**Hematovision : Advanced Blood Cell Classification Using Transfer Learning**

Category: Artificial Intelligence

Field: Biomedical AI / Deep Learning / Medical Imaging

1. Abstract

Hematovision is an AI-based image classification system that uses transfer learning to classify blood cells from microscopic images. It leverages pretrained convolutional neural networks (CNNs) to detect and categorize cells such as Neutrophils, Lymphocytes, Monocytes, and Eosinophils. This automation significantly reduces manual labor and improves diagnostic efficiency, making it ideal for clinical and research settings.

2. Introduction

Manual identification of blood cell types is a time-consuming process and often affected by human error. With advancements in deep learning, transfer learning has emerged as a powerful tool for automating this task using small datasets. The proposed system uses MobileNetV2, a lightweight CNN architecture, for fast and accurate classification.

3. Objectives

- Automate classification of blood cells from image data  
- Improve accuracy with minimal data using transfer learning  
- Enable real-time or near-real-time diagnosis  
- Reduce dependency on manual observation

4. Methodology

4.1 Dataset

• Source: https://www.kaggle.com/datasets/paultimothymooney/blood-cells  
• Used Google Drive to store images and labels.csv  
• Images renamed as BloodImage\_00000.jpg format

4.2 Preprocessing

• Image resizing to 224x224  
• Data normalization  
• Dataset split into training and validation sets

4.3 Model: MobileNetV2 (Transfer Learning)

• Pretrained MobileNetV2 used without top layer  
• Custom dense layers added  
• Compiled using Adam optimizer and categorical crossentropy loss

4.4 Training

• Trained for 10 epochs  
• Batch size: 8  
• Validation accuracy and loss plotted

5. Results

The model achieved over 95% training accuracy and over 90% validation accuracy. Plots of training vs validation accuracy and loss confirm proper learning and minimal overfitting.

6. Applications

- Hematology lab automation  
- Educational tool for medical students  
- Telemedicine support  
- Rural diagnostic solutions

7. Advantages

- High accuracy with small dataset  
- Efficient training using pretrained CNN  
- Quick deployment  
- Reduces need for expert intervention

8. Challenges

- Imbalanced data  
- Limited image variety  
- Medical validation required

9. Future Work

- Use larger datasets  
- Explore XAI (Explainable AI)  
- Test on abnormal cells  
- Build mobile app integration

10. Conclusion

The project shows how transfer learning using MobileNetV2 enables accurate blood cell classification. With correct data preprocessing, minimal training, and good visualization, it serves as a robust solution for clinical image analysis.