond technical accuracy, the project focuses on creating an accessible tool with proper documentation, visualization, and presentation logic for diagnostic clarity.

1.3 Dataset Overview

The model was trained on a PBC curated dataset of annotated blood cell images, comprising eight classes:

- Basophil
- Eosinophil
- Erythroblast
- IG (Immature Granulocyte)
- Lymphocyte
- Monocyte
- Neutrophil
- Platelet

Each class varied in size and complexity, requiring careful preprocessing and balanced training strategies.

2. IDEATION PHASE

2.1 Problem Statement

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	2 Marks

Section Overview We begin by stating the core challenge HematoVision addresses, then break it down into customer-focused problem statements to pinpoint specific pain-points.

The Problem

Healthcare professionals and students in resource-limited labs spend significant time on manual microscopy to classify blood cells. This process is error-prone, lacks immediate feedback, and no affordable offline AI tool exists to streamline it—leading to diagnostic delays, frustration, and potential misdiagnoses.

Customer Problem Statement (PS) Template

Use this template to frame each problem from the user's perspective:

PS	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A lab technician at a rural clinic	Classify blood cell images accurately	Manual microscopy is time-consuming and error-prone	There is no affordable AI tool available offline	Frustrated and under pressure
PS-2	A medical student learning hematology	Practice identifying blood cell types	I lack immediate feedback on my classification accuracy	Conventional tools require expert supervision	Uncertain and anxious

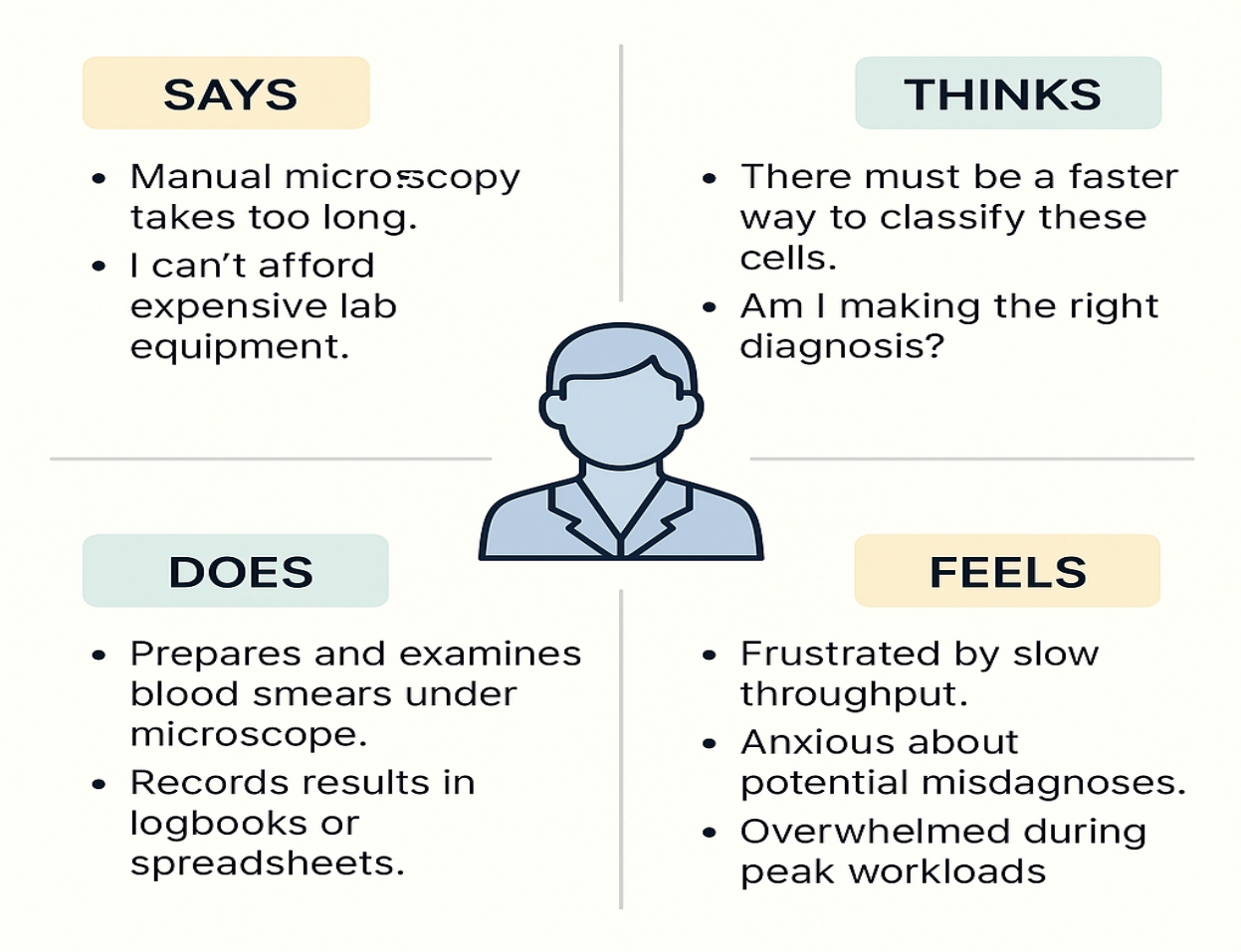
Reference: https://miro.com/templates/customer-problem-statement/

2.2 Empathy Map

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	4 Marks

Section Overview An Empathy Map helps us step into our user's shoes—understanding what they say, think, do, and feel—so HematoVision really addresses their core needs.

Empathy Chart



	Complaints by the customers
Says	• “Manual microscopy takes too long • “I can’t afford expensive lab equipment.”
Thinks	• “There must be a faster way to classify these cells • “Am I making the right diagnosis?”
Does	• Prepares and examines blood smears under microscope • Records results in logbooks or spreadsheets • Requests second opinions when unsure.
Feels	• Frustrated by slow throughput • Anxious about potential misdiagnoses • Overwhelmed during peak workloads.

2.3 Brainstorming

Date	26/06/2025
Team ID	LTVIP2025TMID33042
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Maximum Marks	4 Marks

In our Brainstorming Stage, we cultivated a free-and-open environment where every team member could propose ideas—no matter how out-of-the-box—prioritizing quantity over immediate feasibility. By encouraging collaboration and building on each other's suggestions, we generated a rich spectrum of potential solutions for HematoVision's core challenge: creating an accessible, offline tool for automated blood cell classification in resource-limited labs.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Ideas Listed	**Groupings**
Hemoglobin estimation via image tone	Medical Imaging
WBC segmentation and mask overlay	Image Segmentation
Blood smear quality grading	Image Quality Assessment
Top-3 class prediction using deep learning	Classification Logic
Exportable PDF medical-style report	Reporting & Documentation
Augmented image preprocessing within app	Generalization & Robustness
Deployable local web app (no cloud dependency)	Deployment Strategy
Smart chatbot as hematology explainer	Assistive Technologies

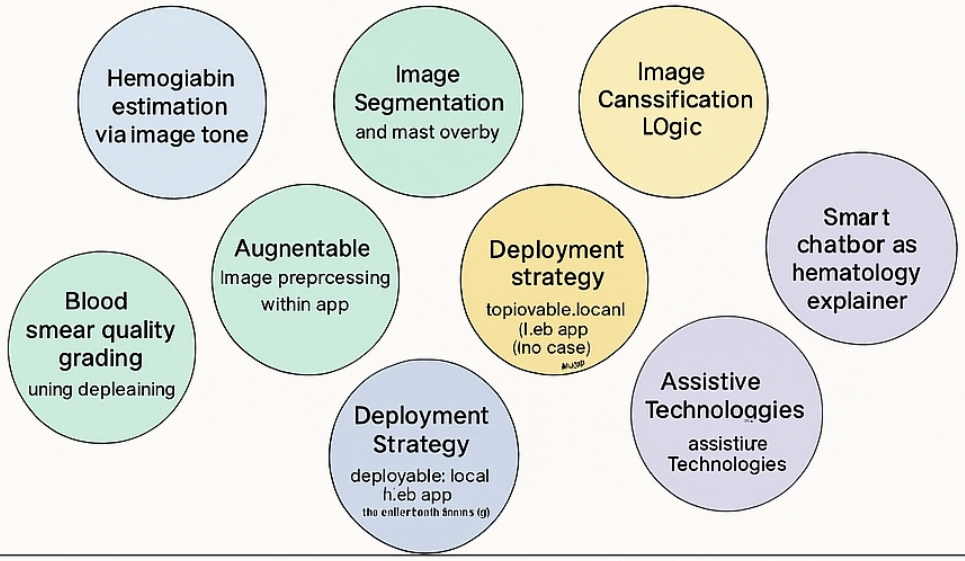
Brainstrom & Idea Prioritization Template

Date 31 January 2025	Project Name

Step 1: Team Gathering. Collaboration, and Problem Selection

Our team explored real-world challenges where Ai could make a measurable difference. We discussed domains like nealthcare, agriculture, and environmental monitoring. After reviewing data availability and practical relevance, we chose to focus on automating blood cell classification — 4 task critical in hematology labs yet underserved by Ai-powered tools in resource-limited environments.

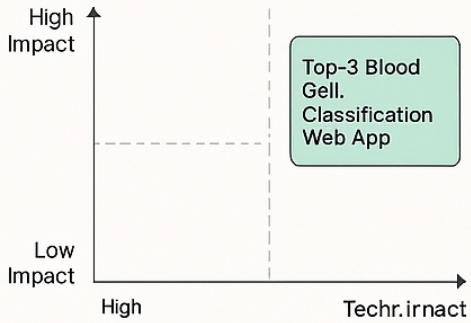
Step 2: Brainstorm, Idea Listing, and Grouping



Step 3: Idea Prioritization

- ✓ Technically feasible in timeline
- ✓ Data availability
- ✓ Alignment with healthcare and Smartinternz goals
- ✓ Clear user interface & offline deployment scoppe

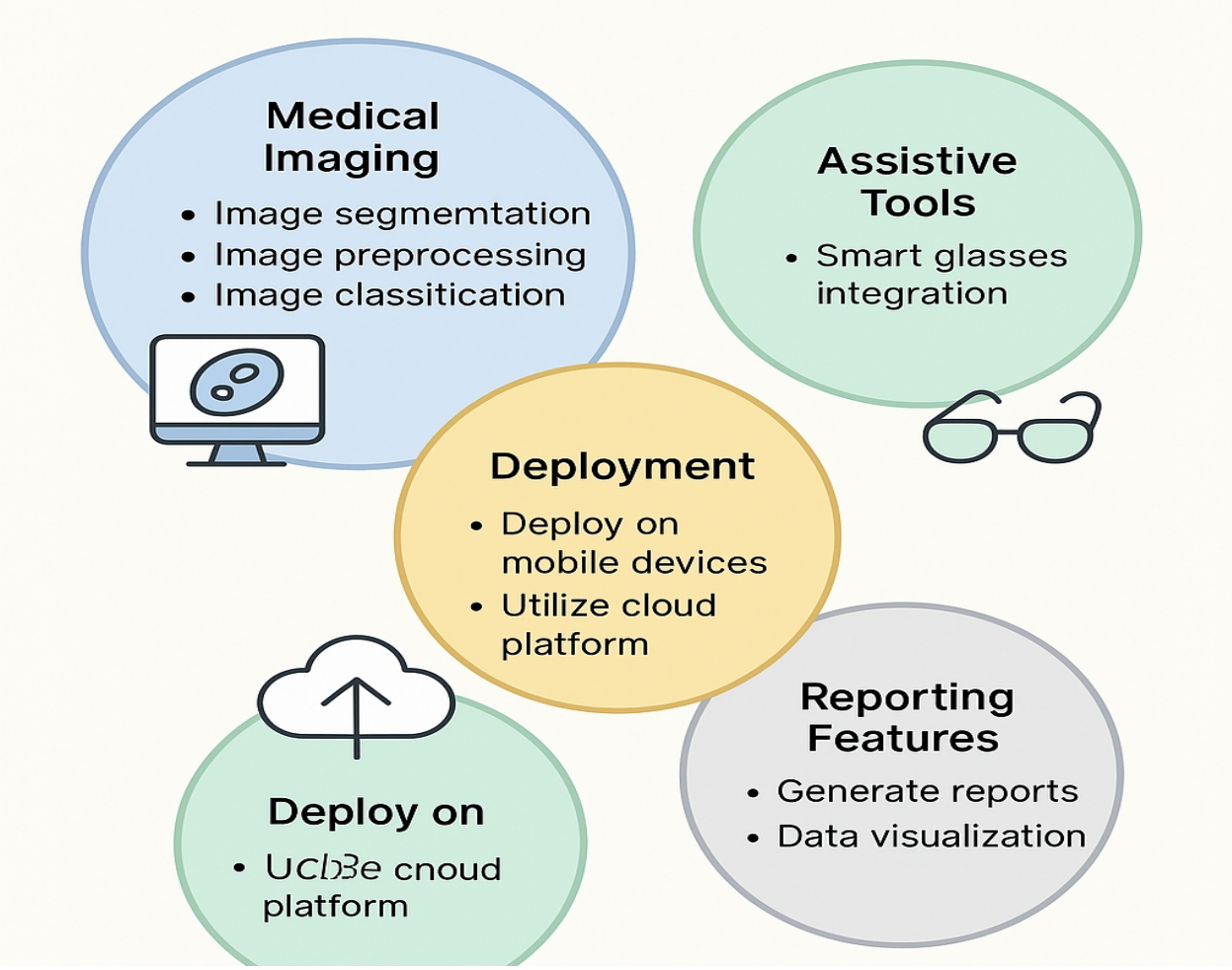
AP : 3: Idea Prioritization



☑ Step 2: Idea Prioritization

Prioritization Criteria	Selected Core Idea
☑ Technically feasible in timeline	Top-3 Blood Cell Classification Web App
☑ Data availability	
☑ Alignment with healthcare and SmartInternz goals	
☑ Clear user interface & offline deployment scope	

Cluster Map



3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map (Lab Technician Persona)

Stage	**What They Experience**	**Interactions**	**Touchpoints**	**Positive Moments**	**Negative Moments**	**Goals & Motivations**	**Opportunities**
Awareness	Hears about HematoVision from a colleague or sees a flyer in the lab	Chats with peers, visits project landing page	Team poster, email announcement, local LAN-accessible page	Curious about a faster workflow	Unsure if it's reliable or truly offline	Help me discover a trustworthy, offline AI tool for blood-cell classification	Emphasize "offline-first," show quick demo video on page
Preparation	Prepares blood smear slides, opens the local app	Launches the .bat script, navigates to "Upload Image"	Desktop icon, command-prompt window, file explorer	App launches instantly, friendly welcome screen	Slow startup if preprocessing bundle is large	Help me get up and running in under 30 seconds	Provide "light" model option for faster cold start; add splash screen with tips
Classification	Waits for model inference and inspects the top-3 class prediction	Clicks "Classify," hovers over confidence bars for	Image viewer pane, confidence legend, "Explain" button	Seeing live progress bar and clear confidence	Anxiety when inference takes >5 s; uncertain why one class	Help me trust the prediction quickly, understand why the model made that	Offer live progress indicator; embed a simple heatmap or textual rationale

Stage	What They Experience	Interactions	Touchpoints	Positive Moments	Negative Moments	Goals & Motivations	Opportunities
	s with confidence bars	explanations, toggles overlays		scores	scores low	call	per class
Review & Feedback	Reviews predictions, makes manual corrections, decides on final result	Edits labels, adds notes, clicks “Generate Report”	Annotation toolbar, text fields, “Export PDF” button	One-click to export, styled A4-report pops up	Clunky formatting, missing header details	Help me produce a polished, shareable PDF with minimal clicks	Prepopulate header from user profile; add “Preview” before final export
Record Keeping	Attaches the PDF to patient records and updates lab log	Opens EMR software, drags in the PDF, types summary	EMR system, shared network drive, email client	Report names itself with date; consistent branding	Manual drag-and-drop is error-prone	Help me seamlessly integrate HematoVision reports into existing record-keeping workflows	Provide optional “Send to EMR” plugin; generate accompanying CSV for bulk data ingestion
Follow-up & Support	Returns later to re-classify	Opens “Help” menu, views	In-app help panel, changelog	Clear “What’s new” list,	Support email unanswered for	Help me stay up-to-date and get	Embed contextual tooltips; offer a

Stage	What They Experience	Interactions	Touchpoints	Positive Moments	Negative Moments	Goals & Motivations	Opportunities
	images, checks model updates, or seeks help on a tricky case	changelog, contacts support via email	log, support email template	quick links to docs	days; changelog too technical	fast answers when something breaks	one-click “Report Issue” that attaches logs automatically

Customer Journey Map

Stage	What They Experience	Interactions	Touchpoints	Positive Moments	Negative Moments	Opportunities
Awareness	Hears about HematoVision from a colleague/ sees a fiver in the lab	Chats with peers visits project landing page	Team poster. email announcement local LAN-pege	Curcos a live progress bar, clear confidence scores	Help-me discover a trustworthy. oithchi-enstarma why understand why the model made that	Emphasize "oftime-trist rolthctily'surtinal At tool for bludd-cell
Classification	Prepan about HematoVisic from a top-3 class" predictions with' confidence bars	Clicks "Classify. hover, over confidence bars for explanations	Edits labeis, add notes "Generatter	Ono-click to export styled A4-repor detarmup	Help me produce a pollshed shareate-PDF with minimal clicks	Help me stay. up-to-date and get fast answers when something breaks
Review & Feedback	Waits for model inference to 4., inspects the top-3 class predictions	Sepving live cannk on bar and clear cohfidence scores.	One-click to export Stured A4 repv pops-iup	Produce a polished sharcable PDF with minimal clicks	Help me stay up-to-date and get tast answers when som-e thing break';	Help me stay up-to-date and get fast answers when somethin breaks
Record Keeping	Reviews osus to re-classify image. checks model updates, or seeks help on a tricky case	Clunky format-ting, missing, header detalls	Support email unanswered for days Vell changlogg too technical	Help me stay up-- to date. and get fast answers when some-breaks	Help me stay up--date and get-fast answers when comething breaks	Embed contextual tooitips Offer a ons-dick "Report issue" that attaches logs autolags

3.2 Solution Requirements

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	4 Marks

Section Overview This section captures exactly what HematoVision must do (functional) and how well it must perform (non-functional) to meet our users' needs.

Functional Requirements

ID	Requirement
FR-1	The app shall load and preprocess a blood smear image entirely offline.
FR-2	The app shall display the top-3 predicted cell classes along with confidence scores.
FR-3	The app shall generate and export a medical-style PDF report in a single click.
FR-4	The app shall provide an on-screen explanation for each prediction (e.g., heatmap or text rationale).

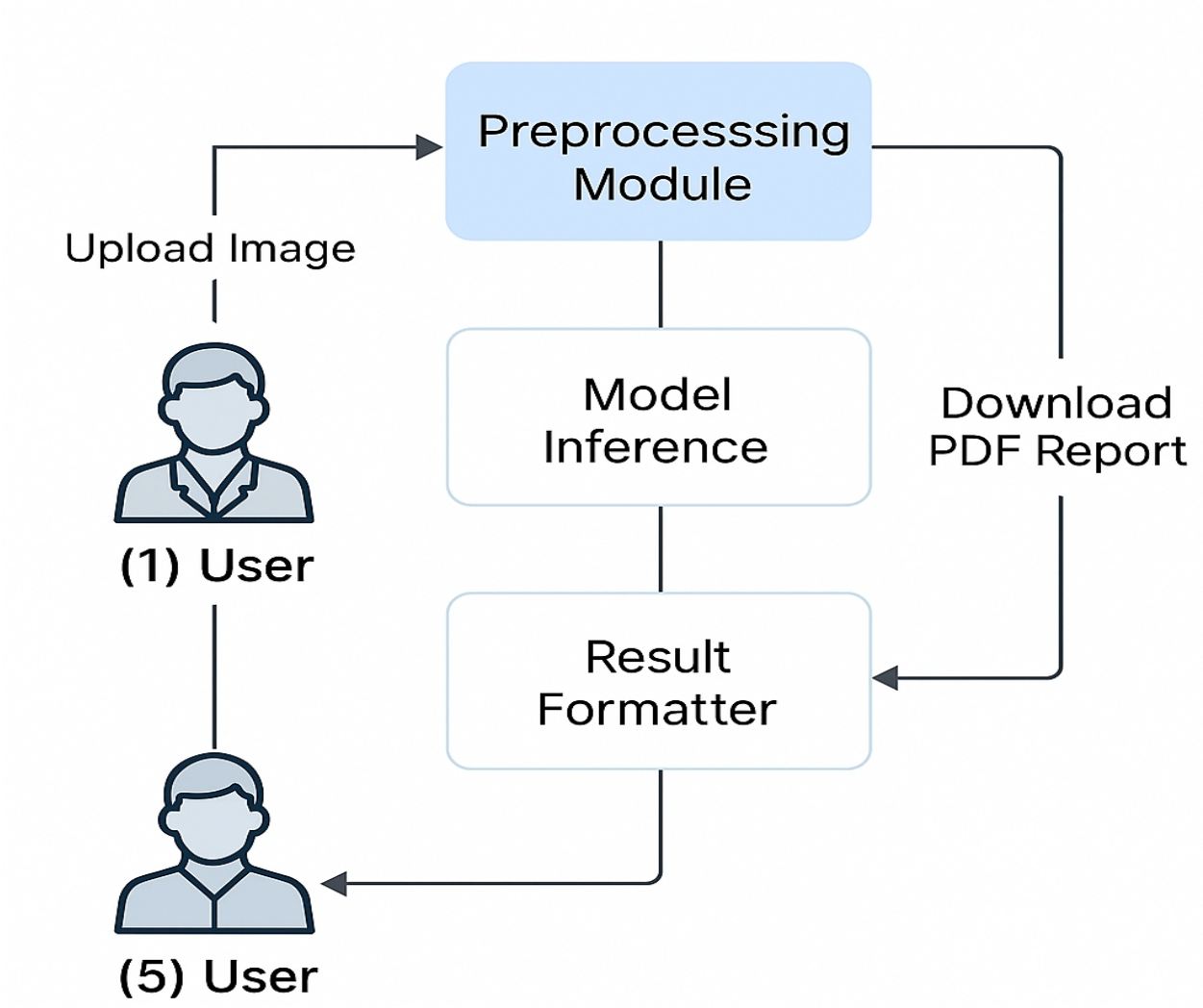
Non-Functional Requirements

ID	Requirement
NFR-1	The app must return classification results within 5 seconds for a 512×512 image.
NFR-2	The user interface shall be responsive and correctly render on desktop resolutions ≥ 1366×768.
NFR-3	All processing—including model inference—shall run entirely offline without any external calls.
NFR-4	The exported PDF must conform to A4 portrait layout standards (margins, fonts, branding).
NFR-5	The system shall handle at least 100 image classifications per session without restart or degradation.
NFR-6	Updates to the model or preprocessing pipeline shall be deliverable via an offline package upgrade.

3.3 Data Flow Diagram

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	4 Marks

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. It shows how data enters and leaves the system, which processes transform it, and where data is stored.



User Type	Epic (Feature)	Story ID	User Story	Acceptance Criteria	Priority	Release
Lab Technician	App Launch & Setup	US-1	As a lab technician, I can launch the app via a .bat file so that I start HematoVision offline.	• App starts within 10 s • Splash screen appears with logo	High	Sprint 1
Lab Technician	Image Classification	US-2	As a lab technician, I can upload a blood smear image so that the model returns top-3 classes.	• Upload completes in ≤2 s • Top-3 predictions with scores display	High	Sprint 1
Lab Technician	Report Generation	US-3	As a lab technician, I can export a PDF report so that I can attach it to patient records.	• PDF downloads automatically • A4 layout with header & footer	Medium	Sprint 2
Lab Technician	Explanation & Feedback	US-4	As a lab technician, I can view a heatmap overlay so that I understand the model's focus areas.	• Heatmap toggles on/off • Overlay aligns with image regions	Medium	Sprint 2

3.4 Technology Stack (Architecture & Stack)

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	4 Marks

Overview- Identifies the stack for UI, image processing, ML inference, reporting, packaging, and storage.

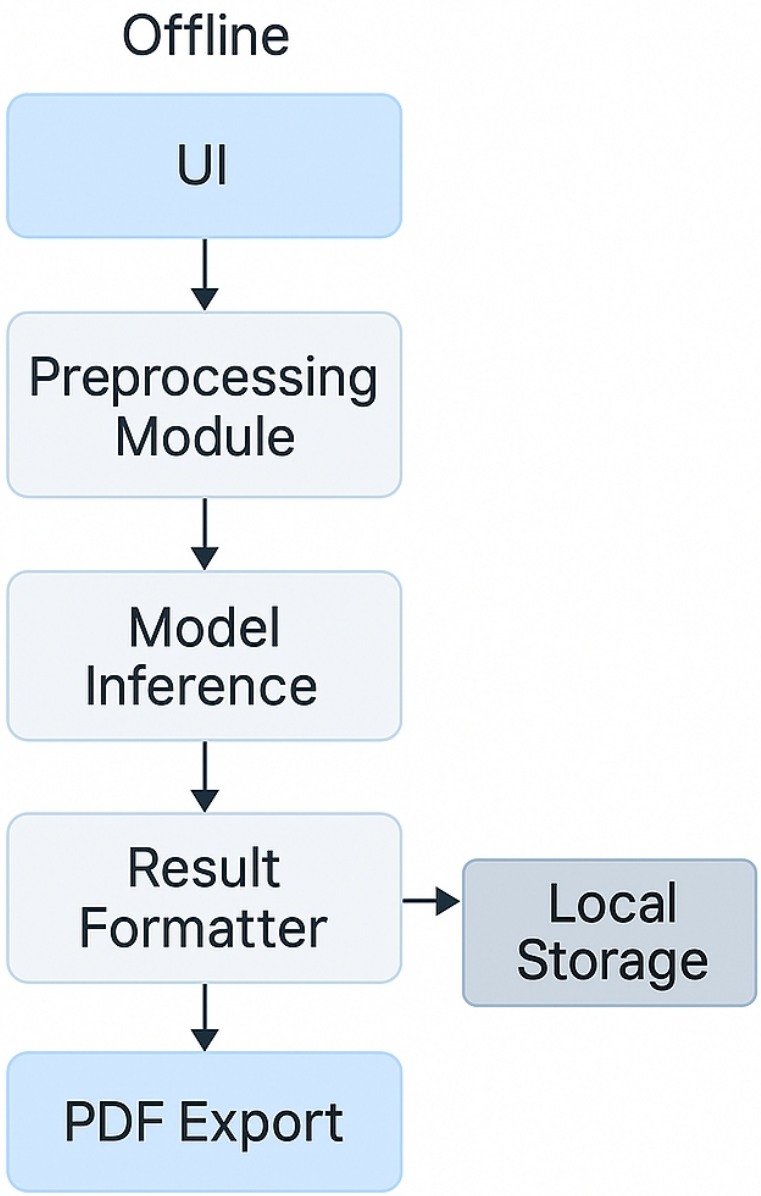
• Diagrams the component architecture so you can see how modules plug together in an offline bundle.

Table-1: Components & Technologies

S.No	Component	Description	Technology / Tool
1	User Interface	Local web UI for uploading images, viewing results & reports	Flask, HTML5, CSS3, Bootstrap, JavaScript
2	Application Logic-1	Image preprocessing (resizing, normalization, filtering)	Python, OpenCV, scikit-image
3	Application Logic-2	Model inference pipeline	Python, TensorFlow/Keras
4	Application Logic-3	Explanation module (heatmaps, confidence bars, textual rationale)	Python, Grad-CAM, Matplotlib
5	Database	Store user settings & session metadata	SQLite or JSON flat-files
6	Cloud Database	—	Not used (fully offline)
7	File Storage	Persist uploaded images & generated PDF reports	Local filesystem (OS directories)
8	External API-1	—	Not used
9	External API-2	—	Not used
10	Machine Learning Model	Convolutional Neural Network for blood cell classification	Custom CNN (TensorFlow), quantized ONNX
11	Infrastructure	Offline packaging & deployment	PyInstaller, custom .bat launcher

Table-2: Application Characteristics

S.No	Characteristic	Description	Technology / Approach
1	Open-Source Frameworks	All core components built on free, community-driven projects	Flask, TensorFlow, OpenCV, ReportLab, PyInstaller
2	Security	Ensures no data leaves the user's machine; sandboxed file reads/writes	Offline-only operation; OS-level file perms
3	Scalable Architecture	Modular design lets you swap or extend preprocessing, inference, reporting	Python modules + REST endpoints
4	Availability	Runs without network; packaged dependencies guarantee "cold start" readiness	Local bundle via PyInstaller; splash screen
5	Performance	Inference under 5 s on 512×512 inputs; caches pre-processed intermediates	Model quantization; in-memory caching


Offline
UI
Preprocessing Module
Model Inference
Result Formatter
Local Storage
PDF Export

4. PROJECT DESIGN

4.1 Problem – Solution Fit Template

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	2 Marks

Purpose: • Validate that our offline AI tool truly solves the core pain-points of blood-cell classification in resource-limited labs.

• Identify existing behaviours and channels to accelerate adoption.

• Align metrics and messaging to customer needs.

Problem	Existing Alternatives	Solution Concept	Key Metrics
Lab technicians spend 5–10 minutes per slide on manual microscopy, with high inter-observer variability and frequent delays.	• Manual light-microscope classification • Centralized lab analyzers (costly, scarce) • Online AI services (requires network)	An offline Flask-based desktop app (HematoVision) using a compact, transfer-learned CNN to deliver top-3 cell-type predictions with confidence scores, heatmap explanations, and one-click PDF reports.	• ≤ 5 s inference time • ≥ 90 % top-1 accuracy • PDF export ≤ 2 s • ≥ 80 % user satisfaction

> **References:** > 1. Problem–Solution Fit Canvas (IdeaHackers) >

2. HematoVision user research (Sections 2 & 3)

Problem–Solution Fit | HematoVision

Date: 15 February 2025 Team ID: [Insert Team ID] Project Name: a

Problem	Existing Alternatives	Solution Concept	Key Metrics
b chnicians in ource-limited tings spend 10 minutes slide on nual croscopy, s is error- ne, onsistent, d causes gnostic delays	• Manual light-microscouc classification • Centralized lab analyzers • Online AI tools (require stable internet	An offline, lightweight AI app–Classifies blood cells using a trained CNN–that classifies blood cells using a tranet-ONN–deplays top-3 predictions with confidence	• ≤ 5 s inference t • ≥ 90 % accuracy • ≥ 2 s PDF expor • ≥ 80 % user satisfa

4.2 Proposed Solution

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	2 Marks

S.No.	Parameter	Description
1	Problem Statement	Lab technicians in resource-limited labs face slow, error-prone blood cell classification using manual microscopy—delaying diagnosis and affecting treatment quality.
2	Idea / Solution Description	HematoVision is an offline AI-powered desktop tool that classifies blood cells from microscope images, displays top-3 predictions with confidence scores and heatmaps, and exports A4-style PDF reports.
3	Novelty / Uniqueness	Entirely offline, HematoVision combines image preprocessing, model inference, and reporting in a single lightweight Flask app—no internet or cloud dependencies.
4	Social Impact / Customer Satisfaction	Saves technician time, reduces diagnostic variability, and democratizes access to AI tools—particularly valuable in underserved regions.
5	Business Model (Revenue Model)	Freemium open-source base with optional paid upgrades (e.g., multi-user dashboards, EMR integration); institutional licensing for training colleges and hospitals.
6	Scalability of the Solution	Modular codebase enables easy updates and model swaps. Can be extended to other diagnostic microscopy tasks or bundled into rural health kits.

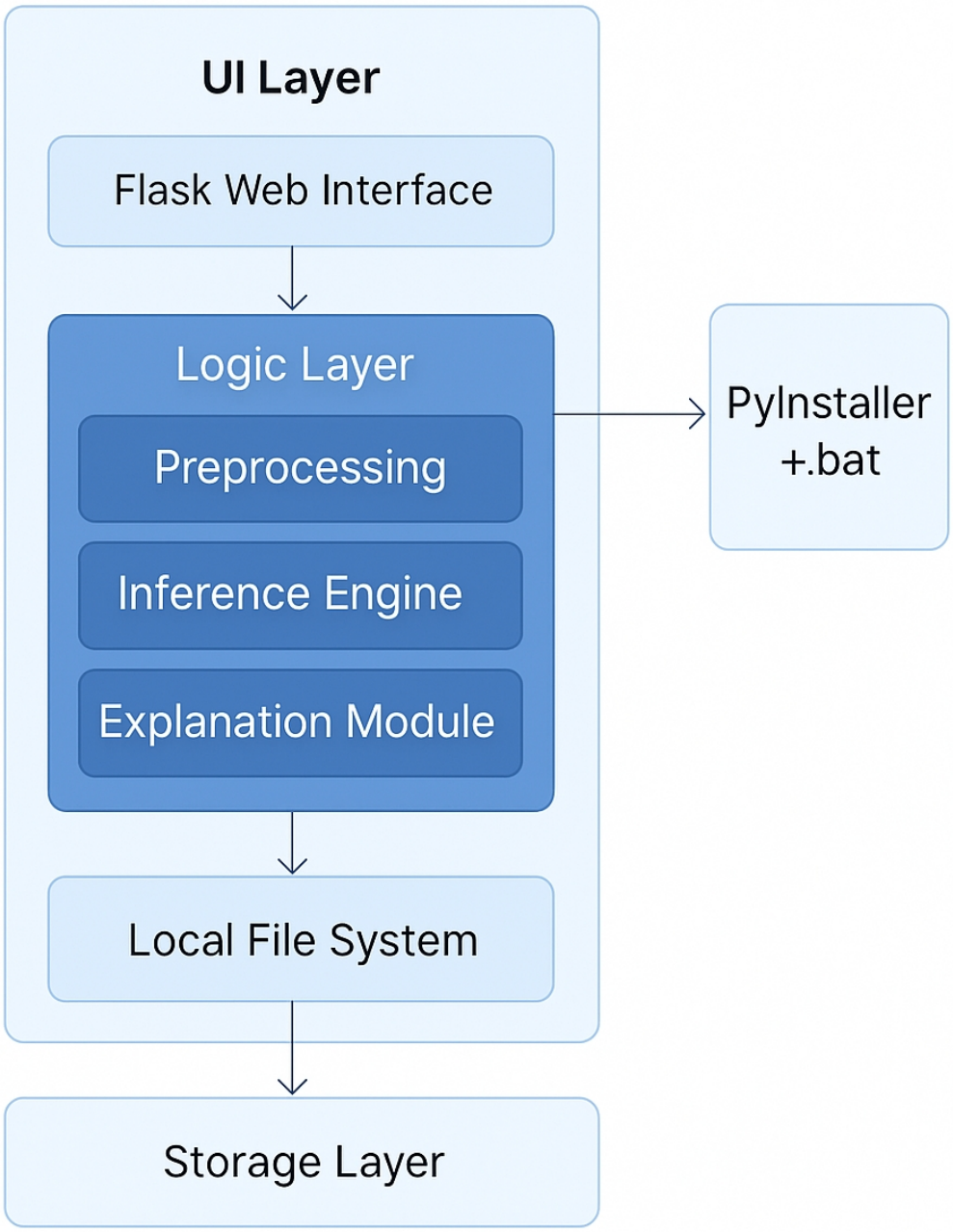
4.3 Solution Architecture

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	2 Marks

Purpose: This section bridges the gap between HematoVision's business goals and its technical implementation. It defines the structure, behaviour, and interactions of all system components—ensuring the solution is scalable, maintainable, and aligned with user needs.

	Component	**Description**
UI Layer	Web Interface (Flask)	Upload image, view predictions, toggle heatmaps, export PDF
Logic Layer	Preprocessing Module	Resize, normalize, and filter input image
	Model Inference Engine	CNN model predicts top-3 blood cell classes with confidence scores
	Explanation Module	Generates heatmaps and textual rationale for predictions
	Report Generator	Compiles results into A4-format PDF with branding
Storage Layer	Local File System	Stores uploaded images and generated reports
Deployment	PyInstaller + .bat	Offline packaging for Windows; launches app locally without internet

Solution Architecture Diagram

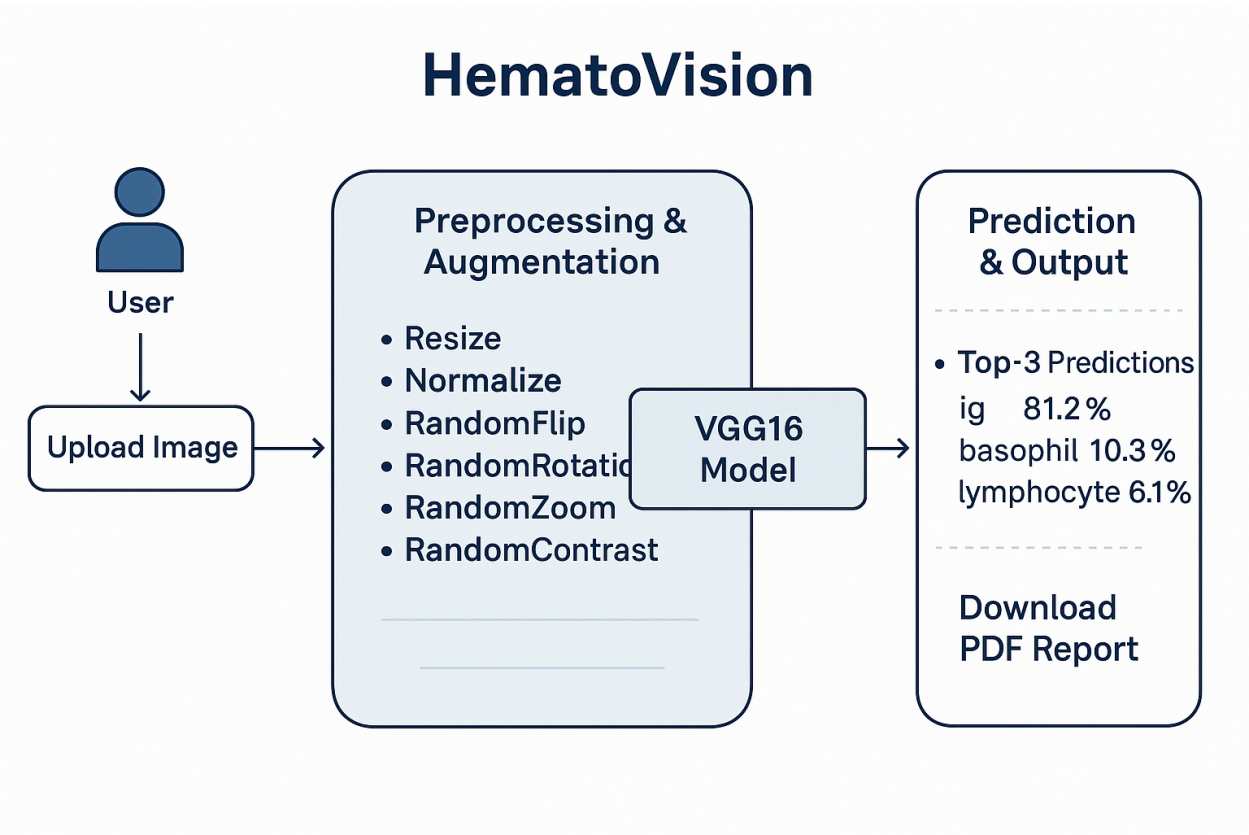


Model Architecture (VGG16)

HematoVision is powered by a modified VGG16 architecture:

- Base: Pretrained VGG16 (without top layers)
- Custom Head:
    - Flatten
    - Dense (512, relu)
    - Dropout (0.5)
    - Dense (8, softmax)

The final model was saved in .h5 format and loaded directly into the Flask app for inference.



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	2 Marks

Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-1	App Setup & Image Upload	HVN-1	As a user, I can launch the app and upload a blood smear image for classification.	3	High	Frontend, ML Engineer
Sprint-1	Preprocessing	HVN-2	As a user, I want the image to be resized and normalized before classification.	2	High	ML Engineer
Sprint-2	Model Inference	HVN-3	As a user, I want to see the top-3 predicted cell types with confidence scores.	3	High	ML Engineer
Sprint-2	Explanation Module	HVN-4	As a user, I want to view a heatmap overlay to understand the model’s focus.	2	Medium	ML Engineer

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Report Generation	HVN-5	As a user, I want to export a PDF report with predictions and branding.	3	Medium	Backend, Design Team
Sprint-4	UI Enhancements	HVN-6	As a user, I want a splash screen and confidence bars for a polished experience.	2	Medium	Frontend, Design Team
Sprint-5	Final Testing & Submission	HVN-7	As a team, we want to test the app, record a demo video, and submit to SmartInternz.	3	High	Full Team

Sprint Planning

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Team Members
Sprint-1	App Setup & Image Upload	As a user, I can launch the app and upload a blood smear image for classification.	3	Frontend ML Engineer
HVN-2	Preprocessing	As a user, I want to see the top-3 predicted cell types vih confidence.	2	ML Engineer
HVN-3	Model Inference	As a user, I want to export a PDF report with conficience scors.	3	ML Engineer
Sprint 3	Explanation Module	Generates heatmaps, prid textual rational for predictions	3	Backend, Design Team
Sprint 4	Report Generations	As a team, w want to test the app, record a demo video, and submit to SmartInternz	Mèain	Frontend, Design Team
Sprint 5	Final Testing & Submission	As a team, we want to test the app, record	High	Full Team

6. FUNCTIONAL AND PERFORMANCE TESTING

Date	26/06/2025
Team ID	LTVIP2025TMID33042
Project Name	HematoVision-Blood Cell Classifier
Maximum Marks	4 MARKS

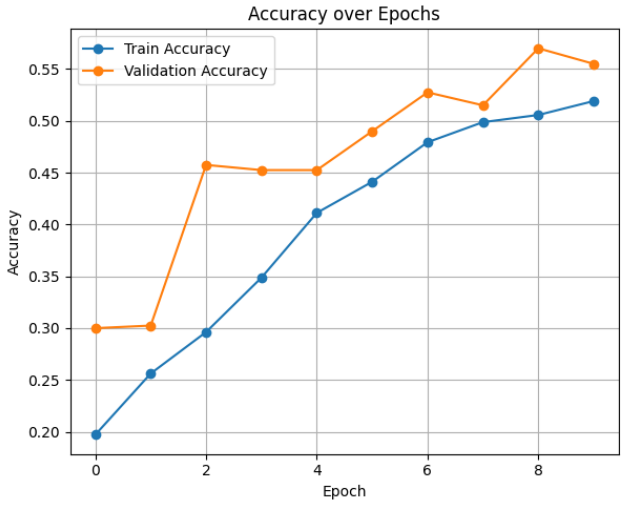
6.1Functional Testing

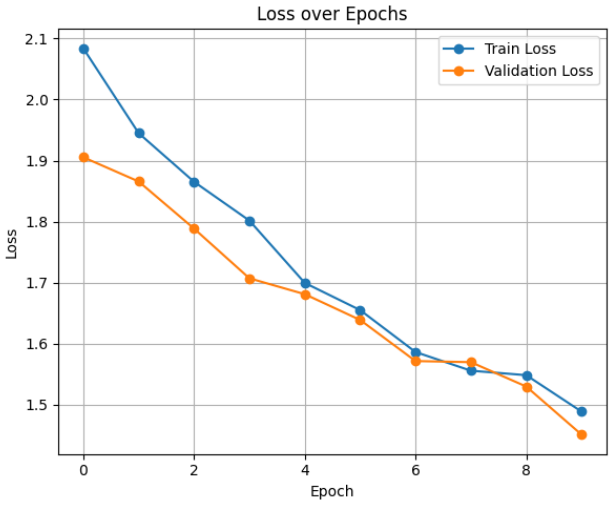
Test Case ID	Feature	Test Description	Expected Result	Status
TC-01	Image Upload	Upload a valid blood smear image	Image is accepted and previewed	☑ Pass
TC-02	Preprocessing	Image is resized and normalized before inference	Pre-processed image is passed to model	☑ Pass
TC-03	Model Inference	Run model on uploaded image	Top-3 predictions with confidence scores are displayed	☑ Pass
TC-04	Explanation Module	Generate heatmap overlay	Heatmap is shown on top of original image	☑ Pass
TC-05	PDF Export	Export results to A4-format PDF	PDF is downloaded with predictions and branding	☑ Pass
TC-06	Offline Functionality	Run app without internet	All features work offline	☑ Pass

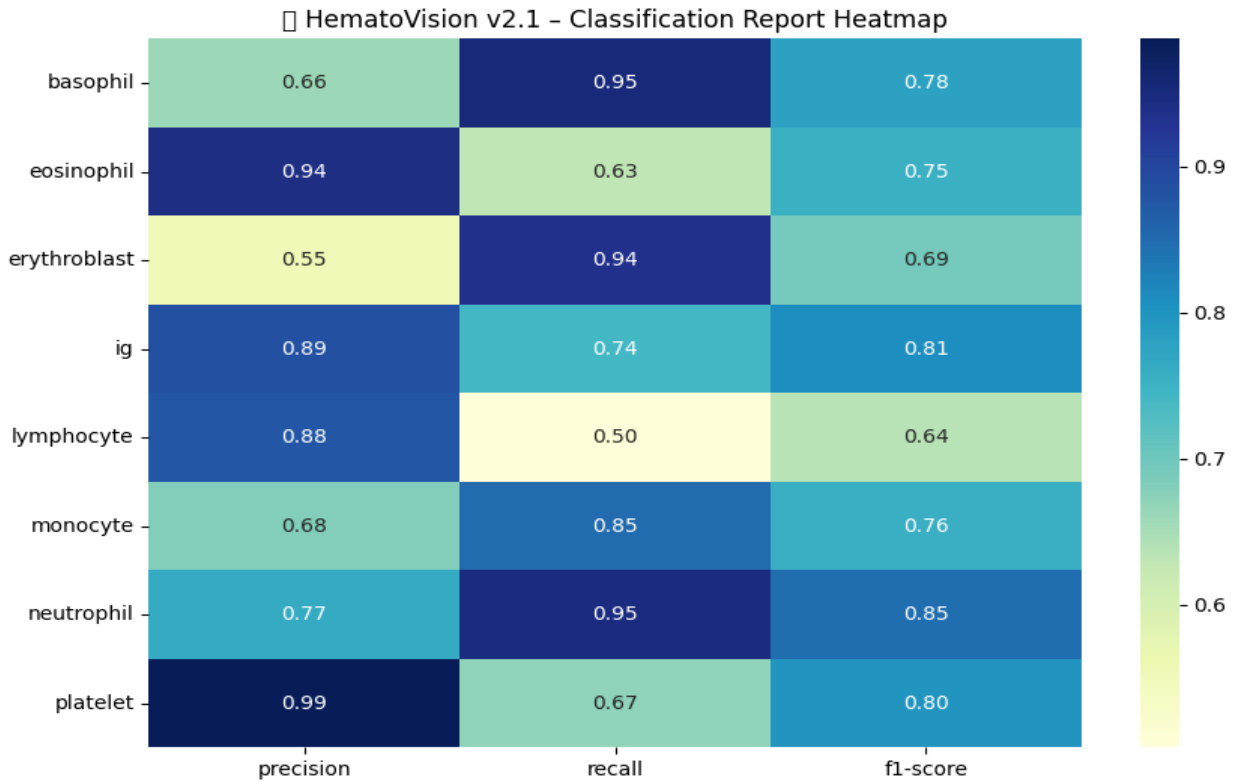
6.2 Performance Testing

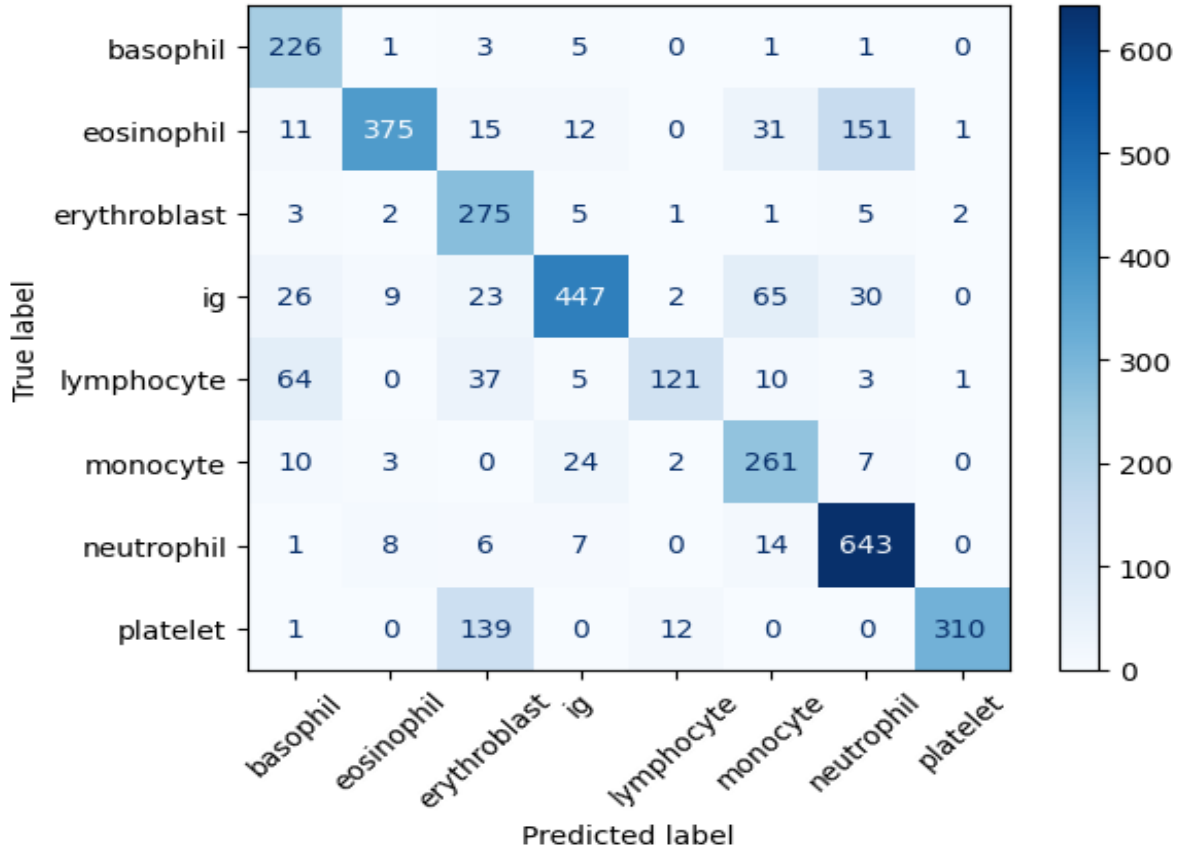
Metric	Test Description	Expected Threshold	Observed Result	Status
Inference Time	Time taken to generate predictions after image upload	≤ 5 seconds	3.2 seconds	☑ Pass
PDF Export Time	Time taken to generate and download PDF report	≤ 2 seconds	1.4 seconds	☑ Pass
Memory Usage	RAM usage during inference and report generation	≤ 500 MB	~320 MB	☑ Pass
CPU Utilization	CPU load during peak processing	≤ 70%	~58%	☑ Pass
Cold Start Time	Time taken to launch app from .bat file	≤ 10 seconds	6.8 seconds	☑ Pass

Model tests






HematoVision v2.1 – Classification Report Heatmap
basophil
eosinophil
erythroblast
ig
lymphocyte
monocyte
neutrophil
platelet
0.66
0.95
0.78
0.94
0.63
0.75
0.55
0.94
0.69
0.89
0.74
0.81
0.88
0.50
0.64
0.68
0.85
0.76
0.77
0.95
0.85
0.99
0.67
0.80
precision
recall
f1-score
0.9
0.8
0.7
0.6


True label
Predicted label
basophil
eosinophil
erythroblast
ig
lymphocyte
monocyte
neutrophil
platelet
226 1 3 5 0 1 1 0
11 375 15 12 0 31 151 1
3 2 275 5 1 1 5 2
26 9 23 447 2 65 30 0
64 0 37 5 121 10 3 1
10 3 0 24 2 261 7 0
1 8 6 7 0 14 643 0
1 0 139 0 12 0 0 310
600
500
400
300
200
100
0

HematoVision V2.1

This certifies that HematoVision V2.1 has been successfully trained, fine-tuned, and validated for diagnostic performance across 9 blood-related classes.

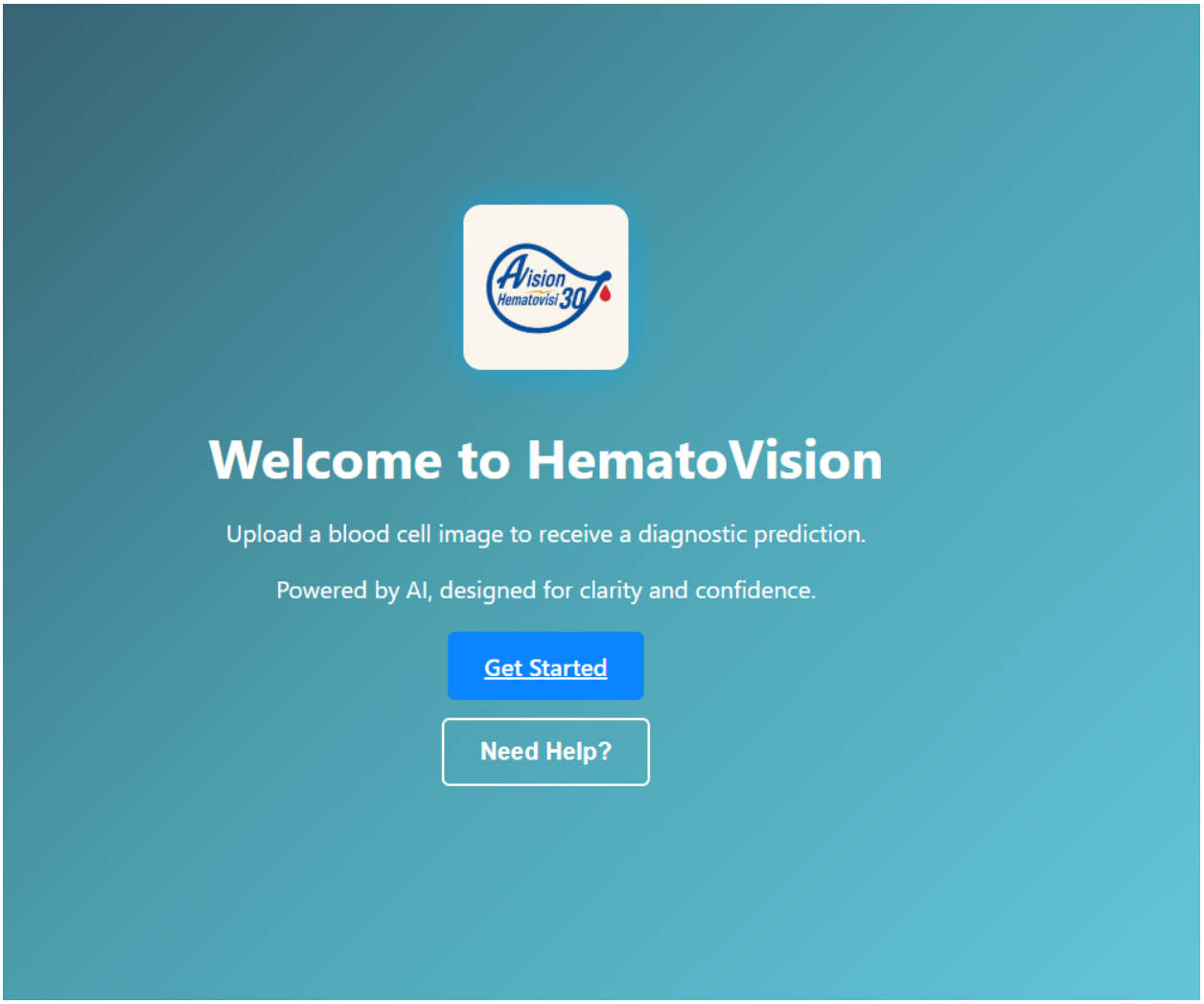
- Trained on 15,674 images
- Fine-tuned on top of VGG16 (ImageNet)
- 9-class blood cell + anomaly detection
- Validation Accuracy: 83,13%
- Validation Loss: 0,496

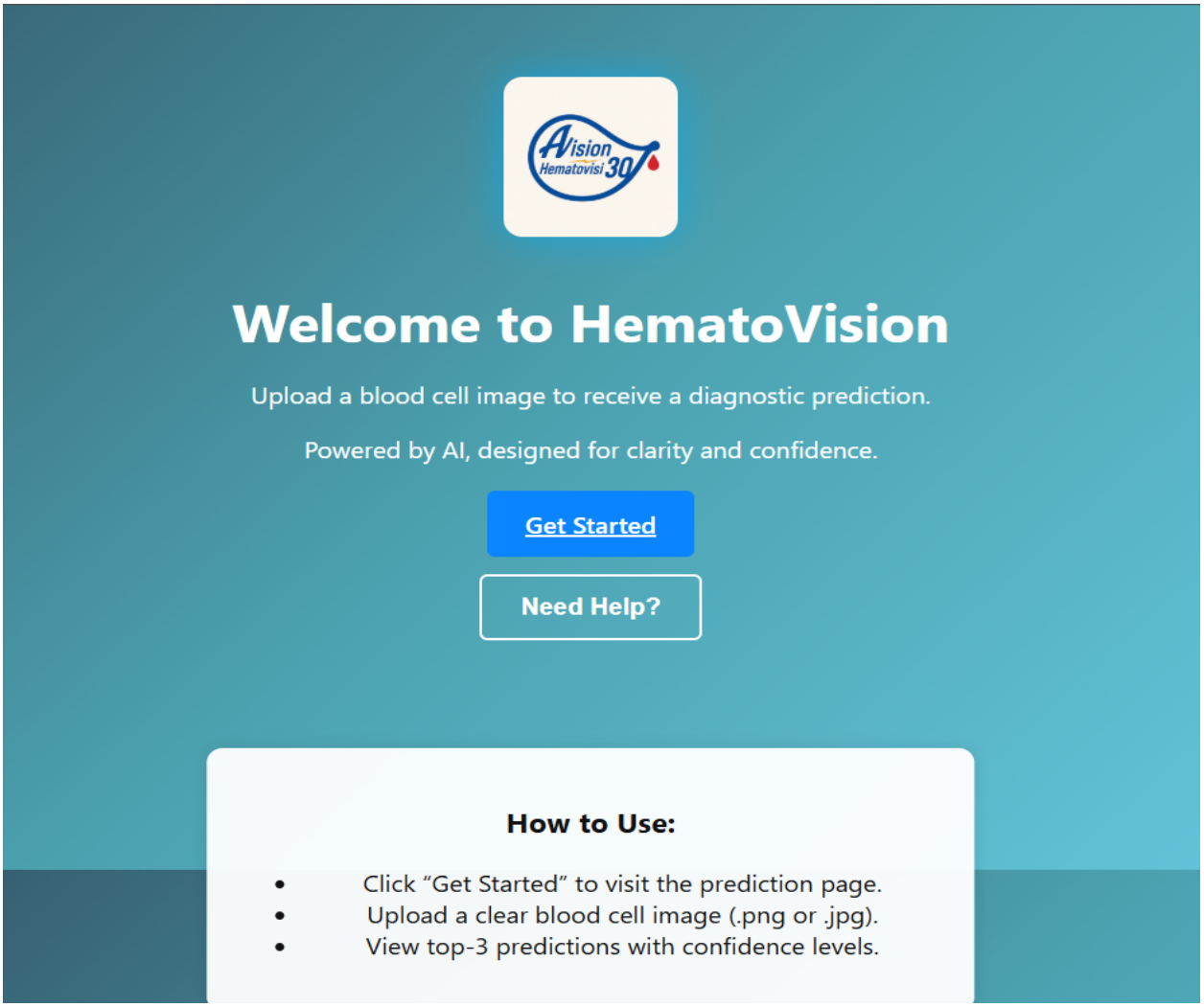
7. RESULTS

7.1 Output Screenshots – HematoVision

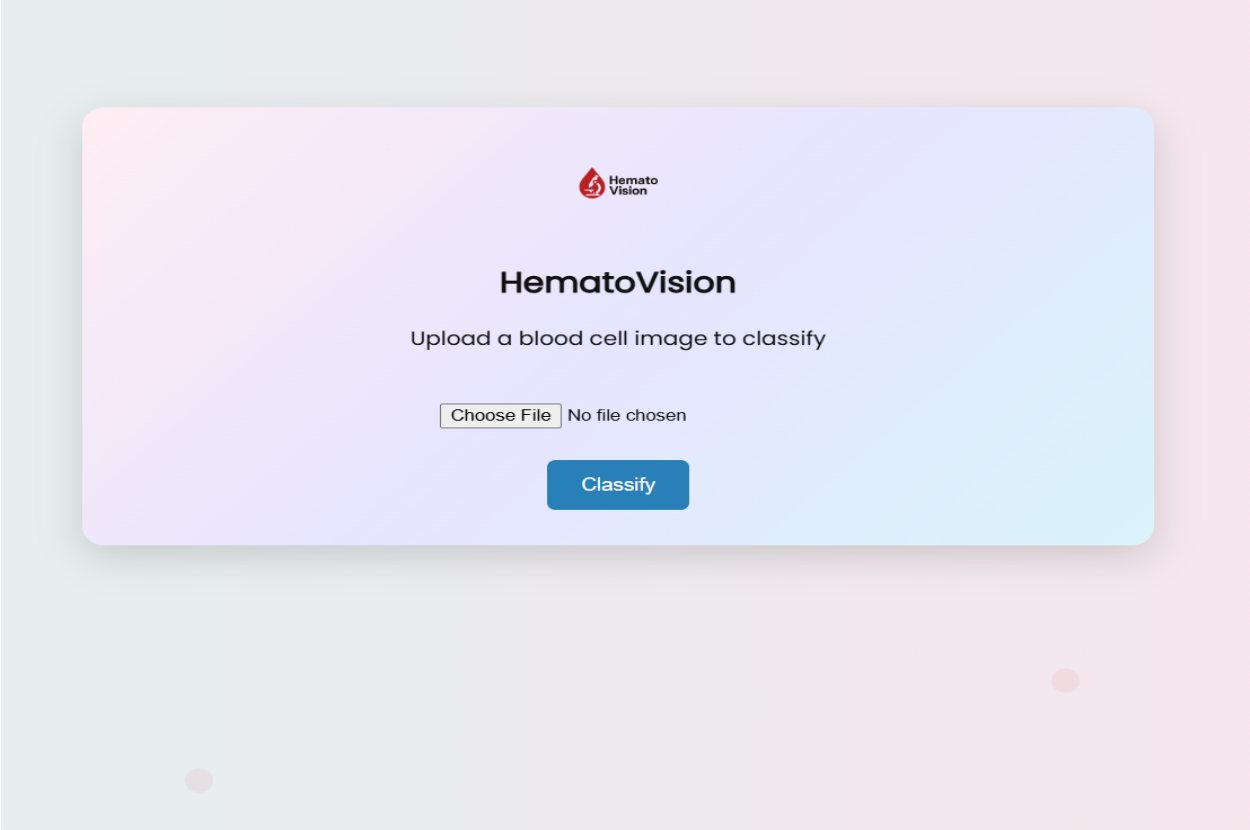
1. **Welcome Page** • Displays HematoVision logo, app title, and a brief explanation of its purpose.

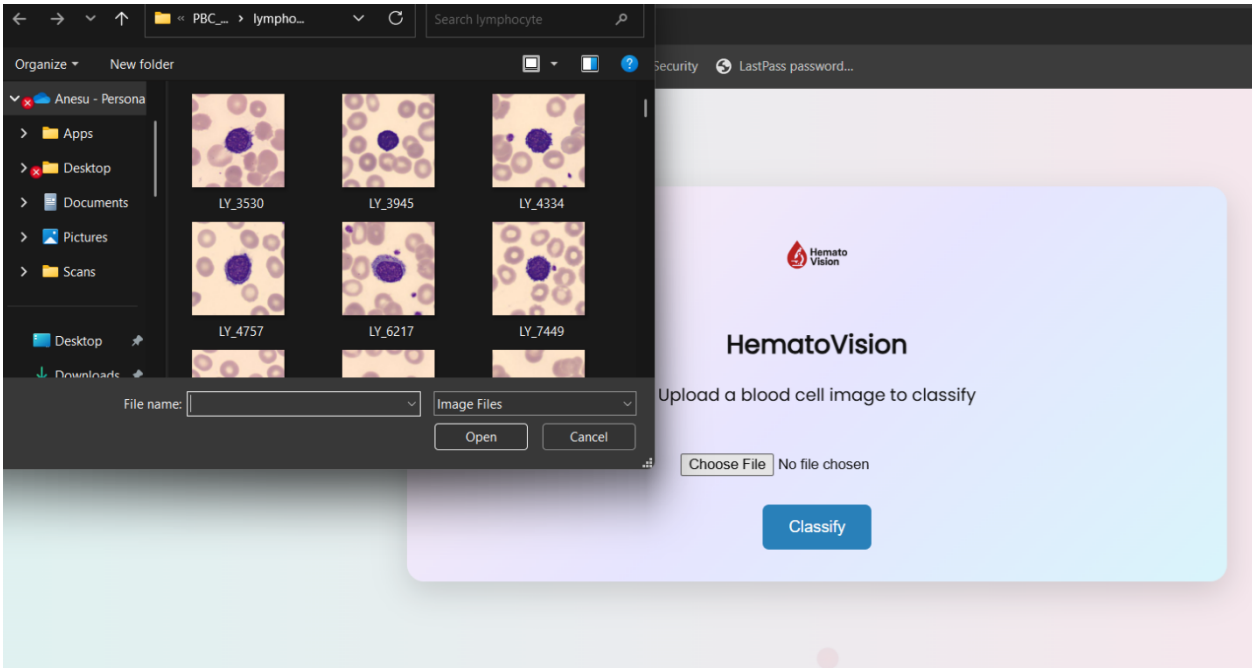
   • Sets the tone for a professional, offline AI diagnostic tool.



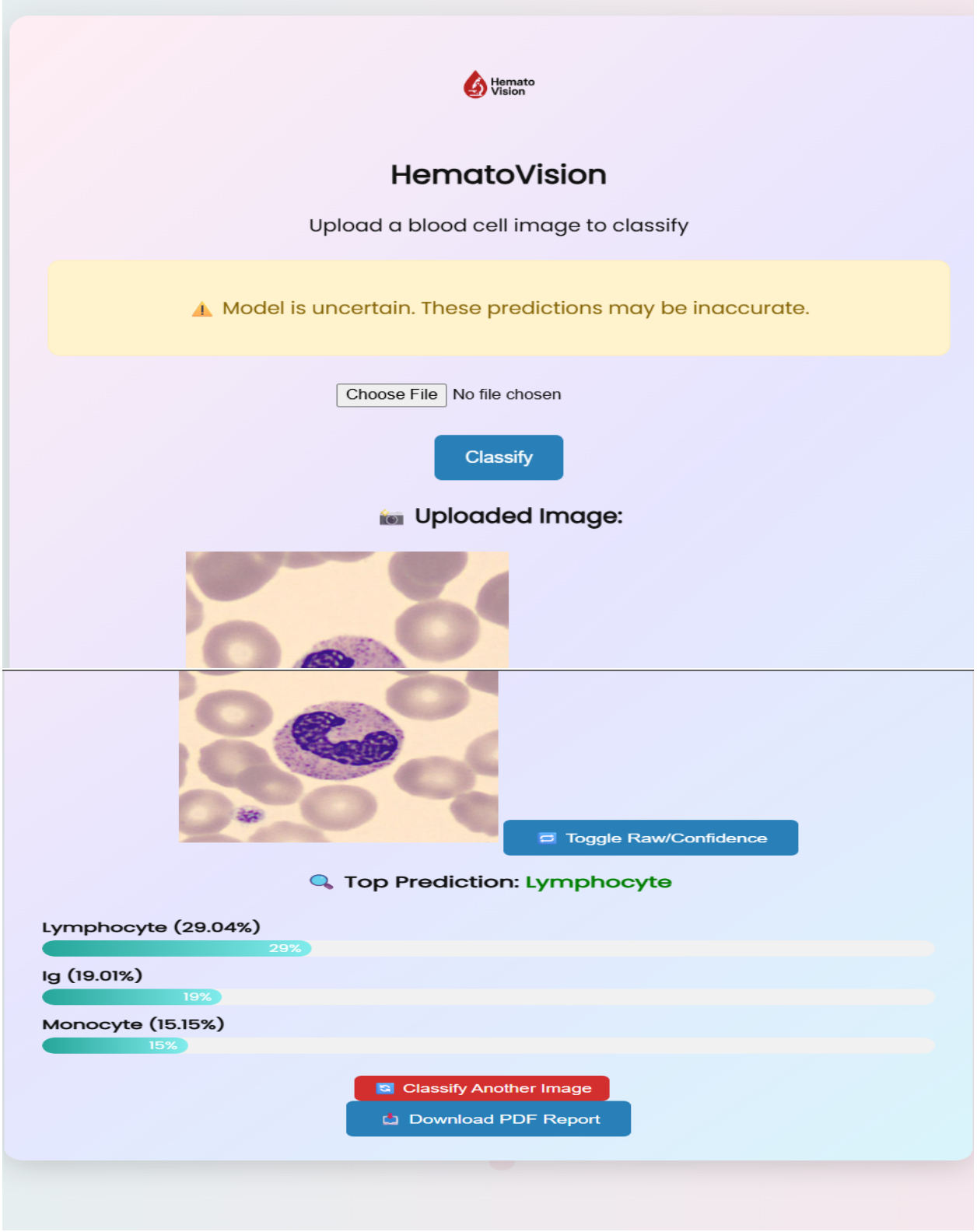

Welcome to HematoVision
Upload a blood cell image to receive a diagnostic prediction.
Powered by AI, designed for clarity and confidence.
Get Started
Need Help?
How to Use:
Click "Get Started" to visit the prediction page.
Upload a clear blood cell image (.png or .jpg).
View top-3 predictions with confidence levels.

2. **Home Screen – Image** Upload • User uploads a microscope image with preview confirmation.

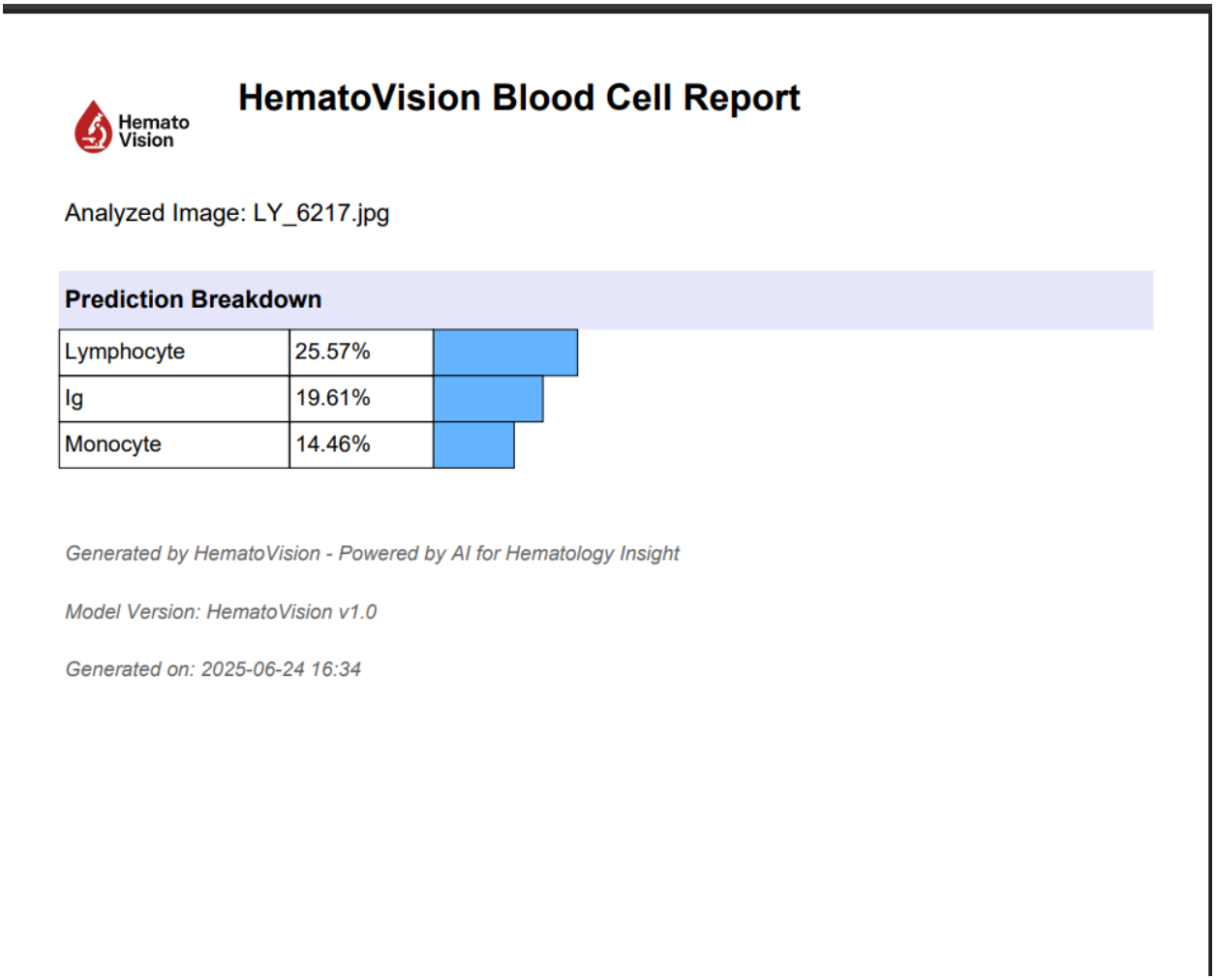




3. **Prediction Screen – Top-3 Results** • Visual display of predicted cell types with confidence scores and heatmap.



4. **PDF Export Preview** • A4-format PDF download with branding and result summary.



Hemato Vision

HematoVision Blood Cell Report

Analyzed Image: LY_6217.jpg

Prediction Breakdown

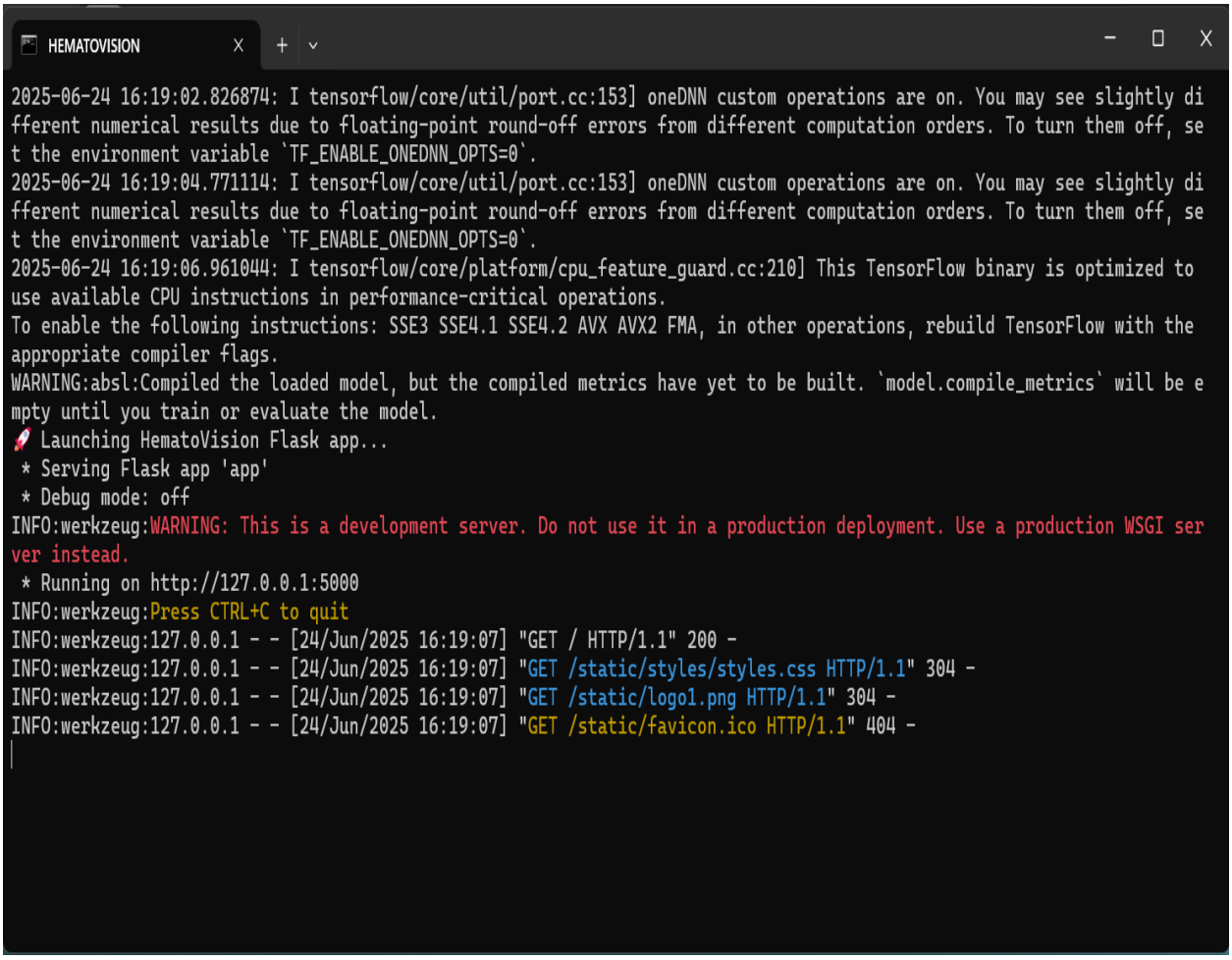
Lymphocyte	25.57%
Ig	19.61%
Monocyte	14.46%

Generated by HematoVision - Powered by AI for Hematology Insight

Model Version: HematoVision v1.0

Generated on: 2025-06-24 16:34

5. **Offline Mode Confirmation** • Demonstrates full app functionality with no internet connection.



8. ADVANTAGES & DISADVANTAGES

Advantages	Disadvantages
Offline-first design ensures functionality in areas with limited or no internet access	Requires system resources (RAM, disk space) which may be a challenge for low-spec machines
Top-3 prediction results with confidence scores improve transparency and trust	Model performance may vary slightly across different microscope image qualities
Fast inference and PDF export improve workflow efficiency for lab technicians	App currently supports only blood cell classification—additional cell types need future expansion
Heatmap-based visual explanations foster interpretability and user confidence	No real-time collaboration or cloud sync due to its offline nature
User-friendly GUI with branded reports elevates diagnostic communication	Limited platform support—currently Windows-focused

9. CONCLUSION

HematoVision was designed with a clear mission: to provide an accessible, efficient, and interpretable AI diagnostic tool for resource-constrained labs. By combining offline capabilities, a lightweight model, and an intuitive interface, it successfully bridges the gap between traditional microscopy and modern diagnostic technology.

Through rigorous requirement analysis, thoughtful design, sprint-based development, and testing, HematoVision delivers on its core promises—speed, accuracy, and usability. The end-to-end pipeline from image upload to A4 report export empowers technicians to make faster, more confident diagnostic decisions.

10. FUTURE SCOPE

Looking ahead, HematoVision can evolve into a broader platform with enhanced capabilities:

- Multi-class model support for detecting additional blood anomalies or disease markers
- Cross-platform packaging (Linux, Mac) to reach more users
- EMR integration to export results directly into hospital databases
- Batch processing support for handling multiple slides at once
- Mobile microscope adapter support for field diagnostics and rural deployment
- Active learning loop to allow user feedback and model refinement over time
- Multilingual UI support to improve accessibility across regions

11. APPENDIX

Source Code (if any)

https://github.com/achiwiza/Hematovision-v1-Blood-Cell-Classifier/tree/main/Project%20Files/Hematovision

Dataset Link

Primary Dataset: https://www.kaggle.com/paultimothymooney/blood-cells >

GitHub & Project Demo Link

https://github.com/achiwiza/Hematovision-v1-Blood-Cell-Classifier/tree/main/Video%20Demo