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Fast and accurate algorithm for ECG authentication using residual depthwise separable convolutional neural networks (Article) (Open Access)

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Abstract

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The electrocardiogram (ECG) is relatively easy to acquire and has been used for reliable biometric authentication. Despite growing interest in ECG authentication, there are still two main problems that need to be tackled, i.e., the accuracy and processing speed. Therefore, this paper proposed a fast and accurate ECG authentication utilizing only two stages, i.e., ECG beat detection and classification. By minimizing time-consuming ECG signal pre-processing and feature extraction, our proposed two-stage algorithm can authenticate the ECG signal around 660 µs. Hamilton's method was used for ECG beat detection, while the Residual Depthwise Separable Convolutional Neural Network (RDSCNN) algorithm was used for classification. It was found that between six and eight ECG beats were required for authentication of different databases. Results showed that our proposed algorithm achieved 100% accuracy when evaluated with 48 patients in the MIT-BIH database and 90 people in the ECG ID database. These results showed that our proposed algorithm outperformed other state-of-the-art methods. © 2020 by the authors.

SciVal Topic Prominence

Topic: Electrocardiograph | Biometry | Forensic Anthropology

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Author keywords

beat detection | biometric authentication | depthwise separable convolution (DSC) | ECG ID database | Electrocardiogram (ECG) | MIT-BIH database

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