Deep Learning based Blood Group Detection using Fingerprint

IEEE BASE PAPER TITLE:

Artificial Intelligence and Image Processing Techniques for Blood Group Prediction

IEEE BASE PAPER ABSTRACT:

The classification and prediction of blood group is most important aspect for the transfusion of blood. In present situations, they are done in laboratory using manual process. This is a time-consuming process and hence need manual energy. To overcome the constraints in the prediction of conventional methods in blood group, the artificial intelligence is implemented. This includes the image processing techniques with segmentation process to detect the classification of blood group. They are done through MATLAB simulations to detect the blood components. Through collecting the blood samples and processing and classified the images with feature extraction leads to govern the variety of blood based on ABO and Rh group systems. To overcome the drawbacks in the conventional process, the developed methodology is implemented. This reduces various manual errors. Thus, the image processing technique with artificial intelligence helps to determine the classification of blood rapidly without any errors.

OUR PROPOSED PROJECT ABSTRACT:

Blood group detection is a vital procedure in medical diagnostics, particularly for transfusion medicine, emergency healthcare, and personalized treatment plans. Current methods rely on the physical collection of blood samples and laboratory-based testing, which can be time-consuming and dependent on specialized resources. To address these limitations, this project proposes a novel deep learning-based system for blood group detection, leveraging two distinct methods: blood images and fingerprint images. Developed using Python for backend processing and Flask as the web framework, the system provides a user-friendly interface powered by HTML, CSS, and JavaScript, enabling efficient blood group detection in both traditional and non-invasive modes.

In the first mode, blood images are used to identify the blood group, utilizing the MobileNetV2 architecture—a lightweight yet highly effective convolutional neural network (CNN) model. The model was trained on a dataset of 750 blood images, with 500 images allocated for training and 250 for testing. By fine-tuning the network, the model achieved remarkable results, with a training accuracy and validation accuracy of 100%. This demonstrates the model's robustness and precision in identifying blood groups using visual data from blood samples. This mode effectively replicates the reliability of laboratory tests but reduces the time required for processing and analysis.

The second mode of detection introduces a groundbreaking non-invasive approach, where fingerprint images are used to predict the individual's blood group. The MobileNetV2 architecture was also applied to this task, trained on a significantly larger dataset of 10,477 fingerprint images, with 6,000 used for training and 4,477 for testing. The model achieved a training accuracy of 94% and a validation accuracy of 90%, showing promising potential for fingerprint-based blood group

detection. Although slightly less accurate than the blood image method, this non-invasive approach could revolutionize healthcare by providing rapid and easy blood group identification without the need for a physical blood sample.

Both methods rely on the efficiency and adaptability of the MobileNetV2 model, known for its superior performance in image classification tasks while maintaining a lightweight structure suitable for real-time applications. The project's blood image mode offers near-perfect accuracy, making it ideal for critical applications in medical laboratories, hospitals, and blood banks. The fingerprint mode introduces the possibility of a future where non-invasive devices could instantly identify blood groups, streamlining workflows in emergency care, blood donation camps, and remote healthcare services.

This deep learning-based blood group detection system provides substantial advancements in terms of speed, accessibility, and accuracy. The deployment of this system through a web platform ensures that the solution is user-friendly and accessible across various settings, from advanced medical facilities to under-resourced clinics. The system offers the dual benefits of precise blood group detection via traditional blood images and a cutting-edge, non-invasive alternative using fingerprint images, marking a significant step forward in healthcare technology.

SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:

- System : Pentium i3 Processor.
- Hard Disk : 500 GB.
- Monitor : 15'' LED.

- Input Devices : Keyboard, Mouse.
- Ram : 8 GB.

SOFTWARE REQUIREMENTS:

- Operating System : Windows 10 / 11.
- Coding Language : Python 3.12.0.
- Web Framework : Flask.
- Frontend : HTML, CSS, JavaScript.

REFERENCE:

Tannmay Gupta, “Artificial Intelligence and Image Processing Techniques for Blood Group Prediction”, 2024 IEEE International Conference on Computing, Power and Communication Technologies (IC2PCT), IEEE CONFERENCE, 2024.