Here's a project report titled:

"Hematovosion: Advanced Blood Cells Classification Using Transfer Learning"

This report includes sections typical of academic or industrial AI/ML projects, such as abstract, introduction, methodology, experiments, results, and conclusion. Let me know if you want it tailored to a specific format (e.g., IEEE, APA, thesis, or poster).

Hematovosion: Advanced Blood Cells Classification Using Transfer Learning

Abstract

The early detection of hematological disorders heavily relies on the accurate classification of blood cells. Traditional microscopic examination is time-consuming and subjective. This project, Hematovosion, proposes a deep learning-based approach utilizing transfer learning to classify blood cells into categories such as erythrocytes, leukocytes (lymphocytes, monocytes, neutrophils, eosinophils, basophils), and platelets. By leveraging pre-trained convolutional neural networks (CNNs) like ResNet50 and EfficientNetB0, the model achieves high accuracy with limited data and computational resources. The system enhances diagnostic support for medical practitioners and lays the groundwork for AI-assisted hematology.

1. Introduction

Hematological analysis is central to diagnosing numerous diseases, including anemia, infections, and leukemia. Manual cell classification by lab technicians is prone to error and inconsistency. Automation using deep learning has shown promise in medical imaging, particularly through transfer learning, which reuses pre-trained networks to perform tasks on new datasets efficiently.

This project focuses on implementing and evaluating a transfer learning-based pipeline to classify blood cells using a labeled microscopic image dataset.

2. Objectives

To design a robust image classification model for blood cell types using transfer learning.

To compare the performance of different CNN architectures.

To evaluate the model's accuracy, precision, recall, and F1-score.

To deploy a prototype system for automated blood smear analysis.

3. Dataset

We used the BCCD (Blood Cell Count and Detection) Dataset, which includes thousands of annotated microscopic images of blood cells, categorized into:

Red Blood Cells (RBCs)

White Blood Cells (WBCs) (further classified)

Platelet

The dataset was augmented using techniques like rotation, flipping, and color normalization to increase diversity and reduce overfitting.

4. Methodology

4.1 Transfer Learning Approach

We explored pre-trained models such as:

ResNet50

VGG16

EfficientNetB0

MobileNetV2

These models were fine-tuned using transfer learning:

The base layers were frozen initially.

A custom classification head was added with:

Global Average Pooling

Dense layers

Softmax activation

4.2 Model Pipeline

1. Data Preprocessing

Resizing images to (224x