

SEFL: Selective Ensemble Fuzzy Learner for Cognitive Detection of Bio-Modality Spoofing in MCPS

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Abstract— User authentication in a Medical Cyber Physical Systems (MCPS) can be effectively done using biometric features. Biometric features, widely used for user authentication, are equally important to national and global technology systems. Biometric features, such as face, iris, fingerprint, are commonly used while more recently palm, vein and gait are also getting attention. To fail the traditional biometric detection systems, various spoofing approaches have also been developed over time. Among various methods, image synthesis with play-doh, gelatin, ecoflex etc. are some of the more common ways for spoofing bio-modalities. Success of traditional detection systems are related to custom tailored solutions where feature engineering for each attack type must be developed. However, this is not a feasible process when we consider countless attack possibilities. Also, a slight change in the attack can cause the whole system to be redesigned and therefore becomes a limiting constraint. The recent success of machine learning inspires this paper to explore weak and strong learners with ensemble learning approaches using AdaBoost. In essence, the paper proposes a selective ensemble fuzzy learner approach using Ada Boost, feature selection and combination of weak and strong learners to enhance the detection of bio-modality spoofing for MCPS. Our proposal was experimented on real datasets and verified on the fingerprint and iris benchmark.

Keyword— MCPS, Biometric spoofing, Spoofing Detection, Ensemble Learning, Feature selection



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