Enhancing User Authentication through the Implementation of the ForestPA Algorithm for Smart Healthcare Systems

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Abstract

The machine learning-based authentication model for smart healthcare systems represents a crucial step in addressing the needs of an ever-evolving healthcare industry. The need to protect sensitive patient data, ensure regulatory compliance, and reduce medical errors, especially in the context of telemedicine and remote monitoring, underscores the importance of such systems. Traditional authentication methods frequently lack sufficient security, resulting in potential breaches. Relying solely on usernames and passwords, without supplementary authentication measures, exposes systems to advanced security attacks. As it involves patients' health and human lives, it is important to provide

additional authentication, fast machine learning-based authentication models and high accuracy at the same time. This study involves five participants with devices and performs various finger-based interactions (raising, lowering, moving the finger, applying pressure, adjusting orientation, and utilizing multiple hikes) while completing reading and image comparison tasks across multiple sessions. Each experiment lasted between 25 and 50 minutes for one participant, with reading tasks typically taking 10--15 minutes and image comparison tasks requiring 3--4 minutes, all measured in milliseconds. All these activities are recorded as a dataset for model training. A model was trained via the forest penalizing attributes (ForestPA) algorithm, which can classify profiles into real or fake profiles on the basis of their behavioral patterns. The results revealed a 99.99% accuracy rate in identifying fake profiles and avoiding them by accessing medical data even though they were able to bypass the username and password.

Author keywords

Classifiers; ForestPA; Internet of Things; Key Forest-based; Medical; User profile authentication

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