

MACHINE LEARNING ALGORITHM AND STRATEGIES IN WSN

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Abstract– The Wireless sensor networks (WSNs) monitor the dynamic environments that change rapidly over time. In this paper Real-time focus for activity recognition using WSN that accurately detects gestures and body movements. Initially, the nodes, which are distributed throughout the body, detect the movement of the organ through an accelerometer sensor with measurements of three axes (positive, negative and null), where these measurements are used by a hidden Markov model (HMM) to predict activity on each sensor. Sensor activation and selection are based on the sensor's potential contributions to the classifier's accuracy (ie, select the sensors that provide the most informative description of the gesture). To generate a final gesture decision, a naive Bayesian classifier is used to combine the predictions of independent nodes to maximize the posterior probability of Bayes' theorem.

Keywords - WSN, HMM, Bayes Theorem.

I INTRODUCTION

A wireless sensor network (WSN) is typically composed of several autonomous, small, low-cost, and low-power sensor nodes. These nodes collect data about your environment and collaborate to send detected data to centralized backend units called base stations or sinks for further processing.

Sensor nodes can be equipped with various types of sensors, such as thermal, acoustic, chemical, pressure, meteorological and optical sensors. Because of this diversity, WSNs have enormous potential to create powerful applications, each with its own individual features and requirements.

Developing efficient algorithms that are suitable for different application scenarios is a challenging task. In particular, WSN designers must address common issues related to data aggregation, data reliability, location, node pooling, power-aware routing, event scheduling, fault detection, and security. Machine learning (ML) was introduced in the late 1950s as an artificial intelligence (AI) technique [1].

Over time, their approach has evolved and moved more towards algorithms that are computationally viable and robust. Over the past decade, machine learning techniques have been widely used for a wide range of tasks including classification, regression and density estimation in a variety of application areas such as bioinformatics, speech recognition, spam detection, vision by computer, fraud detection and advertising networks.

Our proposed signature detection method adopts the Random Forest (RF) algorithm as a supervised classification technique works in two phases, the training phase and the classification phase. Training phase works offline in order to build the regular patterns and intrusion (i.e. anomalous) patterns by using the training dataset A labeled training dataset is delivered after pre-processing operations into the intrusion pattern builder, as a result, it builds the detection module that needs the intrusive patterns. Classification phase works online to detect intrusions based on the generated patterns from the training phase. In the classification phase

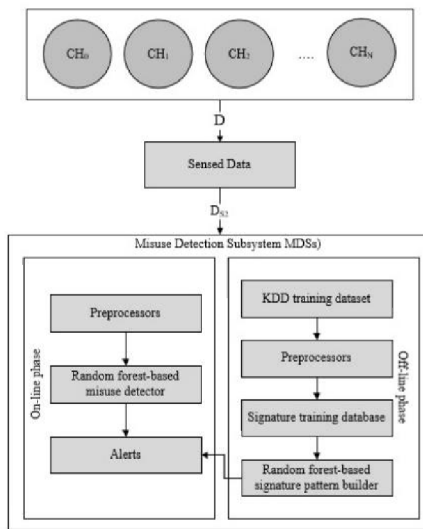


Figure 1. Flowchart of the system

The algorithms and techniques used come from diverse fields such as statistics, mathematics, neuroscience and computer science. The following two classic definitions capture the essence of machine learning:

II LITERATURE SURVEY

Introduction to machine learning:

Since its creation at the beginning of the Second World, radars have forever transformed the practice of modern warfare. The evolution of electronic warfare countermeasures against radar and corresponding radar countermeasures is an intriguing technical question. This book provides a highly accessible introduction to a wide range of radar and electronic warfare technologies. Topics covered in this book range from early radar development to later technologies such as stealth techniques, low probability intercept radar, and machine learning. Historical events are used to illustrate the principles of electronic warfare and to help readers understand the contexts in which radar and corresponding electronic warfare techniques were developed.

The 'what' and 'how' of learning in design:

Designing learning experiences supported by information and communication technology (ICT) is becoming an important skill for all academics in the higher education sector. With a range of "quality" measures being implemented and foreshadowed by government, including "dollars" linked to student learning outcomes, all academics will be increasingly asked to examine their instructional strategies and to offer high quality learning opportunities. Sharing learning resources is seen as one strategy to help academics in this change process. As such, online repositories of learning objects are flourishing to encourage the concept of reuse. However, what is lacking are tools to support academics in designing high quality learning environments that incorporate learning objects. This paper presents a prototype tool that uses the concept of a "learning design" as the framework to assist academics in the design process and demonstrates how learning objects can be incorporated.

Applications of machine learning and rule induction:

A machine learning system through rule induction by the application of concept theory (CT) is described. Conceptual clustering of examples (CCE), one form of learning by discovery, determines the natural classes of input training instances. A concept for each class is thereafter formed. CT is then applied over those concepts to induce concept rules (CR). Further modifications of CR are performed by the application of the technique of learning by analogy to the input instances and CR, thereby inducing modified concept rules.

A survey of fault management in wireless sensor networks:

Wireless sensor networks (WSNs) have gradually emerged as one of the key growth areas for pervasive computing in the twenty-first century. Recent advances in WSN technologies have made possible the development of new wireless monitoring and environmental control applications. However, the nature of these applications and harsh environments also created significant challenges for sensor networks to maintain a high quality of service in potentially harsh environments. Therefore, efficient fault management and robust management architectures have become essential for WSNs. In this article, we address these challenges by surveying existing fault management approaches for WSNs. We divide the fault management process into three phases: fault detection, diagnosis, and recovery and classify existing approaches according to these phases. Finally, we outline future challenges for fault management in WSNs.

Routing techniques in wireless sensor networks: A survey:

Recent advances in Wireless Sensor Networks (WSN) now witness the increased interest in the potential use in applications like disaster management, combat field reconnaissance, border protection and security surveillance. Sensors are expected to be remotely deployed in large numbers and operate autonomously in unattended environments. Many routing protocols have been specifically designed for WSNs where energy awareness is an essential design issue. This paper presents a survey of the state-of-the-art routing techniques in WSNs. We survey different routing algorithms for WSNs from the recent work; highlighting their objectives, features, complexity, etc. with a classification for the various approaches. Each routing protocol is described and discussed under the appropriate category.

III MODULES DESCRIPTION

wireless network sensor:

Förster and Murphy introduced the WSN cluster formulation method called "Roleless Clustering with Q-Learning for Wireless Sensor Networks" (CLICK). Instead of performing an election process, CLIQUE allows each node to investigate its ability to function as a head node in the cluster. This is achieved using the Q learning algorithm in combination with some dynamic network parameters such as power levels.

Machine Learning:

Over the past decade, machine learning techniques have been widely used for a wide range of tasks including classification, regression and density estimation in a variety of application areas such as bioinformatics, speech recognition, spam detection, vision by computer, fraud detection and advertising networks. The algorithms and techniques used come from diverse fields such as statistics, mathematics, neuroscience, and computer science.

Localization:

Because of this diversity, WSNs have enormous potential to create powerful applications, each with its own individual features and requirements. Developing efficient algorithms that are suitable for different application scenarios is a challenging task. In particular, WSN designers must address common issues related to data aggregation, data reliability, location, node pooling, power-aware routing, event scheduling, fault detection, and security.

Data Aggregation:

WSN challenges were also written. For example, he addressed the development of efficient outlier detection techniques so that appropriate actions can be taken, and some of these techniques are based on machine learning concepts. Meanwhile, it discusses computational intelligence methods to address challenges in WSNs, such as data aggregation and fusion, routing, task scheduling, optimal deployment, and localization. Here, computational intelligence is a branch of machine learning that focuses on biologically inspired approaches such as neural networks, fuzzy systems, and evolutionary algorithms.

Data Integrity:

It investigates machine learning solutions in WSNs to meet non-functional requirements, that is, those that determine the quality or improve the performance of functional behaviors. Examples of such requirements include security, quality of service (QoS), and data integrity. In this section, we also highlight some unique efforts in specialized WSN applications.

ADVANTAGES:

The proposed framework exploits the fact that the readings of multiple sensors are highly correlated. This will minimize the communication overhead for detecting the structure of the sensor data.

Collectively, these results serve as an important step in developing a distributed learning framework for wireless networks using linear regression methods. The main advantages of utilizing this algorithm are the good fitting results, and the small overhead of the learning phase. However, it cannot learn non-linear and complex functions.

DISADVANTAGE:

The advantages and disadvantages of each proposed algorithm are evaluated against the corresponding problem. We also provide a comparative guide to aid WSN designers in developing suitable machine learning solutions for their specific application challenges.

A novel technique for exchanging node local information as a feedback response to other nodes, named “Feedback Routing for Optimizing Multiple Sinks in WSN” (FROMS) is introduced. The main advantage of FROMS is to allow efficient routing from multiple sources to multiple sinks. The Q-values are initialized based on the hop counts to every node in the network

RESULTS :

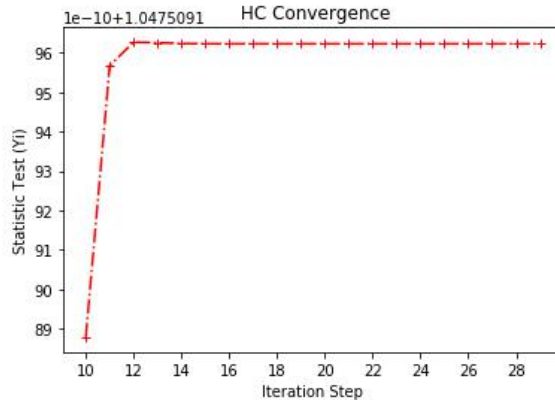


Figure 2 – Hopcount wrt cluster head

Number of network or network devices through which data passes between source and destination hop count is measure of distance between two host. Hop count convergence (HC convergence) show the collected all available topology information from each routing protocol where the data transmitted

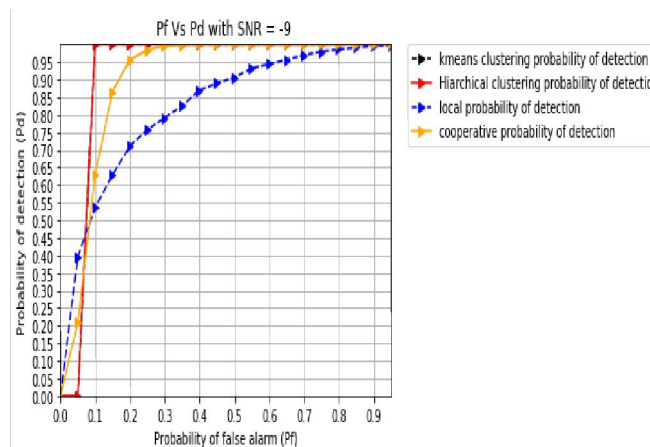


Figure 3 - detection probability (pd), false alarm probability (pf)

Figure 3 shows the change of the overall detection probability (P_D) with respect to the collaboration size for various values of P_d , it can be observed that collaboration is useful in increasing the overall detection rate (P_D). As the collaboration size increases, overall detection probability increases and approaches one

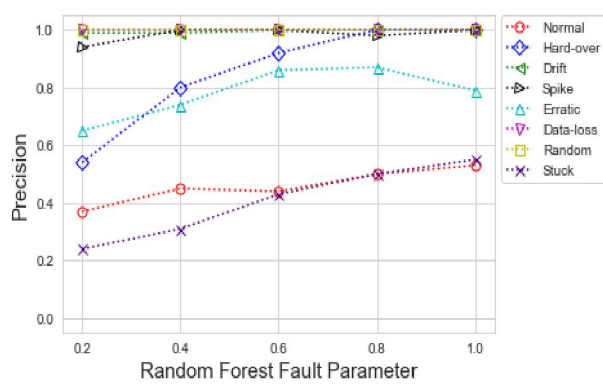


Figure 4

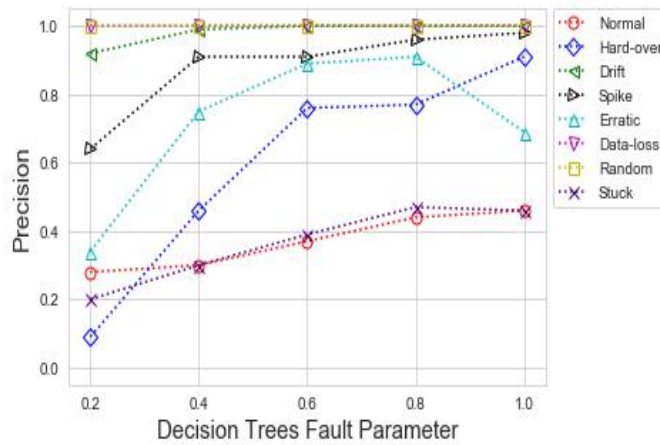


Figure 5

In both diagram the normal database are stuck, spike and drift the accuracy level is decreases. The value of database (normal show in red line) is spike and not accurate.

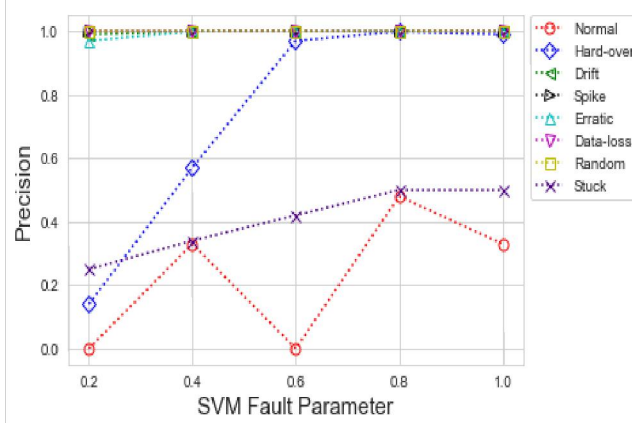


Figure 6

Fault detection method based on these three algorithm SVM, RF and DT. it is probabilistic based fault algorithm exploiting increase resource consumption. Its purpose to minimize that the probability of sending a false signal during an event detection or an object tracking

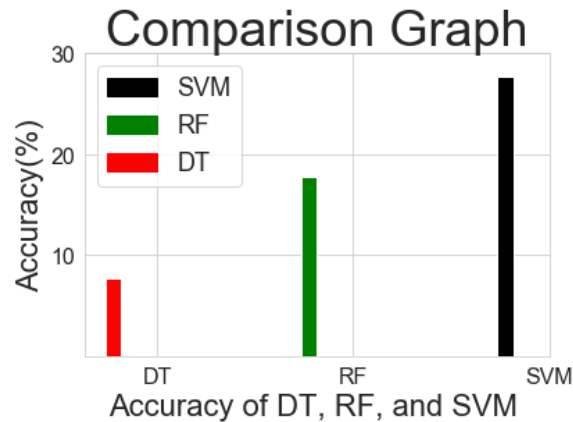


Figure 7 SVM accuracy level is high

IV CONCLUSION

Wireless sensor networks are different from traditional networks in many ways, requiring protocols and tools that address unique challenges and limitations. As a result, wireless sensor networks require innovative solutions for enroutement, security, programming, location, grouping of nodes, data aggregation, detection of failures and data integrity in real time and aware of the energy. Machine learning provides a collection of techniques to improve the wireless sensor network's ability to adapt to the dynamic behavior of its surrounding environment. From the discussion so far, it became clear that many design challenges in wireless sensor networks have been resolved using several machine learning methods.

In addition, several topics are still open and need further research efforts, such as the development of lightweight and distributed message passing techniques, online learning algorithms, hierarchical clustering patterns, and the adoption of machine learning in problem management. of wireless sensor network resources.

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