Touch to Type:

Blood Group Detection through Fingerprint Scanning

SVKM'S NMIMS Deemed-to-be UNIVERSITY

Objective

To develop a non-invasive, fast, and scalable solution for blood group detection using fingerprint scanning and advanced machine learning models. The goal is to improve accuracy and reduce processing time compared to traditional methods, making it viable for emergency medical care and large-scale applications like blood donation drives.

Introduction

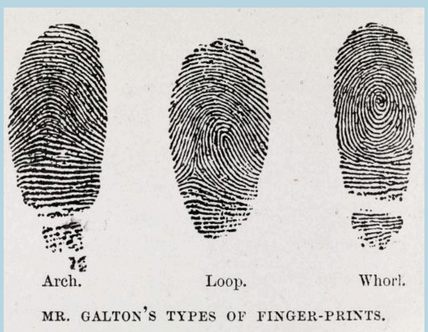
Fingerprints, traditionally used for identification, offer a unique opportunity for non-invasive blood group prediction. This research explores the correlation between fingerprint features and blood types using machine learning and deep learning models. Our goal is to develop a rapid, affordable, and scalable solution for blood group determination, potentially revolutionizing healthcare diagnostics.

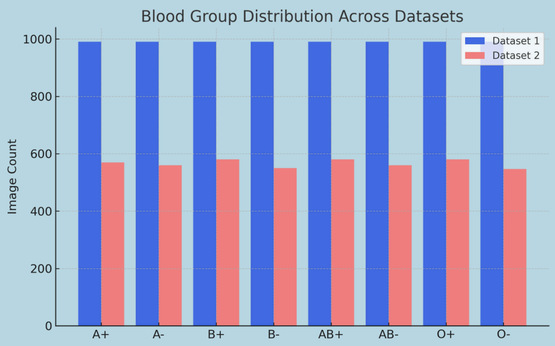
Business Problem

Current blood group detection methods are invasive, time-consuming, and not scalable for emergencies or large-scale applications like blood donation drives. This creates delays in critical situations and limits accessibility in remote areas. A non-invasive, quick, and reliable solution is needed to address these challenges and improve healthcare efficiency.

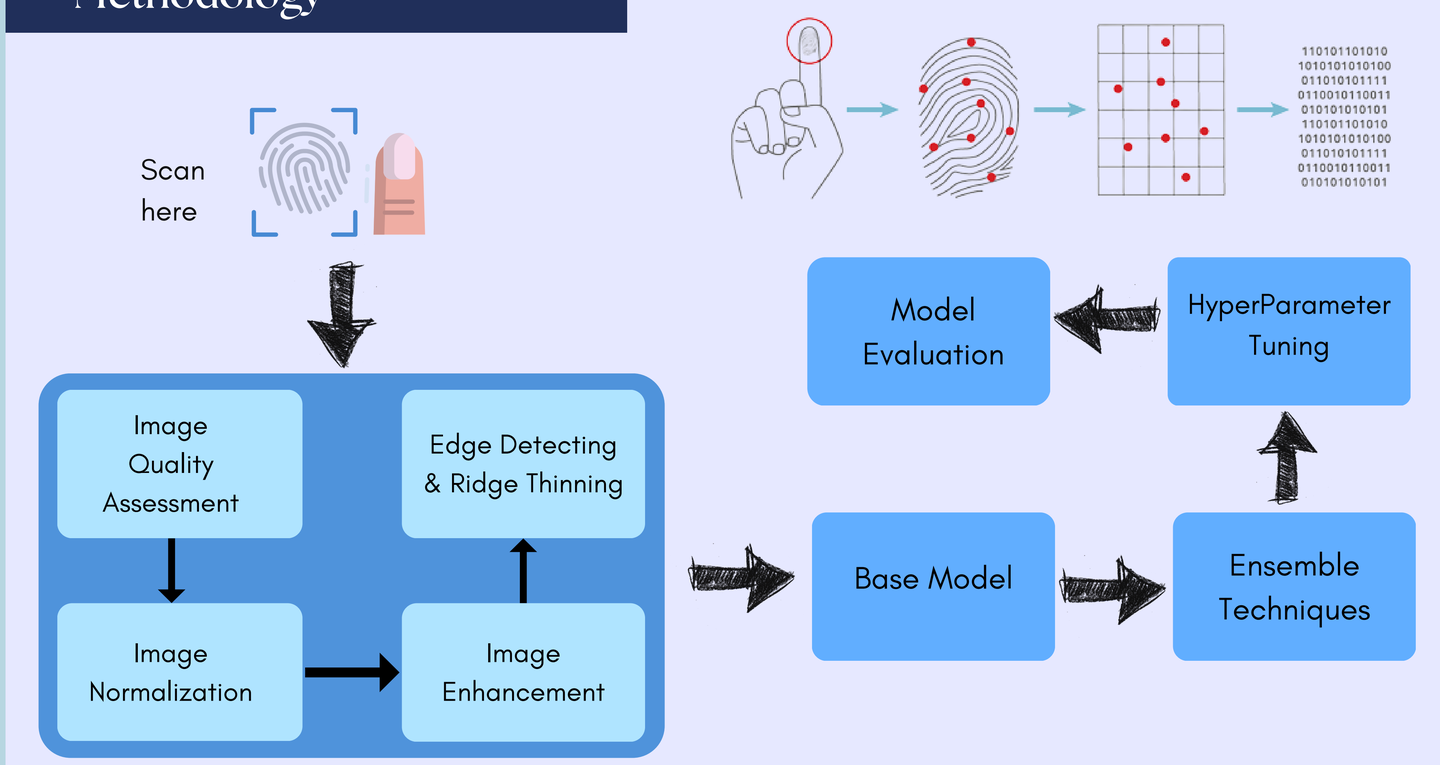
Data Science Stack

- Datasets: Kaggle (7,920 & 4,527 images), SOCOFing (6,000 images)
- Hybrid Models:
  - Gabor Filters + Random Forest
  - CNN + SVM + KNN (Stacking)
  - ResNet + VGG + DenseNet
- Ensemble Techniques: Soft Voting, Hard Voting, Boosting to improve accuracy
- Model Evaluation: Metrics: Accuracy, Precision, Recall, F1-score, ROC-AUC

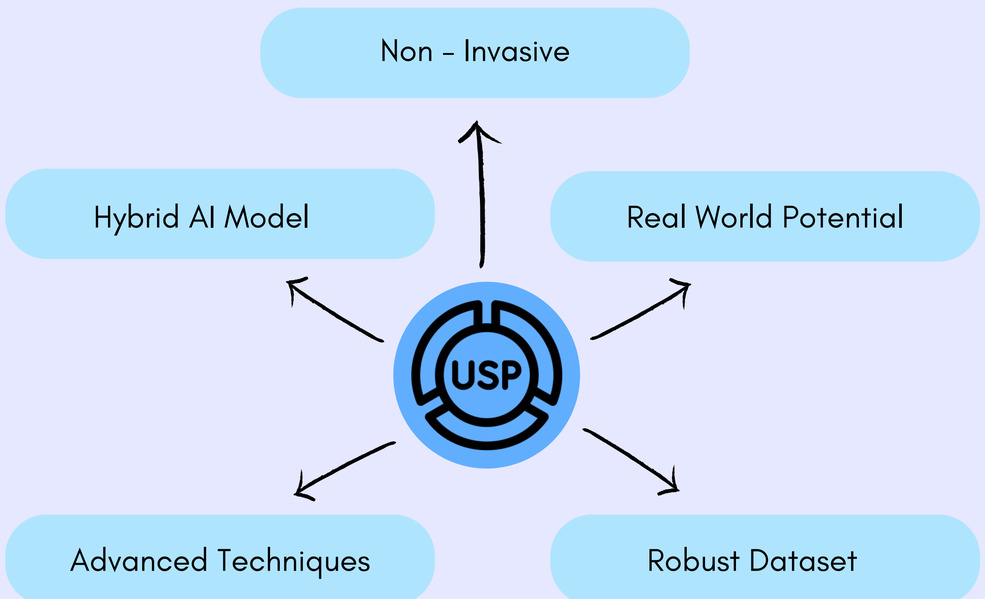




Methodology



Point of Difference



Solution Benefits

- Fingerprint-based blood group prediction eliminates the need for blood samples.
- Ideal for remote areas with limited healthcare infrastructure.
- Eliminates expensive lab-based blood tests.
- Saves time for healthcare professionals.
- No needles, no contamination risk.

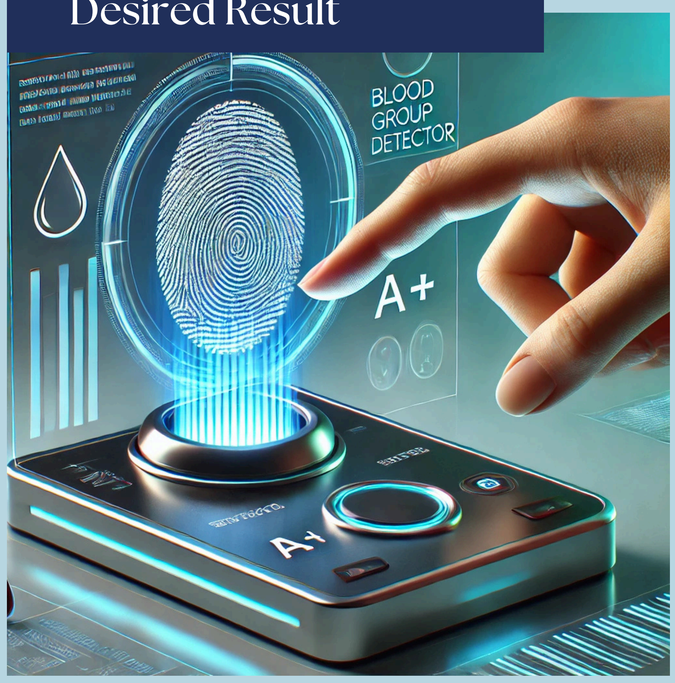
Limitations

- Processing Time: Ensemble model complexity leads to longer processing times, hindering real-time applications.
- Accuracy Factors: Fingerprint quality and environmental conditions can influence prediction accuracy.
- Privacy & Ethics: Handling biometric data necessitates careful consideration of ethical and legal implications.
- Data Diversity: Limited dataset diversity may impact model performance across different populations.

Future Scope

- Real-Time Applications: Improve speed for emergency and medical use.
- Global Accessibility: Deploy in remote areas with limited healthcare facilities.
- Healthcare Integration: Collaborate with hospitals and NGOs for widespread adoption.
- Regular Model Updates: Continuously refine the model with new data for improved accuracy.
- Wearable Tech Integration: Enable fingerprint-based blood group detection on smartphones and smartwatches.
- Ethical & Legal Framework: Develop standards for secure and privacy-compliant biometric usage.

Desired Result



Scan to know more

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