# HematoVision: Advanced Blood Cell Classification Using Transfer Learning

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## 1 Introduction

### 1.1 Project Overview

Hemato-Vision is an AI-based web application built to automate the classification of human blood cells using image inputs. This project aids medical diagnostics and hematology research by offering fast, accurate cell-type classification.

### 1.2 Purpose

The purpose of Hemato-Vision is to provide a tool for medical professionals and researchers to quickly classify blood cells into four major types: eosinophil, lymphocyte, monocyte, and neutrophil, using a pre-trained deep learning model.

## 2 Ideation Phase

### 2.1 Problem Statement

HematoVision aims to develop an accurate and efficient model for classifying blood cells by employing transfer learning techniques. Utilizing a dataset of 12,000 annotated blood cell images, categorized into distinct classes such as eosinophils, lymphocytes, monocytes, and neutrophils, the project leverages pre-trained convolutional neural networks (CNNs) to expedite training and improve classification accuracy. Transfer learning allows the model to benefit from pre-existing knowledge of image features, significantly enhancing its performance and reducing computational costs. This approach provides a reliable and scalable tool for pathologists and healthcare professionals, ensuring precise and efficient blood cell classification.

### 2.2 Empathy Map Canvas

- **Medical Professionals:** Need accurate and quick classification to aid in diagnosis.
- **Researchers:** Require a reliable tool for hematology studies.
- **Patients:** Benefit from faster and more accurate diagnostic results.

### 2.3 Brainstorming

The team brainstormed various approaches to solve the problem, including traditional image processing techniques and deep learning models. Transfer learning was selected for its efficiency and accuracy.

## 3 Requirement Analysis

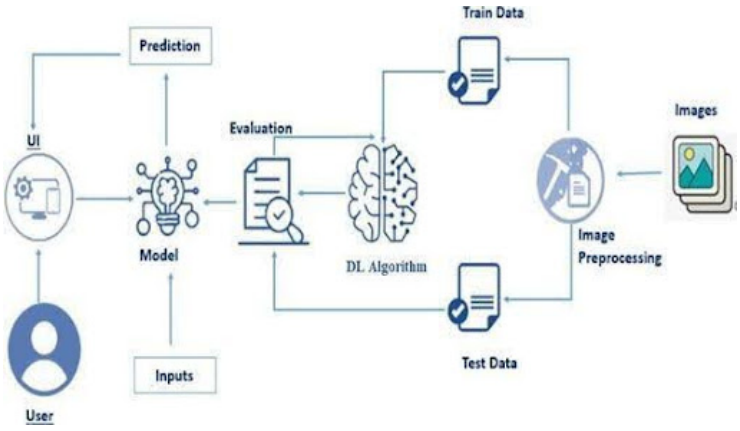
### 3.1 Customer Journey Map

- **Awareness:** User learns about the application.
- **Engagement:** User uploads a blood cell image.
- **Outcome:** User receives the classification result.

### 3.2 Solution Requirement

- Web interface for easy access.
- Pre-trained model for accurate classification.
- Real-time inference capability.

### 3.3 Data Flow Diagram



### 3.4 Technology Stack

- **Frontend:** HTML5, CSS3, Bootstrap 5
- **Backend:** Flask (Python)
- **Model:** TensorFlow/Keras, OpenCV

## 4 Project Design

### 4.1 Problem Solution Fit

The application fits the problem by providing an automated, accurate, and quick solution for blood cell classification, reducing manual effort and errors.

### 4.2 Proposed Solution

The solution involves a web application with a user-friendly interface that allows users to upload images and receive instant classification results.

### 4.3 Solution Architecture

- **Frontend:** HTML, CSS, Bootstrap
- **Backend:** Flask
- **Model:** Pre-trained CNN for classification

## 5 Project Planning & Scheduling

### 5.1 Project Planning

The project was divided into phases:

- Research and ideation
- Model development and training
- Web application development
- Testing and deployment

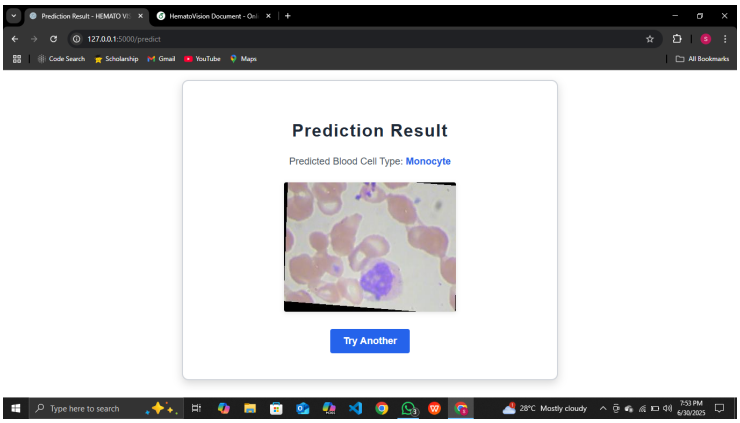
## 6 Functional and Performance Testing

### 6.1 Performance Testing

The model was tested with various blood cell images to ensure accuracy and performance. Manual testing was conducted to verify the UI and functionality.

# 7 Results

## 7.1 Output Screenshots




# 8 Advantages & Disadvantages

## 8.1 Advantages

- Fast and accurate classification
- User-friendly interface
- No need for extensive manual effort

## 8.2 Disadvantages

- Large model file size (over 100MB)
- Limited to four blood cell types

# 9 Conclusion

Hemato-Vision successfully automates the classification of blood cells using a pre-trained deep learning model. The web application provides a quick and accurate solution for medical professionals and researchers.

# 10 Future Scope

- Add drag-and-drop image upload
- Enable batch predictions

- Improve dataset diversity for better accuracy
- Deploy on cloud platforms for wider access

# 11 Appendix

## 11.1 Source Code

The source code is available on GitHub: `https://github.com/Sreelatha09/HematoVision-Advanced-Blood-Cell-Classification-Using-Transfer-Learning.git`

## 11.2 Dataset Link

The dataset used for training can be accessed via the GitHub repository.

## 11.3 GitHub & Project Demo Link

GitHub: `https://github.com/Sreelatha09/HematoVision-Advanced-Blood-Cell-Classification-Using.git`