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A MACHINE LEARNING FRAMEWORK FOR BIOMETRIC AUTHENTICATION USING ELECTROCARDIOGRAM (ECG)

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ABSTARCT

This paper presents a system for how with suitably embrace and modify AI (ML) techniques used to construct electrocardiogram (ECG)- based biometric authentication systems. The proposed system can assist agents and engineers in ECG-based biometric verification components to define the boundaries of required datasets and get preparing information with great quality. To determine the limits of datasets, a use case analysis is conducted. In light of different application scenarios for ECG-based verification, three distinct use cases (or validation classes) are developed. By providing more qualified preparing information given to corresponding AI models, the accuracy of ML-based ECG biometric authentication systems are expanded in result. The ECG time cutting method with the R-top mooring is utilized in this system to secure ML preparing information with great quality. In the proposed system, four new measurement metrics are acquainted with assess the quality of the ML training and testing data. Additionally, a Matlab toolkit, containing all proposed tools, metrics, and test data with exhibitions utilizing different ML techniques, is developed and made publicly available for further analysis. For developing ML-based ECG biometric authentication, the proposed system can guide experts to establish the appropriate ML solutions and the ML training datasets along with three identified user case scenarios. For analysts taking on ML techniques to design new systems in other research domains, the proposed framework

is as yet helpful for generating high-quality ML-based training and testing datasets with great quality and utilizing new measurement metrics.

Keywords: acquaints,electrocardiogram,unmistakable,instruments,exploration

1. INTRODUCTION :

Most application systems support internet access for general users. Identifying persons with their own body has become a trend for users to access application systems. Consequently, biometric authentication has become a hot research topic in recent years. Among various biometric authentication schemes, such as fingerprint scanning and facial recognition, electrocardiogram authentication has the advantage of adopting live user body signals during authentication. In general, machine learning techniques are adopted to construct a verification model for user identification by obtaining the user's live ECG data. Recently, there have been a number of state-of-the-art literature on ECG-based biometrics. However, several ECG biometric challenges still require further investigation, such as authentication categorization, pre-processing for data quality enhancement, data acquisition, selection on deep learning (DL), and other machine learning classification approaches.

2. LITERATURE SURVEY :

In this session, we discuss Biometric Authentication using Electrocardiogram by a Machine Learning Framework. Several ML techniques are adopted: Decision Tree (DT) and Support Vector Machine (SVM) for the regression approach, and Artificial Neural Network (ANN) and Convolution Neural Network (CNN) for the classification approach. Song-Kyoo (Amang) Kim received the M.S. degree in computer engineering from the Florida Institute of Technology in 1999 and the Ph.D. degree in operations research in 2002. He is currently a Research Scholar with Khalifa University. He has been an Associate Professor at various universities in the United Arab Emirates. Prior to joining the Gulf regions, he was a Core Faculty Member of the Asian Institute of Management, where taught Technology, Innovation, and Operations topics. Before joining the academy, he had been a Technical Manager with the Mobile Communication Division of Samsung Electronics for over ten years and mainly dealt with technology management in IT industries. He has authored various research papers and patents focused on mobile industries. His research interests include artificial intelligence and ECG-based biometric securities. His current research interests include Blockchain Governance Game. For

developing ML-based ECG biometric authentication, the proposed framework can guide researchers in preparing the proper ML setups and the ML training datasets along with the three identified use case scenarios. For researchers adopting ML techniques to design new schemes in other research domains, the proposed framework is still useful for generating ML-based training and testing datasets of good quality and utilizing new measure metrics.

3. EXISTING SYSTEM :

To determine the boundaries of datasets, case analysis is used. Based on various application scenarios for ECG-based authentication, three distinct use cases (or authentication categories) are developed. By providing more qualified training data to corresponding machine learning schemes, the precision of ML-based ECG biometric authentication mechanisms is increased. Consequently, biometric authentication has become a hot research topic in recent years. Among various biometric authentication schemes, such as fingerprint scanning and facial recognition, electrocardiogram authentication has the advantage of adopting live user body signals during authentication. However, several ECG biometric challenges still require further investigation, such as authentication categorization, pre-processing for data quality enhancement, data acquisition, selection on deep learning (DL), and other machine learning classification approaches.

4. PROPOSED STRUCTURE :

This article introduces an ML framework for ECG-based biometric authentication to mitigate identified challenges in ECG authentication. To better understand potential application environments for ECG authentication, it is necessary to identify basic application scenarios through use cases. In the proposed framework, application scenarios using ECG authentication are categorized into three general use cases: Hospital (HOS), Security Check (SCK), and Wearable Devices (WD). Furthermore, new data pre-processing techniques, including the time-slicing technique, are introduced in the framework to prepare ML-based training datasets, along with new measure metrics developed for authentication precision evaluation. Four new measure metrics for data quality are introduced in the proposed framework. The Mean Absolute Error Rate (MAER), Upper/Lower Range Control Limits (UCL/LCL), Accuracy Percentage within Ranges (APR), and Accuracy per UCL (APU).Illustrates an overview of the new framework model for ML-based ECG biometric authentication. Within the core process portion, several ML techniques are adopted: Decision Tree (DT) and Support Vector Machine (SVM) for regression approach, and Artificial Neural

Network (ANN) and Convolutional Neural Network (CNN) for classification approach. Additionally, a time slicing technique for ECG data is developed and associated with the core process.

5. SYSTEM ARCHITECTURE :

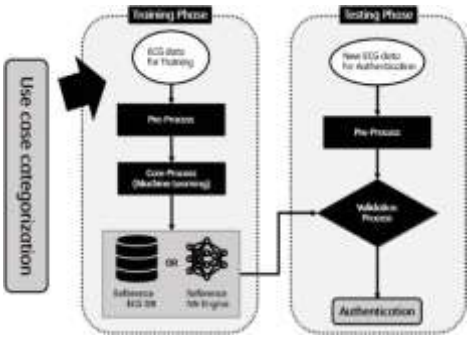

Figure 1. System Architecture

6. RESULT :

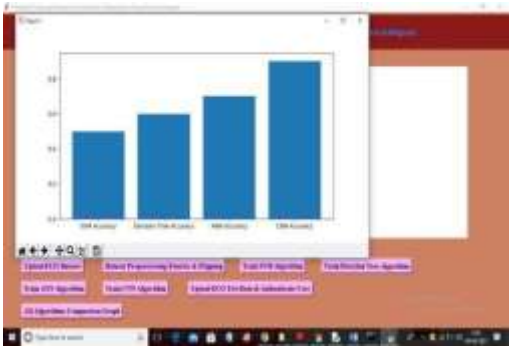

Figure 2.algorithms accuracy results graph

Figure 3.ECG authentication ID was predected

Figure 4.ECG authentication another ID was predected

7. CONCLUSION :

As new ECG detection devices become portable, lightweight, embeddable with smart phones and wearable devices, and connectable with remote servers through wireless technologies in the near future, ECG based biometric authentication will be deployed on massive application systems all over the world. To get high accuracy on user authentication, ML techniques are generally adopted to build a more robust evaluation model for ECG based biometric authentication. In this paper a generalized machine learning framework for ECG based biometric authentication is introduced. The proposed framework describes the general data processing flow of a ML-based ECG authentication mechanism along with various function features to help researchers easily design and evaluate a ML-based ECG user authentication scheme. Those functions include three general authentication categories for ECG user authentication, three new data pre-processing techniques, a time slicing technique to generate high quality ECG datasets, four new data quality metrics, and a publicly available Matlab Toolbox (i.e., *amgecg Toolbox*). For people using ML technologies to investigate other topics instead of ECG based biometric authentication, several data pre-processing techniques and newly defined measure metrics offered by the proposed framework are still useful and can help researchers accelerate the development of their ML-based schemes.

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