Development and Validation of a Cyber-Physical System Leveraging EFDPN for Enhanced WSN-IoT Network Security

Authors Sundaramoorthy Krishnasamy , Mutlaq B. Alotaibi , Lolwah I. Alehaideb 2 and Qaisar Abbas

Publication Year 2023
Grant Number IMSIU-RG23129
DOI link https://doi.org/10.3390/s23229294

Abstract: In the current digital era, Wireless Sensor Networks (WSNs) and the Internet of Things (IoT) are evolving, transforming human experiences by creating an interconnected environment. However, ensuring the security of WSN-IoT networks remains a significant hurdle, as existing security models are plagued with issues like prolonged training durations and complex classification processes. In this study, a robust cyber-physical system based on the Emphatic Farmland Fertility Integrated Deep Perceptron Network (EFDPN) is proposed to enhance the security of WSN-IoT. This initiative introduces the Farmland Fertility Feature Selection (F3S) technique to alleviate the computational complexity of identifying and classifying attacks. Additionally, this research leverages the Deep Perceptron Network (DPN) classification algorithm for accurate intrusion classification, achieving impressive performance metrics. In the classification phase, the Tunicate Swarm Optimization (TSO) model is employed to improve the sigmoid transformation function, thereby enhancing prediction accuracy. This study demonstrates the development of an EFDPN-based system designed to safeguard WSN-IoT networks. It showcases how the DPN classification technique, in conjunction with the TSO model, significantly improves classification performance. In this research, we employed wellknown cyber-attack datasets to validate its effectiveness, revealing its superiority over traditional intrusion detection methods, particularly in achieving higher F1-score values. The incorporation of the F3S algorithm plays a pivotal role in this framework by eliminating irrelevant features, leading to enhanced prediction accuracy for the classifier, marking a substantial stride in fortifying WSNIoT network security. This research presents a promising approach to enhancing the security and resilience of interconnected cyber-physical systems in the evolving landscape of WSN-IoT networks.