Ensemble Learning Framework for Blood Group Classification Using Fingerprint Patterns

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1. Introduction

Recent research has pointed to a possible statistical relationship between fingerprints and blood groups, which could unlock new applications of artificial intelligence (AI) and machine learning (ML) to improve accuracy and efficiency. In an age where time is of the essence and accuracy can mean the difference between life and death, conventional methods of blood group determination are often slow and require laboratory testing.

This work aims to develop an AI-based system that utilizes real-time fingerprint scanning for blood group prediction using state-of-the-art deep learning models. The proposed system is designed for deployment on an embedded platform, incorporating a fingerprint scanner and a Raspberry Pi for realtime inference.



Fig. 1: Illustration of fingerprint.

2. Methodology

The machine learning pipeline for this research involves:

- Feature extraction from fingerprint images using deep learning models.
- Classification using an ensemble of ResNet50, EfficientNetB0, and DenseNet121.
- Optimization with an XGBoost-based stacked ensemble model.

The dataset consists of labeled fingerprint images categorized by blood group, and models are trained using TensorFlow and Keras in a GPU-accelerated environment.

3. Results and Discussion

The proposed system achieves high classification accuracy with low latency, making it suitable for real-time medical diagnostics, emergency healthcare, law enforcement, and biometric security applications.

Experimental results indicate that the ensemble approach improves prediction accuracy compared to individual models. Performance evaluation is conducted using accuracy, precision, recall, and F1score metrics.

4. Conclusion

This study demonstrates the feasibility of AIdriven blood group prediction using fingerprint images. The deployment of this system on an embedded platform enables fast and reliable blood group determination, which could revolutionize medical diagnostics and biometric identification.

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References

[1] C. Sivamurugan, et al., "Enhanced blood group prediction with fingerprint images using deep learning," 2024 3rd International Conference on Automation, Computing and Renewable Systems (ICACRS), 2024.

Appendix A. Additional Information

Further details on dataset preprocessing and model evaluation can be found in the supplementary materials.