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DATE: 21-03-2025

DEPARTMENT OF INFORMATION TECHNOLOGY

IT3811 - Project work

First Review

Fingerprint-Based Blood Group Detection Using Deep Learning and Image Processing

Submitted by

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Abstract

1 Blood group prediction is crucial for medical diagnostics and emergency care.

2 Traditional methods require blood samples, lab equipment, and time-consuming procedures, making them impractical in urgent situations.

3 This study explores a non-invasive approach using fingerprint images and deep learning (CNNs) to detect blood groups.

Faster and more efficient than conventional methods.

Reduces dependency on laboratory facilities.

Enhances accessibility for real-world medical applications.

Extensive experimentation validates the feasibility of this technique for practical use in healthcare.

Aim & Objectives

Aim

To develop a **non-invasive** and **automated blood group detection system** using fingerprint images and deep learning.

Objectives

- To collect and preprocess fingerprint images labeled with blood groups.
- To implement and compare deep learning models (**LeNet5, AlexNet, VGG16, and ResNet34**).
- To evaluate the models based on accuracy, precision, and recall.
- To identify key fingerprint features correlated with blood groups.

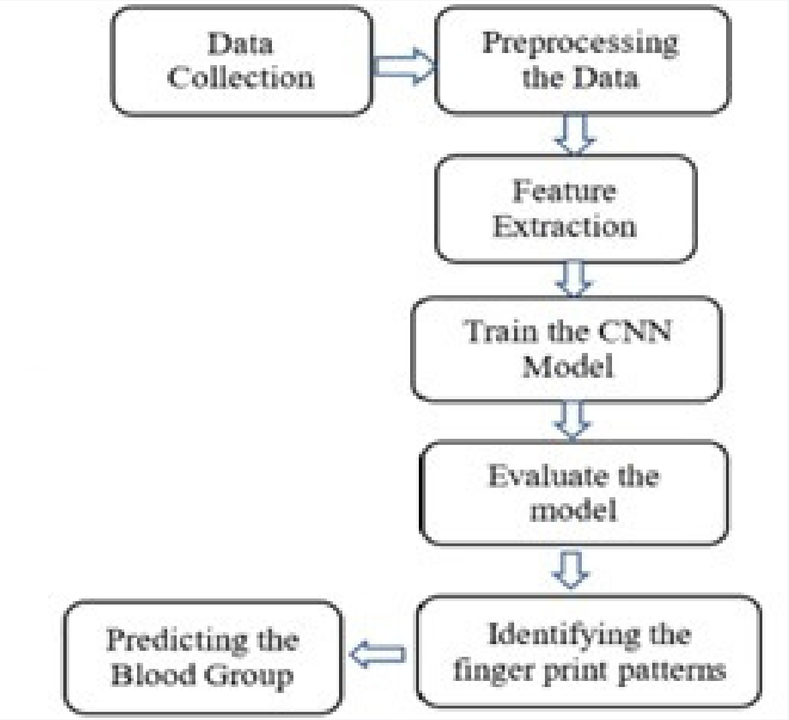
Methodology

Existing Methods

- **Serological Testing:** Requires blood sample mixing with antibodies.
- **Automated Blood Typing Systems:** Optical sensors analyze blood reactions.
- **Genotyping:** Uses molecular techniques for antigen detection (costly & complex).

Proposed Method

- Uses fingerprint images for blood group prediction.
- Applies **Convolutional Neural Networks (CNNs)** to detect blood group patterns.
- Uses datasets of **6000 fingerprint images**, labeled with blood groups.



- Preprocessing includes **image normalization, noise reduction, contrast adjustment**.
- **Feature extraction:** Identifies ridges, bifurcations, and minutiae points.
- Models are trained and validated using **LeNet5, AlexNet, VGG16, and ResNet34**.

Proposed Framework

Step 1: Data
6000 labeled fingerprint images

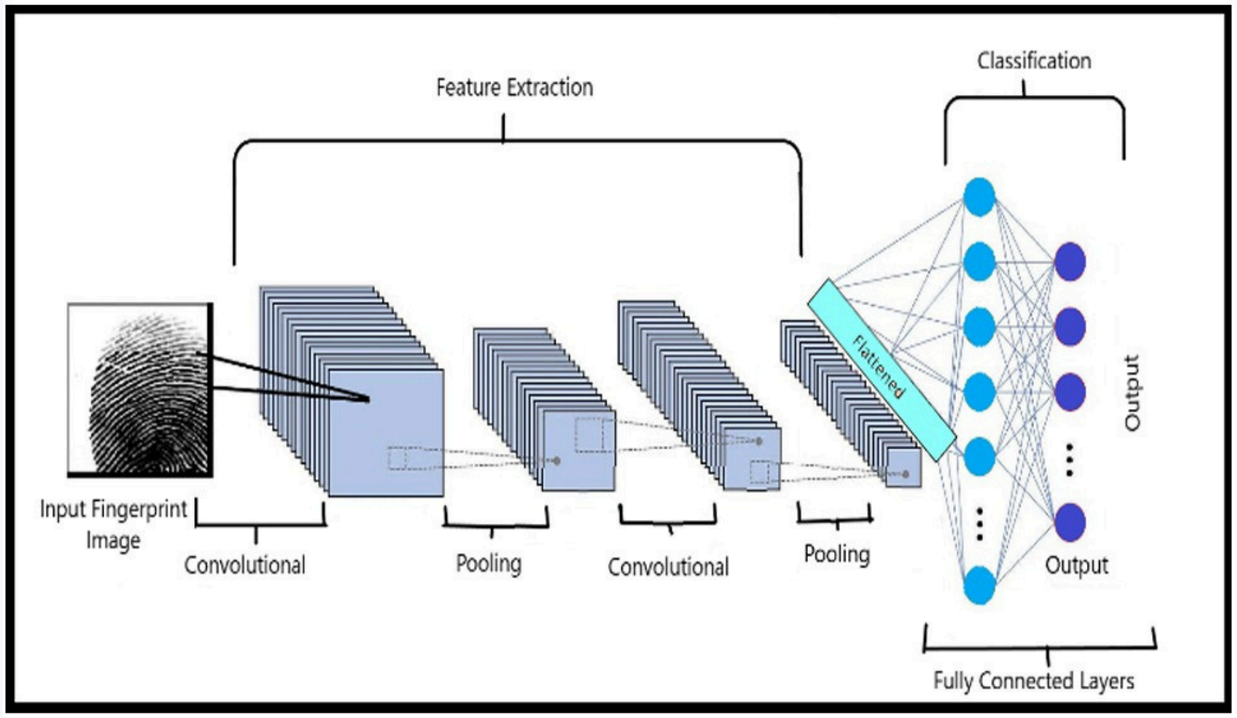
Step 2:
Grayscale conversion, Normalization, Denoising

Step 3: Feature
Minutiae points, Ridge endings, Bifurcations

Step 4: Model
Comparing CNN architectures

Step 5: Training & Evaluation
Accuracy, Precision, Recall metrics

Step 6: Blood Group
Deploy best-performing model



Software Requirements

Programming Language

- Python

Frameworks & Libraries

- TensorFlow
- Keras
- OpenCV
- NumPy
- Pandas

Tools

- Jupyter Notebook
- Google Colab

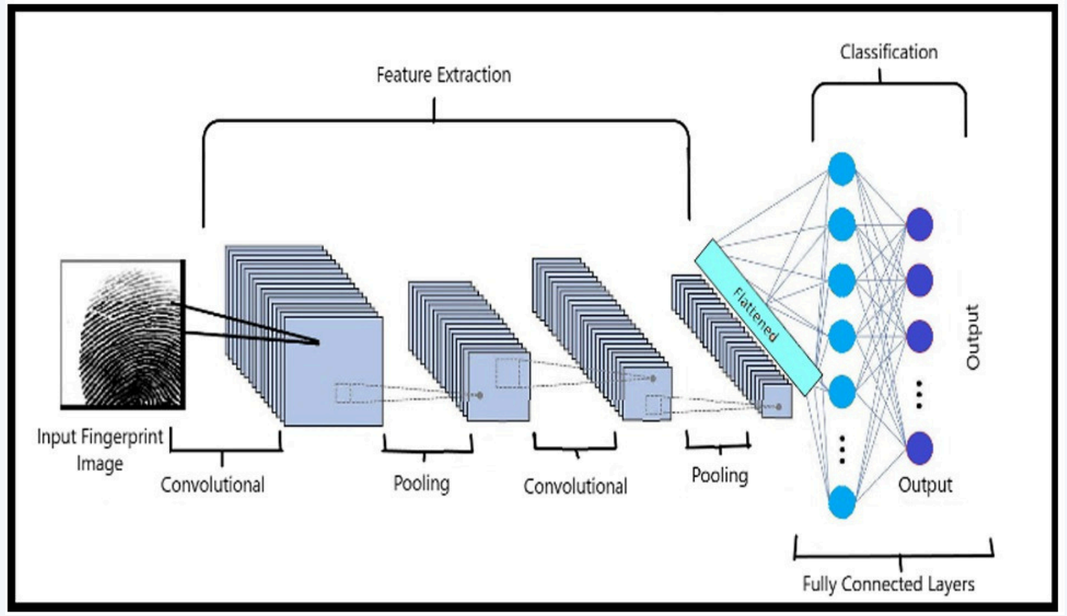
Database

CSV dataset containing fingerprint images with labeled blood groups

Architecture Diagram

Step 1: Input Stage

- A **fingerprint image** is provided as input.
- The image is **preprocessed** before being passed into the CNN model.



Step 2: Feature Extraction (CNN Layers)

- **Convolutional layers** detect patterns and edges in the fingerprint.
- **Pooling layers** reduce the size while preserving essential features.

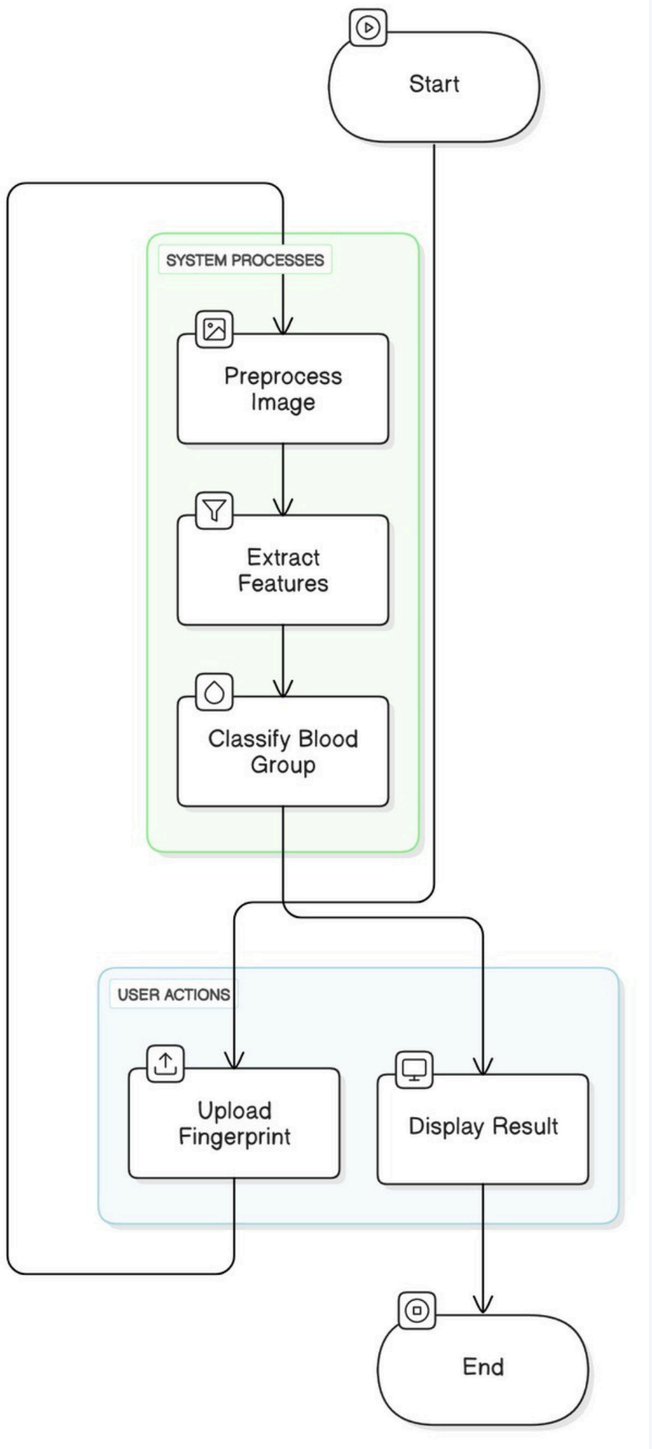
Step 3: Flattening & Fully Connected Layers

- Extracted features are **flattened** into a 1D vector.
- The **fully connected layers** classify the fingerprint into a **blood group** category.

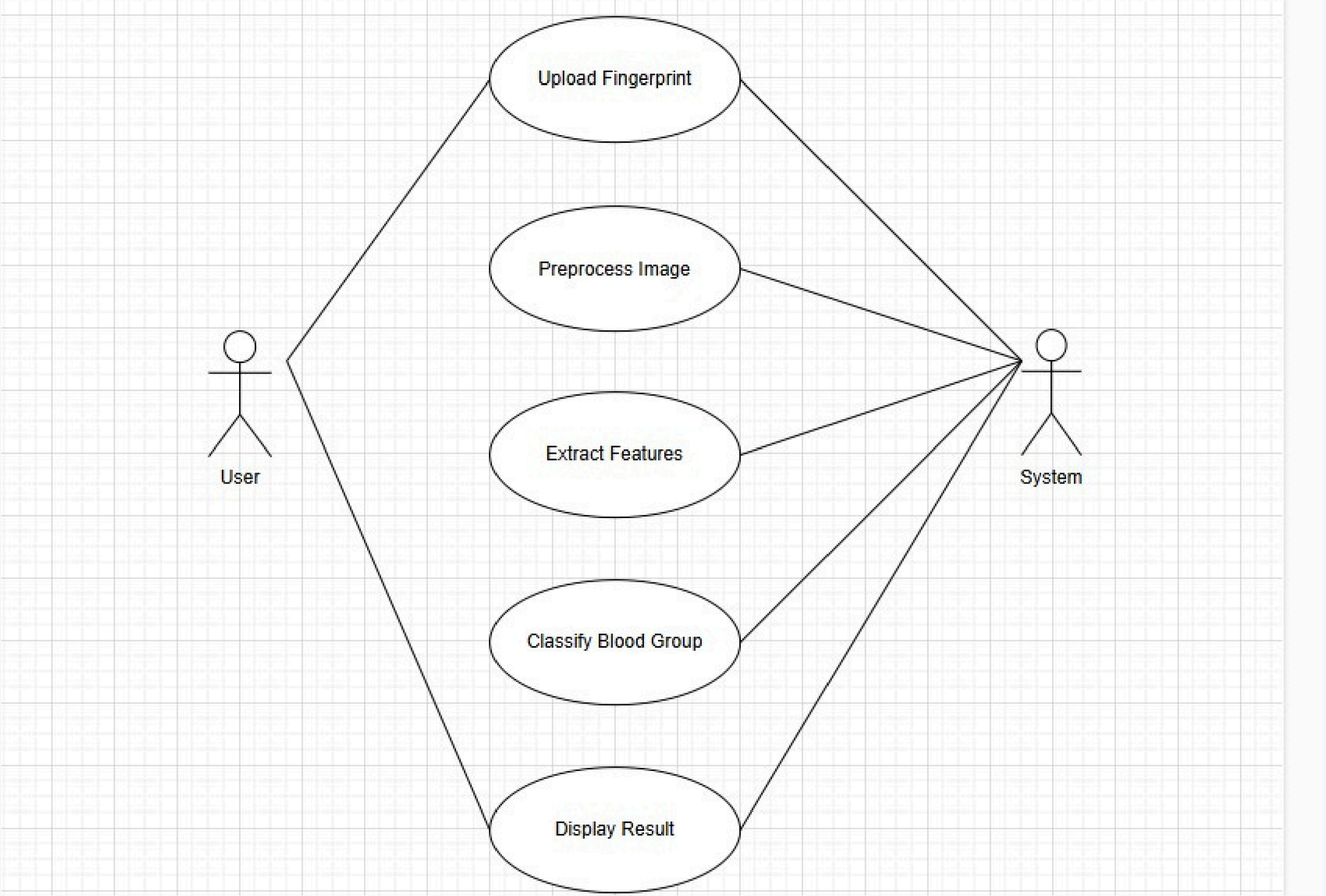
Step 4: Output Stage

- The model predicts the **blood group (A, B, AB, O, etc.)** with high accuracy.

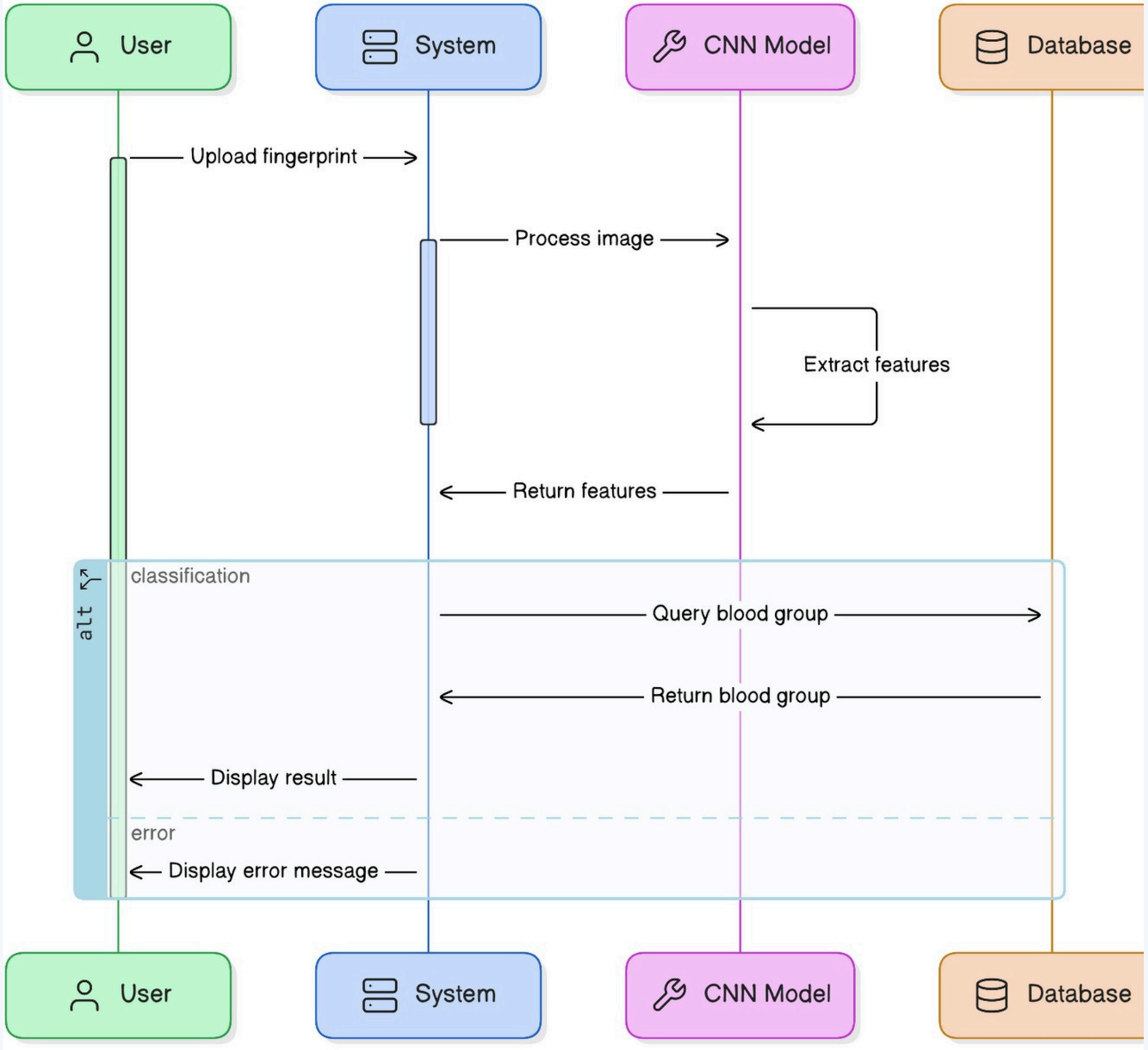
Workflow Diagram



USE CASE DIAGRAM



Sequence Diagram



Thank You!