PROJECT REPORT

HematoVision: Advanced Blood Cell Classification Using Transfer Learning

1. Introduction

HematoVision is a machine learning project developed during the SmartBridge Virtual Internship under the AI/ML domain. The goal is to classify blood cells into four types: Eosinophils, Lymphocytes, Monocytes, and Neutrophils using transfer learning techniques and deploy the model using a Flask web application.

2. Problem Statement

Accurate and timely identification of blood cell types is crucial for diagnosing various diseases. Manual analysis is time-consuming and prone to human error. This project aims to automate the classification process using deep learning.

3. Objectives

- To use transfer learning (MobileNetV2) to classify blood cell images.
- To visualize and evaluate the performance of the model.
- To integrate the trained model into a Flask web application.
- To deploy a simple UI for users to upload blood cell images and get predictions.

4. Tools and Technologies

- Python
- TensorFlow / Keras
- OpenCV
- Flask
- Jupyter Notebook
- HTML/CSS (Milligram CSS)
- Git & GitHub

5. Dataset

Source: Kaggle Blood Cell Dataset

Classes: Eosinophil, Lymphocyte, Monocyte, Neutrophil

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Total Images: 12,500 (augmented)

6. Project Workflow

Step 1: Data Preprocessing

- Images resized to (224x224)
- Normalized using MobileNetV2's preprocess_input

Step 2: Model Building

- Used MobileNetV2 with frozen base layers
- Added custom dense layers

Step 3: Model Evaluation

- Achieved ~89% accuracy
- Visualized training using loss and accuracy graphs
- Evaluated with classification report and confusion matrix

Step 4: Saving the Model

- Saved the model as Blood Cell.h5

Step 5: Web App using Flask

- Created home.html for image upload
- Created result.html to show prediction

7. Folder Structure

```
HematoVision/
 app.py
 Blood Cell.h5
 static/
    [uploaded images]
 templates/
```

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```
  home.html
  result.html
dataset/
  [image folders]
report.pdf
demo_video.mp4
```

8. Results

- Achieved ~89% classification accuracy
- Predicted all four blood cell types via web UI
- Users can upload images and view predictions instantly

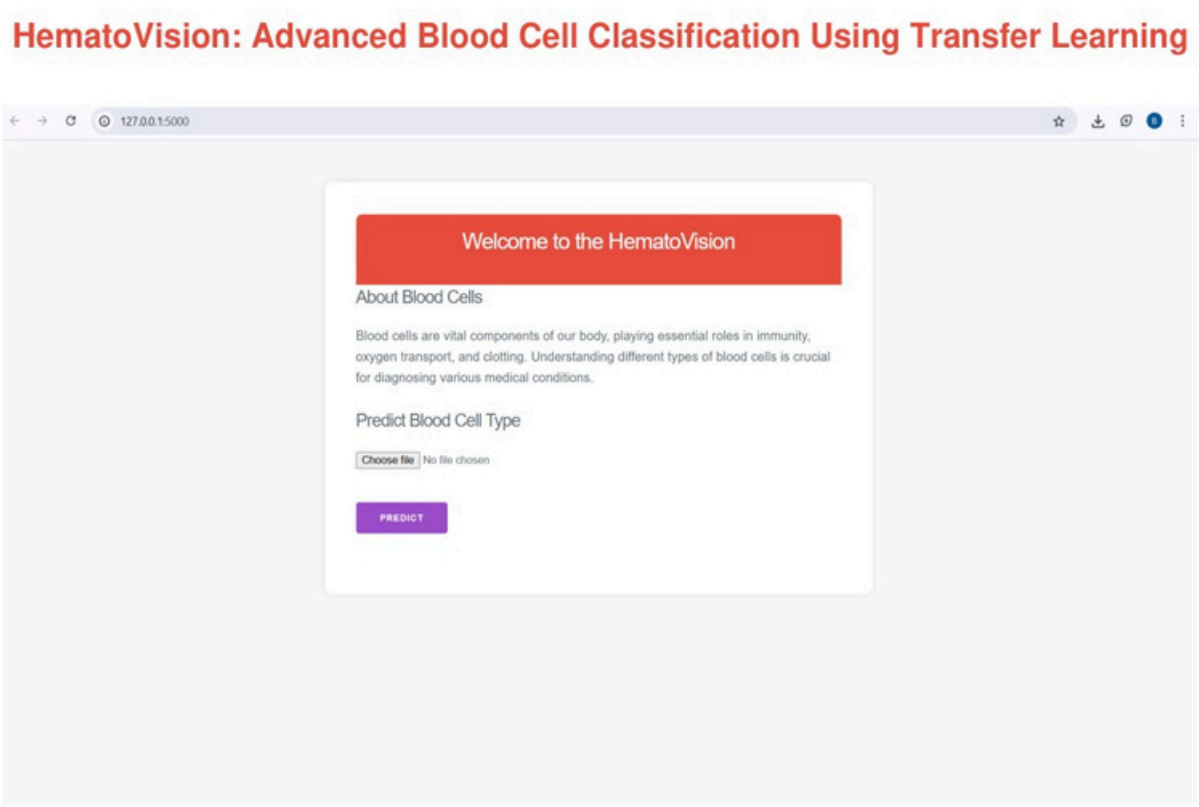
9. Conclusion

HematoVision demonstrates how transfer learning and Flask can be combined to build a real-time diagnostic tool. This helps reduce the burden on healthcare professionals by automating routine tasks.

10. Future Work

- Integrate additional cell types and datasets
- Add cloud deployment features
- Improve UI and add batch prediction support

Show Case ScreenShots:



- Allows the user to upload microscopic blood cell images (JPEG/PNG).
- Ensures a user-friendly layout using Milligram CSS.
- Accepts files directly from local device storage.
- Prepares image for backend processing upon form submission.

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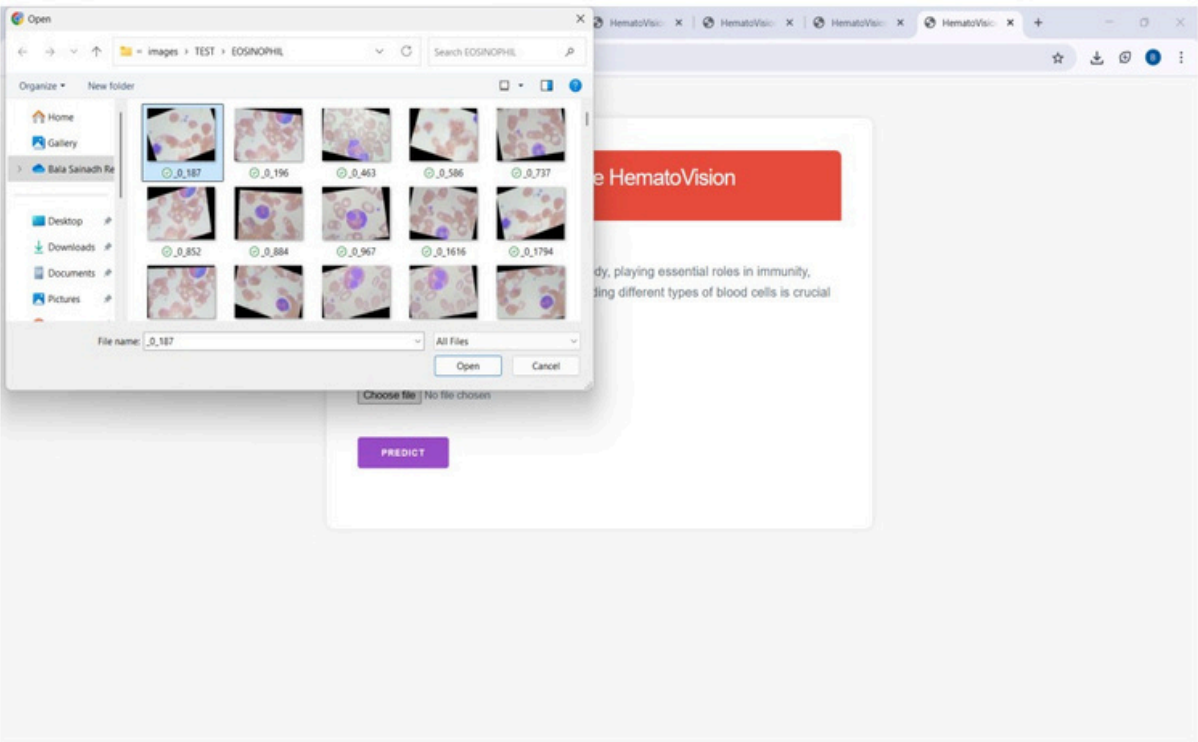
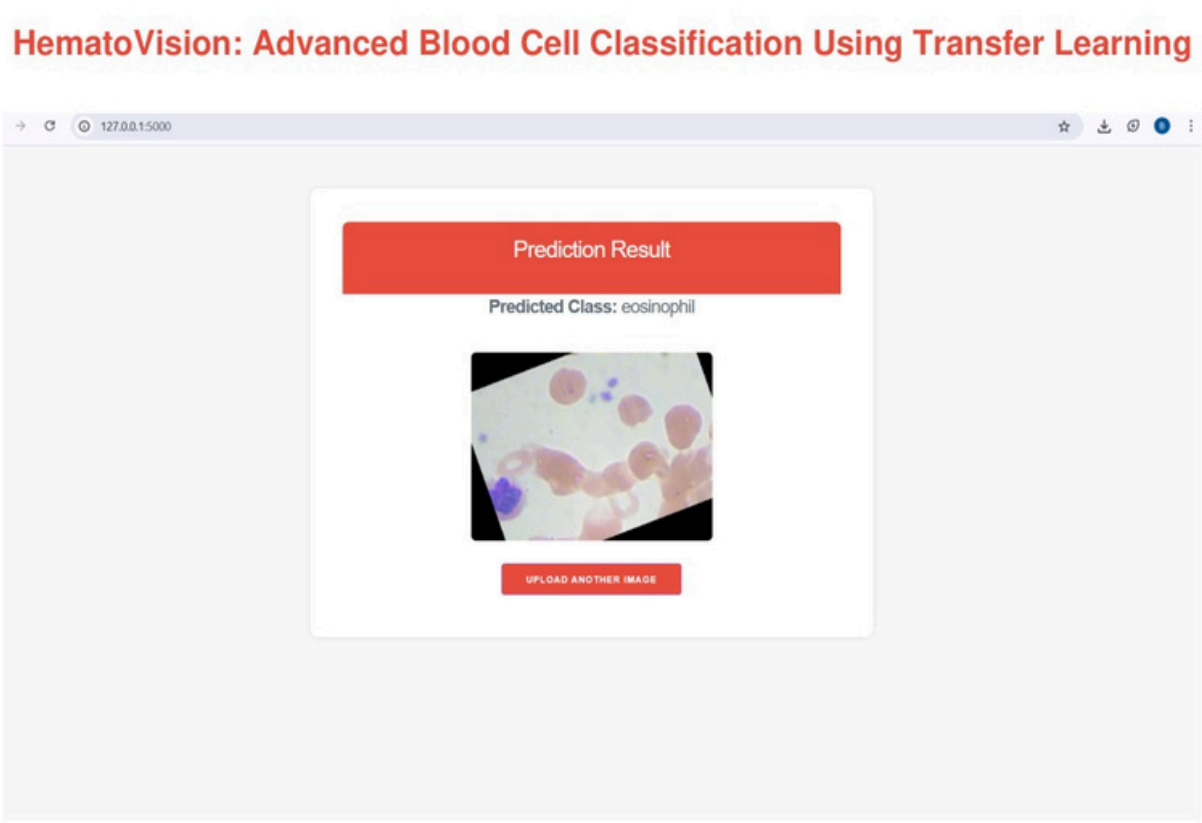


- Triggered when the user clicks the Predict button.
- Uploaded image is sent to Flask backend.
- The trained MobileNetV2 model processes and classifies the image.
- Prediction happens in real-time with fast response.



- Displays the uploaded image preview alongside the predicted label.
- Predicted blood cell type: Eosinophil, Lymphocyte, Monocyte, or Neutrophil.
- Accurate result displayed using TensorFlow model's output.
- Provides visual confirmation to the user.