# HematoVision: Advanced Blood Cell Classification Using Transfer Learning

Category: Artificial Intelligence

Skills Required: Python, Deep Learning, Transfer Learning

## 1. INTRODUCTION

• HematoVision aims to automate blood cell classification using deep learning.

• Leverages a dataset of 12,000 labeled images to train the model.

• Utilizes transfer learning for improved efficiency and accuracy.

• Designed for use in medical diagnostics and education.

## 2. IDEATION PHASE

• Identifies manual cell classification as a bottleneck in diagnostics.

• Seeks automation through deep learning to reduce error and workload.

• Brainstormed use in hospitals, remote areas, and educational tools.

• Developed empathy maps and user scenarios for system design.

## 3. REQUIREMENT ANALYSIS

• Requires high-resolution image input and preprocessing pipeline.

• Needs accurate model with low false positive/negative rates.

• Integration with GUI for image upload and result display.

• Should be scalable and deployable across platforms.

## 4. PROJECT DESIGN

• Based on MobileNetV2 for lightweight and fast processing.

• Pipeline includes image preprocessing, classification, result generation.

• Designed to handle real-time input and prediction.

• Can be integrated into mobile or desktop platforms.

## 5. PROJECT PLANNING & SCHEDULING

• Week 1: Data collection, cleaning, and exploration.

• Week 2: Model training with MobileNetV2 + transfer learning.

• Week 3: Evaluation and hyperparameter tuning.

• Week 4: Deployment setup using Flask or Streamlit.

## 6. FUNCTIONAL AND PERFORMANCE TESTING

• Evaluated on classification accuracy, precision, recall.

• Performance testing done on CPU and GPU environments.

• Achieved >94% accuracy across all classes.

• Confusion matrix used to detect class-wise errors.

## 7. RESULTS

• Model successfully classifies 4 major blood cell types.

• Training accuracy ~97%, testing accuracy ~94%.

• Visual outputs include prediction labels and metrics.

• Output reports can be generated and saved.

## 8. ADVANTAGES & DISADVANTAGES

• Reduces diagnostic time and workload.

• Improves accuracy and consistency in diagnosis.

• May require high-quality input images.

• Might struggle with rare or abnormal samples.

## 9. CONCLUSION

• HematoVision presents a reliable tool for blood cell classification.

• Transfer learning significantly boosts performance.

• Model is generalizable for various use-cases.

• Opens door to further medical AI research.

## 10. FUTURE SCOPE

• Extend model to identify rare/diseased blood cells.

• Deploy in mobile app with offline capabilities.

• Improve accuracy using ensemble or hybrid models.

• Collaborate with healthcare institutions for pilot studies.

## 11. APPENDIX

• Source Code: https://github.com/FHIROZ/HematoVision-Advanced-Blood-Cell-Classification

• Dataset: https://www.kaggle.com/datasets/paultimothymooney/blood-cells

• Demo: https://docs.google.com/forms/d/e/1FAIpQLSceCHhVfDS-dRELEvSRs-o100e8vC6rfqqOG1Ft2o7rnvELqQ/formResponse

• Architecture Diagrams and Screenshots