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Fault Detection in Wireless Sensor Network Based on Deep Learning Algorithms

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Abstract

This paper is about Fault detection over a wireless sensor network in a fully distributed manner. First, we proposed the Convex hull algorithm to calculate a set of extreme points with the neighbouring nodes and the duration of the message remains restricted as the number of nodes increases. Second, we proposed a Naïve Bayes classifier and convolution neural network (CNN) to improve the convergence performance and find the node faults. Finally, we analyze convex hull, Naïve bayes and CNN algorithms using real-world datasets to identify and organize the faults. Simulation and experimental outcomes retain feasibility and efficiency and show that the CNN algorithm has better-identified faults than the convex hull algorithm based on performance metrics.

Keywords: Wireless sensor network, Fault detection, Convolution neural network, convex hull, Naive-Bayes, performance metrics and energy efficiency.

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1. Introduction

Due to recent advances in wireless communication and embedded computing, wireless sensor networks can deliver various applications identified. Wireless sensor networks have been widely used to support various monitoring and control applications, such as environmental surveillance, industrial sensing, or traffic checking. WSNs include enormous quantities of small, low power, wireless devices, for example, monitoring the environment, industrial sensing, or traffic. WSNs include huge quantities of wireless devices, small, low power, regularly sent at remote and badly arranged locales. Various mobile and unavoidable applications are always gathering and handling data from the physical world and giving data about the detected condition or occasions at a high level of detail. Specifically, SVM is a classification algorithm with the advantages of broad applicability, sparsity of information, and optimal worldwide. Preparing an SVM requires a quadratic dimensionality optimization issue based on the preparation set's cardinality. A subset of the preparation set, known as support vectors, communicates the subsequent discriminating guideline [12]. In new studies, distributed SVM preparation was investigated due to tight energy, data transfer capacity, and various imperatives on wireless sensor systems' communication capabilities. One methodology is a parallel structure of centralized SVM [16], [10]. When the information collection of training is enormous, partial SVMs are obtained using small subsets of training and joined in a combination focus. This methodology can handle huge information sizes but can be applied only if a central processor is accessible to join the incomplete, partial support vectors [17-24]. The arbitrary partitioning of the data set is not constantly guaranteed to the concentrated SVM [7]. Then again, there are completely appropriate methodologies for the whole SVM utilizing conveyed enhancement strategies [25-32].

Since SVM is a quadratic advancement issue, an existing convex optimization method can be utilized. A distributed SVM was introduced in [4] that receive the multiplier exchange direction technique [3].