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Assessment on Different Classification Algorithms Used in Internet of Things Applications

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ABSTRACT

The past few years have witnessed the Internet of Things (IoT) has evolved a lot and continues to evolve in various fields such as healthcare, agriculture, smart city, education, industries, automation, home care, etc. This advancement is caused by the development of sensor-enabled devices called IoT devices. The data collected from such devices will be used to identify and manage complex environment around us that will reduce the human intervention and also escalate efficiency, productivity, accuracy and economic benefits of the devices. In this survey article, the authors analyze how the datasets of different applications of the IoT such as agriculture, healthcare, smart city are processed and classified. The article also outlines the recent review of more common classification algorithms such as Support Vector Machine, Naïve Byes, Decision Tree, etc., that were used to classify the dataset with different parameters applied to the Internet of Things applications. In addition, this article also gives a brief review of the applications of the Internet of Things.

KEYWORDS

Agriculture, Efficiency, Healthcare, IoT, Large Data Set, Medical Care, Smart City, Smart Homes

1. INTRODUCTION

Ubiquitous computing (Marimuthu et al., 2013) is a concept where computing is made to appear everywhere using any device, in any location and format. The objective of Ubiquitous Computing is to implant technology into the surroundings of everyday life. Internet of things (IoT) (M.S. Mahdavinejad et al., 2017) is one of the important information technologies which leads to the growth of ubiquitous computing infrastructure. To delineate or orientation of systems that depends on the self-governing communication of a group of physical objects, the "Internet of things" concept is used. Internet of things is the backbone of the modern technology and a lot can be achieved through the vast potential of the application of IoT. Approximate 60-70 billion of connected IoT based objects are expected in every field including Household, Industrial, and Medical, Defence, Automobile, Education by 2020 - 2021 (Alamet et al., 2016).

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The Internet of things (IoT) is the interconnection of physical objects or things, called "smart devices", with embedded electronic computing devices such as actuators, sensors (Mahdavinejad et al., 2017) and internet connectivity that can communicate with each other to share information and data and also perform some tasks or actions. The IoT permit the smart objects remotely manage and sense the data of the smart devices across the network infrastructure this will reduce human intervention and also increase efficiency, productivity, accuracy and economic benefits of the devices. The main challenge in IoT is to analyze the huge amount of data timely so that our smart objects generate a reliable result and accurate decisions. This can be done by applying classification algorithms on a large dataset of the Internet of Things. The aim of this research survey is to discover in which applications of IoT we can apply classification algorithms (Chen et al., 2015). The aim will be achieved by surveying or studying different research papers on applications of IoT based on Classification Algorithms. The main contribution of this survey is the analysis of classification algorithms such as Support vector machine (SVM) (Verma et al., 2017), Decision Tree (DT), Random Forest (RF), Naïve Bayes (NB) (Chen et al., 2015), etc., with multiple parameters in different applications of the Internet of things.

The remainder of this paper is organized as follows. Applications of the Internet of things will be discussed in Section II and related work with comparison table will be discussed in Section III, in Section VI we will discuss the main conclusion of the paper.

2. INTERNET OF THINGS APPLICATION AREA

2.1. Health

The integration of health care with IoT (Bansal et al., 2018) helps the patients to get medical care quickly and easily. IoT exhaust a new lifeline in the healthcare sector by enhancing the sensor-enabled device techniques and by compounding the other techniques such as RFID (Jia et al., 2012) (radio frequency identification system), Bluetooth, Wi-Fi (Saraswathi et al., 2016). In case of an emergency with the help of IoT, doctors can monitor patient's health from a remote location (Ani et al., 2017) and provide the related treatment. In the diagnosis of many chronic diseases (Raji et al., 2016) such as asthma, heart attack, kidney, cancer, diabetes (Chui et al., 2017; Islam et al., 2015) IoT plays a significant role. IoT is a boon for old age people, it helps in their activity and movement recognition of elderly people (Bisio et al., 2017), helps in the Alzheimer etc. IoT based e-healthcare system (Farahani et al., 2018) is a patient-based healthcare system in which doctor, hospitals, patients are connected to each other by using IoT, cloud computing, and fog computing. This e-health service of IoT plays an important role in providing better healthcare services such as mobile healthcare, assisted living, e-medicine care, early warning systemsdda to the patients. IoT plays an important role in bioinformatics-based healthcare (Chang, 2018) for the analysis and visualization of tumors and genes (Chang, 2018) that contributes to the development of cancer.

2.2. Agriculture

In India, agriculture (Sarangdhar et al., 2017) sector plays a significant role in the growth of the country. Agriculture field requires a solution that will help the farmers to increase the productivity of crops. As shown in Figure 1, the Internet of things can deliver different types of technologies to the farming sector.

It can help the farming sector in tremendous ways such as soil monitoring to monitor the humidity and soil moisture (Venkatesan et al., 2017), crop monitoring to detect and control leaf diseases and insects which are very harmful to crops (Sarangdhar et al., 2017), optimizing the usage of soil fertilizers (Sujithra et al., 2017) which maximizing the productivity of the crops and that will reduce the time and cost needed for soil testing, monitoring weather condition/ environmental temperature (R. Venkatesan et al., 2017; Lee et al., 2013) of the field. These services can help farmers, agriculture