

Cloud-Assisted Secure CNN Model for Leukemia Detection with ECC in A Multi-User Setting

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Abstract: *The rise in cloud computing has transformed how healthcare systems store, process, and analyze patient data. However, this advancement has also heightened the urgency for securing sensitive information, particularly when dealing with high-dimensional medical images for disease diagnosis. This project introduces a Cloud-Assisted Secure Convolutional Neural Network (CNN) model for leukemia detection, integrated with Elliptic Curve Cryptography (ECC) to ensure robust privacy in a multi-user, multi-server setting. Unlike conventional centralized learning approaches, our model utilizes federated learning, allowing distributed training of the CNN model on local medical datasets across different healthcare institutions without sharing raw data. The CNN component is specifically designed to extract hierarchical features from blood cell images, providing precise leukemia classification. To preserve data privacy and prevent unauthorized access, ECC is employed to encrypt model parameters before they are stored or transmitted over the cloud. The system incorporates a secure computation protocol that allows inference directly on encrypted models, ensuring that sensitive information remains protected even during the prediction phase. An integrated appointment system facilitates real-time communication between patients and doctors based on diagnostic outcomes, enhancing care continuity. Real-world testing with leukemia datasets confirmed high classification accuracy, efficient response time, and strong privacy preservation. Performance was evaluated using metrics such as Accuracy, Precision, Recall, F1 Score, Detection Rate, and Response Time, all indicating robust outcomes.*

Keywords: Federated Learning, Convolutional Neural Network, Leukemia Detection, Elliptic Curve Cryptography, Privacy-Preserving, Multi-User Cloud System, Secure Diagnosis, Medical Imaging

