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A Novel Framework for Reliable Network Prediction of Small Scale Wireless Sensor Networks (SSWSNs)

Jasminder Kaur Sandhu[*†], **Anil Kumar Verma, Prashant Singh Rana**
Research Scholar, CSED
Thapar Institute of Engineering and Technology
Patiala, India
{*jasminder.kaur, akverma, prashant.singh*}*@thapar.edu*

Abstract. In Small Scale Wireless Sensor Networks (SSWSNs), reliability is defined as the capability of a network to perform its intended task under certain conditions for a stated time span. There are many tools for modeling and analyzing the reliability of a network. As the intricacy of various networks is increasing, there is a need for many sophisticated methods for reliability analysis. The term reliability is used as an umbrella term to capture various attributes such as safety, availability, security, and ease of use. The existing methods have many shortcomings which include inadequacy of a novel framework and inefficacy to handle scalable networks. This paper presents a novel framework which predicts the overall reliability of the SSWSNs in terms of performance metrics such as, sent packets, received packets, packets forfeit, packet delivery ratio and throughput. This framework includes various phases starting with scenario generation, construction of a dataset, applying ensemble based machine learning techniques to predict the parameters which cannot be calculated. The ensemble model predicts with an optimum accuracy of 99.9% for data flow, 99.9% for the protocol used and 97.6% for the number of nodes. Finally, to check the robustness of the ensemble model 10-fold cross-validation is used. The dataset used in this work is available as a supplement at *http://bit.ly/SSWSN-Reliability*.

Keywords: Small Scale Wireless Sensor Networks, Reliability, Machine Learning, Network Prediction, Ensemble

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[†]Address for correspondence: Research Scholar, CSED, Thapar Institute of Engineering and Technology, Patiala, India.

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