

**LEMBAR**  
**HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW***  
**KARYA ILMIAH: JURNAL ILMIAH**

Judul Artikel Ilmiah : **Waste analysis on patient care in the emergency installation of government hospital X of Riau Province**

Nama semua penulis : Misra Kamalia, Sutopo Patria Jati, **Septo Pawelas Arso**

Status Pengusul (coret yg tidak perlu) : ~~PenulisUtama~~/~~PenulisUtama&Korespondensi~~/~~PenulisKorespondensi~~/  
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- Nama Jurnal : International Journal of Scientific and Technology Research
- Tahun terbit/Vol/No/halaman : 2020/Vol. 9/No.1/868-875
- Edisi (bulan, tahun) : Januari, 2020
- ISSN : 2277-8616
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d	Kelengkapan unsur dan kualitas jurnal (30%)	9	9
	Nilai Total	<b>30</b>	27
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a	Kelengkapan unsur isi artikel	Unsur-unsur dalam artikel sudah lengkap, antara lain introduction, literatur review, method, result and discussion, limitation, conclution and suggestion, references
b	Ruang lingkup & kedalaman pembahasan	Topik penelitian sesuai dengan keilmuan penulis. Pembahasan masih kurang mendalam
c	Kecukupan dan kemutakhiran data/informasi dan metodologi	Masih banyak sumber Pustaka yang lebih dari 10 tahun (16 dari 23 references)
d	Kelengkapan unsur dan kualitas jurnal	Editorial board terdiri dari enam negara, Dalam satu terbitan terdapat 5 negara penulis artikel. Coverage scopus : 2018-2020, Artikel terbit di Januari tahun 2020 Penulisan nomer sitasi kurang sempurna

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Reviewer 1



Dr. dr. Apoina Kartini, M.Kes.

NIP. 196604171991032002

Unit Kerja : FKM Universitas Diponegoro

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c	Kecukupan dan kemutakhiran data/informasi dan metodologi (30 %)	9	7,5
d	Kelengkapan unsur dan kualitas jurnal (30%)	9	7,5
	Nilai Total	<b>30</b>	<b>25,0</b>
	<b>Nilai yang didapat pengusul:</b>	<b><math>25 \times 0,4 = 10 / 2 = 5</math></b>	

**Catatan Penilaian artikel oleh Reviewer**

a	Kelengkapan unsur isi artikel	Unsur pada artikel ini sudah mencakup unsur yang harus ada dalam jurnal ilmiah sesuai ketentuan: Introduction; Literature Review; Method & Material; Result & Discussion; Research Limitation; Conclusion & Suggestion; dan References.
b	Ruang lingkup & kedalaman pembahasan	Substansi artikel tentang analisis pengelolaan limbah pasien di instalasi gawat darurat (IGD) RS menggunakan pendekatan lean management.
c	Kecukupan dan kemutakhiran data/informasi dan metodologi	Terdapat 6 artikel yang disitasi dari 23 daftar Pustaka dan selebihnya buku referensi sehingga secara teoritis cukup bisa menjelaskan analisis yang dituliskan dalam artikel.
d	Kelengkapan unsur dan kualitas jurnal	Merupakan jurnal internasional bereputasi meski untuk saat ini sudah discontinued in Scopus

Semarang, 27 April 2022

Reviewer 2



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Unit Kerja : FKM Universitas Diponegoro

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## Waste analysis on patient care in the emergency installation of government hospital X of Riau Province (Article)

Kamalia, M. [✉](#), Jati, S.P., [Arso, S.P.](#) [👤](#)

Public Health Science, Diponegoro University, Indonesia

### Abstract

[View references \(23\)](#)

The researcher wishes to analyze the existence of waste with a lean hospital management approach on the process of patient care in the Emergency Installation (IGD) of Government Hospital X of Riau Province. Congestive Heart Failure was chosen to describe the flow of the patients-care process starting from the registration until the patient was ready to be delivered to the treatment room. This study employed a qualitative type utilizing a descriptive analytic approach. Primary data were obtained through the observations to 20 patients delivered by families, supplemented by in-depth and unstructured interviews of with the patient's family and emergency installation staff as a respondent. In addition, the primary respondent is a head of the emergency installation and a person who carry out role as a coordinator as well as in charge of the emergency installation. Secondary data was obtained from the collection of documents, journals, and reference books related to the research topic. The results showed that at the Emergency Installation of the Government Hospital X of Riau Province had not implemented Lean Management yet. The care process flow had a non-value added ratio of 31.8% for recent patients and a non-value added ratio of 31.5% for preceding patients. Over-processing, over-motion, unused employee creativity, waiting, defects, unnecessary transportation and unnecessary inventory were the forms of waste found during research. Adding the Human Resources (HR), optimizing managerial activities, implementing 5S work culture (Seiri/Concise; Seiton/Neat; Seiso/Clean; Seiketsu/Care; Shitsuke/Diligent) and error proofing, adding visual management, improving the ability of Hospital Management Information System using E-Kanban, and planning re-layout with line balancing analysis were expected to reduce waste of the patient care process in the Emergency Installation of the Government Hospital X of Riau Province. © IJSTR 2020.

### SciVal Topic Prominence ⓘ

Topic: Lean Production | Total Quality Management | Value Stream Mapping

Prominence percentile: 92.692 ⓘ

### Author keywords

[Lean hospital management](#) [Line balancing](#) [Waste](#)

ISSN: 22778616

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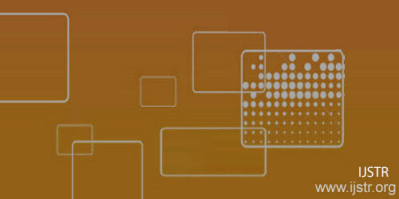


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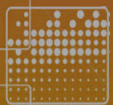
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### Current Status Of Agricultural Soil Fertility In Erode

Dr.K.Chitra,

Soil fertility is an important aspect in agriculture. Fertile soils only produce high nutritive value crops. Nowadays agricultural soil contaminated due to many reasons. Farmers use synthetic fertilizers and synthetic pesticides for crop production. They play a major role in soil fertility. Physicochemical parameters of soil enable the current status of soil fertility. The soil samples were collected in Erode. Agricultural soils were acidic in nature. Electrical conductivity of all the samples showed that the soils were good for seed germination. Total dissolved solids and salinity were in appropriate level in all the samples. Organic carbon level were in sufficient level. Macro nutrients were in medium level. Calcium and magnesium were in sufficient level in all the soil samples.

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### Intelligent Neural Network For Bacteria Classification: An Innovation In Artificial Neural Network

Ananda Khamaru, Sunil Karforma, Soumendranath Chatterjee, Ishita Saha Raktima Bandyopadhyay

The work focused on reliable outcome from next generation artificial neural network (ANN). ANN was efficiently used for decision making on labeled and unlabeled data but problem was that it was always generated as a result through the short input data. The conventional model is being used in some financial sectors for prediction and analysis of financial data, but it would not make an outcome due to its inapplicable data. Our objective is to design a neural network which will have the intelligence by which it can generate most promising decision. A mathematical model of new generation artificial neural network called Intelligent Neural Network (INN) has been proposed which would solve that problem and would make the decision like a human. The INN model has been designed with two layers of connected neurons, where the first layer neurons has taken input as the features of bacteria and produced input for hidden neurons; in the second layer the output from hidden neurons provided as input of decision neurons and the output of decision neurons was the expected result. This model was trained by back propagation process by reducing Sum Squared Error (SSE) through Stochastic Gradient Descent (SGD) technique. Prediction accuracy of this model was 97.11% to distinguish medically important bacteria. This study would be useful for laboratory users to identify medically important bacteria in an easy way.

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### Project, Technology And Active (PROTECTIVE) Learning Model To Develop Digital Literacy Skills In The 21st Century

Fatkhur Rohman, Ahmad Fauzan, Yohandri

This research aims to find out the impact of implementing a physics learning based on Project, Technology and Active (PROTECTIVE) learning model in building three digital literacy skills namely information literacy, media literacy, and ICT literacy. This research is an alternative solution to the students' skills and awareness to utilize and integrate technology in learning physics. The subject of this research is early semester students who took a basic physics course. The sample of the research is 71 students majoring in physics education from Universitas Negeri Padang (UNP) and Universitas Islam Negeri Imam Bonjol (UIN IB). Data on digital literacy skills were obtained through performance observation and assessment of structured task reports during the learning process. The instruments used were observation sheets and analytic rubrics. The data were analyzed by using descriptive statistics interpreted in 4 rating scales, they were very good, good, fair and poor. Based on the results of the observation at the stage of the project, project and practicum tests, there were 13% of students experiencing little difficulty in using, managing and evaluating information data from the technology software or platform for physics learning. The analysis result of research samples from UNP and UIN IB respectively suggests that 20% and 23% of students achieve very good predicate in information literacy skills, the good predicate has a considerable portion of 64% and 69%, The remainder 16% and 8% fall into the fair predicate. On the assessment of media literacy, there were 18% and 12% of students who fall into a good predicate of 78% and 81% and 4% and 8% fall into the good predicate. For very good predicate, ICT literacy Skills has 22% and 15% of students, while 62% and 62% of the students fall into good predicate. Besides, the rest of 16% and 23% of the students fall into the fair predicate. The conclusion of the achievement of these three literacies show that the digital literacy skills achieved by students from UNP and UIN IB is said to be at a good level of 77% and 76%. The findings in this research are highly relevant and interesting in the 21st century of education because the application of PROTECTIVE learning is one of the best solutions for teachers, lecturers and education managers to build digital literacy skills for the participants in the 21st century.

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### Two Recommendation System Algorithms Used SVD And Association Rule On Implicit And Explicit Data S

Marwa Hussien Mohamed, Mohamed Helmy Khafagy, Mohamed Hasan Ibrahim

Nowadays, the recommender system is an important research area for online companies that suggest items and services to users like FM music, Netflix movies, and movie-lens). Building a recommendation system to meet users' preferences is very difficult due to the increasing size or volume of digital information. Also, the recommendation has many challenges that need to overcome like sparsity, accuracy, performance and novelty. In this paper, we build two new algorithms to solve the sparsity, accuracy and performance of a recommendation system. Firstly, we used association rule mining to find a hidden pattern and count numbers of played songs transaction and compute similarities by cosine vector similarity to make a recommendation to users also taking into concern the merged with clustering technique. Secondly, we used K-means clustering algorithms with SVD (singular value decomposition) to reduce dimensionality, increase the performance, and solve sparsity and accuracy problems. Our experiments are applied on last FM radio datasets and movie-lens datasets implicit and explicit feedback, we compare our new algorithms with k-means collaborative filtering and RMSE (root mean square error) to show the accuracy and performance of movie lens and measure the accuracy using precision, recall and F-measure to show the accuracy between basic collaborative filtering and our two new algorithms. This experiment shows that association rule is better than improved k-means while combining with SVD and basic collaborative filtering. But our new k-means and algorithm has better performance than random collaborative filtering K-means.



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The issue of this study is a view on Oil & Gas' CSR program and collaborative community development in KRZL Ltd. This study analyzes and discusses the collaborative process model applied to the clean water installation program to several villages in the community, besides as a solution to the limitation of local government in East Part Seram Regency, Maluku Province. Primary collection was conducted by using in-depth interview, FGD and field observation, while secondary data was conducted by using documents such as CSR program rules and reports and brochure of KLZR Ltd. Descriptive qualitative analysis technique was used for analysis. The results showed that by optimizing participation and active involvement of the community with KLZR at each stage of collaborative processes proved more successful in implementing the CSR program development of clean water installation to the community.

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## **THE KEY SUCCESS FACTORS OF AVAILABILITY PAYMENT SCHEME IMPLEMENTATION IN THE PALAPA RING WESTERN PACKAGE PPP PROJECT**

Maman Suhendra

The availability payment scheme (AP) is one of the investment return models for a business entity in a Public-Private Partnership (PPP) scheme for infrastructure provision. This study aims to analyze the critical success factors implementation of availability payment in Palapa Ring Western Package PPP Project from the various perspectives, namely (1) the government contracting agency (GCA); (2) business entity; and (3) the other relevant stakeholders. This project is the first PPP project to successfully implement AP in Indonesia. The methodology used in this study is a qualitative method through several in-depth interviews with 10 (ten) entities involved in the project and 3 (three) PPP experts. The study finds 5 (five) key success factors that most determine the overall success of the AP implementation, i.e. the commitment of the GCA, the coordination between stakeholders, the existence of guarantees, the GCA's ability to pay AP, and GCA institutional form as the Public Service Body. Knowledge of these factors is expected to be used to improve relevant policies related to the infrastructure provision through PPPs.

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## **E-Commerce Recommender System Using Product Data**

Rajesh Kumar E, Kakani Jyotsna, Keerthana Ganta, Ramya Sirisha Nori

In previous days, before buying a product, people used to get suggestions from our close friends, family or people known. This is the idea of recommender systems. Recommender systems work with the same idea of predicting a product that a customer may like to purchase. Recommender systems can be used in different areas to recommend products such as books, apparel, accessories, movies according to the items viewed. A recommender system is a system that helps to expect and recommend similar products to the given input or product. In many online e-commerce websites like Amazon, Myntra and other sites, one can find sections like "recommended for you" or "products related to this item", "customers also viewed" when a person views certain product. These are the recommended sections.

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## **Prediction Of Cognitive Impact Of Yoga And Meditation On Psycho-Physiological Health For Students**

N.Anitha, Dr.T.Abirami, Dr.R.Tamilselvan

Now a day, one can find most places of the world different types of yoga centers, meditation centers. Millions of people got benefited from practicing yoga. There is no doubt that in future for a healthy future generation and for a peaceful world, yoga is going to play a major role. Yoga increases blood flow and levels of hemoglobin and red blood cells which allow more oxygen to reach the body cells, enhance their function. Yoga also thins the blood which can decrease the risk of heart attack and stroke, as they are often caused by blood clots. Hence, the objective of this research is to predict the effects of yoga and meditation on a variety of physical and mental health outcomes and health conditions. For experimental purpose, a total of 100 healthy students in the age group of 17-23 are considered for prediction of cognitive ability. The results have been shown that the proposed system accurately predicted the cognitive skill and its prevalence compared to non-practicing yoga students.

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## **Waste Analysis On Patient Care In The Emergency Installation Of Government Hospital X Of Riau Province**

Misra Kamalia, Sutopo Patria Jati, Septo Pawelas Arso

The researcher wishes to analyze the existence of waste with a lean hospital management approach on the process of patient care in the Emergency Installation (IGD) of Government Hospital X of Riau Province. Congestive Heart Failure was chosen to describe the flow of patient care process starting from the registration until the patient was ready to be delivered to the treatment room. This study employed a qualitative type utilizing a descriptive analytic approach. Primary data were obtained through the observations to 20 patients delivered by families, supplemented by in-depth and unstructured interviews of with the patient's family and emergency installation staff respondent. In addition, the primary respondent is a head of the emergency installation and a person who carry out role as a coordinator as well as in charge of the emergency installation. Secondary data was obtained from the collection of documents, journals, and reference books related to the research topic. The results showed that the Emergency Installation of the Government Hospital X of Riau Province not implemented Lean Management yet. The care process flow had a non-value added ratio of 31.8% for recent patients and a non-value added ratio of 31.5% for preceding patients. Over-processing, over-motion, unused employee creativity, waiting, defects, unnecessary transportation and unnecessary inventory were the forms of waste found during research. Adding the Human Resources (HR), optimal managerial activities, implementing 5S work culture (Seiri/Concise; Seiton/Neat; Seiso/Clean; Seiketsu/Care; Shitsuke/Diligent) and proofing, adding visual management, improving the ability of Hospital Management Information System using E-Kanban, and planning layout with line balancing analysis were expected to reduce waste of the patient care process in the Emergency Installation of Government Hospital X of Riau Province.

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## **Autoscaling Study Of Load Balancing In Cloud Environment Via Gravitational Optimization And Clustering Paradigm**

N. Subalakshmi, M. Jeyakarthic

These days, cloud infrastructures give flexible provisioning by supporting an assortment of scaling mechanisms and various equipment designs for lease, each with an alternate framework cost. The virtual machines (VM) are distributing assets to crush this trouble that is dependent on priority in the cloud. Here, the best quantities of consumers are conveying the errands or works in the cloud. In this paper, proposed a novel optimization and clustering algorithm for illuminating Load balancing (LB) process with expanding the versatility of the framework. At first medoid clustering used to cluster the VMs. Cloud condition scalability is significant of asset distribution that in auto-scaling so Gravitational Load balancing search (GLBS) system with different Quality factor think about that is Cost, processing time, throughput, workload. These parameters are the wellness of the optimization for fulfilling this condition gravitational parameter is still be balanced. The outcomes introduced the preferable execution other over comparable techniques just as flexible conduct of LB issue.

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# Two Recommendation System Algorithms Used SVD And Association Rule On Implicit And Explicit Data Sets

Marwa Hussien Mohamed, Mohamed Helmy Khafagy, Mohamed Hasan Ibrahim

**Abstract:** Nowadays, the recommender system is an important research area for online companies that suggest items and services to users like (last FM music, Netflix movies, and movie-lens). Building a recommendation system to meet users' preferences is very difficult due to rapidly increasing the size or volume of digital information. Also, the recommendation has many challenges that need to overcome like sparsity, accuracy, performance and novelty. In this paper, we build two new algorithms to solve the sparsity, accuracy and performance of the recommendation system. Firstly, we used association rule mining to find a hidden pattern and count numbers of played songs per transaction and compute similarities by cosine vector similarity to make a recommendation to users also taking into concern the rating merged with clustering technique. Secondly, we used K-means clustering algorithms with SVD (singular value decomposition) to reduce dimensionality, increase the performance, and solve sparsity and accuracy problems. Our experiments are applied on last FM music datasets and movie-lens datasets implicit and explicit feedback, we compare our new algorithms with k-means collaborative filtering using RMSE (root mean square error) to show the accuracy and performance of movie lens and measure the accuracy using precision, recall and, F- measure to show the accuracy between basic collaborative filtering and our two new algorithms. This experiment shows that using association rule is better than improved k-means while combining with SVD and basic collaborative filtering. But our new k-means and SVD algorithm has better performance than random collaborative filtering K-means.

**Index Terms:** Recommender systems; K-means clustering; Association Rule; SVD (Singular Value Decomposition); Dimensionality Reduction.

## 1. INTRODUCTION

IN this modern era, everybody depends on the internet to find products, services, and items daily to determine their needs. This is regarded as a natural phenomenon of the human decision-making process [1]. Recommender systems help users to get the decision more easily and rapidly by filtering huge information about millions of products and items over websites. The main issue is to recommend items to users' will be liked and give a high rate to meet their expectations. Recommender system process using some data mining techniques like clustering to group similar items together to find similarity between them when we select an item as a centroid of the cluster or user's similarity if we select a user as a centroid of the cluster and association rules to find hidden patterns and discover new relationships between products to increase sales as a part of E-commerce [2].

**Recommender system has many techniques [3]:**

- Content based filtering: it's depends on analyzing the content of textual data and discovering similarities between items specification.
- Collaborative filtering techniques: it's depends on the similarities between users' rating items on the site to recommend to the other different presences he or she may be liked.

- Hybrid collaborative filtering: it's merging between content based filtering and collaborative filtering to gain more advantage and get best recommended items results [4].

Recommender systems work by using feedback on products as data inputs to the systems. It has two types explicit and implicit data sets. The feedback mostly used is explicit, it calculates the similarity and makes recommendations depends on users' ratings on items. The other type is used several watching items like movies or listening to songs more times or viewing product types this named by implicit feedback. But, one of recommender systems challenges is users' feedback about items it's not available all times this called sparsity problems so that recommender systems can use implicit feedback which it reflects users' preferences indirectly to the system [5]. For recommendation system example, if users like to watch a lot of movies for an actor probably this user likes this actor so we can recommend to him different movies haven't seen on the website before [5]. Figure 1 shows an example for reading and rating books between three users and four books the first and the third user when they rate one of the four books its explicit feedback, but the second user wish and reading some of these books without rating it's implicit feedback.

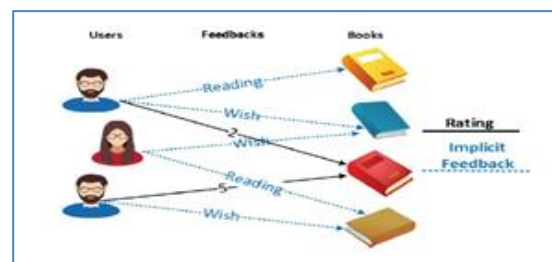


Figure 1. Example of implicit and explicit feedback.

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Another example of explicit feedback like movies-lens

# Current Status Of Agricultural Soil Fertility In Erode

Dr.K.Chitra,

**Abstract :** Soilfertility is an important aspect in agriculture. Fertile soils only produce high nutritive value crops. Nowadays agricultural soils are contaminated due to many reasons. Farmers use synthetic fertilizers and synthetic pesticides for crop production. They play a major role in soil fertility. Physicochemical parameters of soil enable the current status of soil fertility. The soil samples were collected in Erode. All the agricultural soils were acidic in nature. Electrical conductivity of all the samples showed that the soils were good for seed germination. Total dissolved solids and salinity were in appropriate level in all the samples. Organic carbon level were in sufficient level. Macronutrients were in medium level. Calcium and magnesium were in sufficient level in all the soil samples.

**Key words:** Agriculture, fertility, Macro nutrients, Micro nutrients, Physicochemical parameters, Seed germination, Soil. Introduction

## 1 INTRODUCTION

Soil qualities are related with agricultural activities. It includes physical, chemical and biological properties. These characters play a vital role in soil and make it suitable for agricultural activities [(Rakesh et al., 2012)]. Soil is composed of many minerals, soil organic matter, water and air. It is very complex in nature [(Vishal et al., 2009; Flores-Magdaleno et al., 2011)]. Soil quality is related with environmental issues. Agricultural soils are contaminated due to synthetic fertilizers and synthetic pesticides. Industrial effluents are discharged in agricultural areas. Runoff from water streaming also play a major role in agricultural soil contamination. Soil quality is measured by soil nutrients. Soil physicochemical parameters are the good indicator of soil fertility. Soil quality and crop productivity are decreased due to continuous use of fertilizers. For sustainable agricultural production, fertility status of agricultural soils be evaluated. Its role is very specific in crop production and yield. Nutritional quality of crops depends on soil nutrients in soil profile [S. S. Dhanve et al., 2018]. In agriculture soil compaction is caused by mechanization and large machineries [Allman et al., 2015; Beylich et al., 2010]. The present study was conducted to understand the current status of agricultural soils. It is useful to farmers, they decide how to increase the crop yield in their areas. Soil management is a qualitative parameter. Soil organic carbon play a major role in crop production and it reduces the environmental issues on agriculture [Adhikari and Hartemink, 2016; Chabbi et al., 2017; Hatfield et al., 2017]. Soil quality is a significant factor. It determines the suitability of crops to grow. Good soil is an indicator of good environment. A good soil should be suitable for all kinds of plants to grow on it [M. Shanmuganathan, A. Rajendran, 2018].

## 2 MATERIALS AND METHODS

### Study area

Following agricultural samples were collected from Erode.

Sorghum bicolorL. - Seenapuram

Pennisetumpurpureum- Seenapuram

Arachis hypogaeaL. - Veeranampalayam

OryzasativaL. - Sunampuoodai

SaccharumofficinarumL. - Sunampuoodai

### Soil collection

Soil samples were collected with the help of auger at the depth of 0-20 cm. They were collected in a clean polythene bags. They brought to the laboratory for further analysis. They air dried at room temperature. Then, they were passed through a 2 mm sieve for further analysis. Soil texture was identified for each samples. Moisture and temperature were measured. Physicochemical parameters like pH, EC, TDS, salinity, organic carbon, macronutrients like nitrogen, phosphorus, potassium and micronutrients like calcium and magnesium were estimated with standard methods.

## 3 Results and Discussion

**Table No: 1.** Physical parameters of agricultural soil samples

S:No	SAMPLE	MOISTUR E	TEMPERATURE °C
1.	<i>Sorghum bicolor L.</i>	8.3	7.60
2.	<i>Pennisetumpurpureum</i>	13.5	9.01
3.	<i>Arachishypogaea L.</i>	2.19	5.10
4.	<i>Oryza sativa L.</i>	30.5	7.90
5.	<i>Saccharumofficinarum L.</i>	20.1	8.01

**Table No: 2.** Chemical parameters of agricultural soil samples

S: No	SAMPLE	pH	EC μS/cm	TDS ppm	SAL ppm	OC %
1.	<i>Sorghum bicolor L.</i>	06.35	092.2	060.0	068.6	1.5

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# Performance Evaluation Of Physical Layer Using Lora Technology For Indoor Environment

I. S. Ismail, N. A. Abdul Latiff, N. A. Azmi Ali, N. M. Abdul Latiff

**Abstract:** Low Power Wide Area Network is a new wireless technology which is designed for low power with long-range communication, and LoRa is one of the primary solutions of the technology. The objective of this paper is to evaluate the performance of the physical layer of LoRa Technology in an indoor environment. An experimental testbed is conducted using LoRa module as LoRa transmitter and receiver node and several LoRa parameters such as transmit power, bandwidth, spreading factor and coding rate are exploited. A series of experiments are performed at different locations with different LoRa parameters to investigate the effect of these parameters on the packet data throughput, received signal strength indication and signal-to-noise ratio. The results showed that the combination of different LoRa physical parameters have a clear impact on the overall performance. In addition, the external parameters such as the variant of distance between the transmitter and the receiver node and the obstacles that exist between the two nodes can also affect the performance of LoRa network.

**Index Terms:** Internet of Things, LoRa, long-range communication, LPWAN.

## 1 INTRODUCTION

The Internet of Things (IoT) is one of the technological drivers towards Industry 4.0 and has become one of the essentials in the modern life today. Generally, every devices that are connected to the internet, or communicate among each other via the internet are part of the IoT network. The increasing preponderance of IoT technologies has made a great positive impact not only in daily human activities but also in other applications such as real-time environmental monitoring system, energy and resources management, industrial control and productions system and smart city and transportation [1],[2]. In addition, recent advances in IoT have made it possible to be adopted in healthcare sector which contributes to enhancement of healthcare services, innovation in medical applications and reduction in healthcare costs. Wireless technology is commonly used together with IoT application. Applications with different function require different technology to function correctly. Common short-range wireless technologies such as Bluetooth and ZigBee are not suitable for applications which require long-range radio communication and low bandwidth. Although cellular technology is able to provide a wider coverage area than short-range radio technology, it consumes a lot of energy which is not suitable for low power applications. The latest advancement in communication device has seen that it becomes smaller, cheaper and more energy efficient. Consequently, it inspired the development of a communication technology called Low Power Wide Area Networks (LPWAN). This new technology becomes a complement to the traditional communication technologies such as cellular and short-range wireless technologies by enhancing a better functionality and requirement for IoT applications. This paper aims to study the performance of LoRa technology for indoor environment which the focus will be on physical layer known as LoRa (Long Range).

An experimental testbed is constructed, and the relationship between LoRa parameters such as transmit power, bandwidth, spreading factor and coding rate with LoRa performance parameters such as received signal strength indication (RSSI), signal-to-noise (SNR) and packet data throughput are analysed. The effect of distance between LoRa nodes (transmitter and receiver nodes), and also the location of LoRa node at indoor environment that affects the network performance of LoRa are also examined. The rest of the paper is organized as follows. Section 2 gives overview on LPWAN and LoRa technology while Section 3 describes on the experimental setup. Results obtained from the experiments are explained and discussed in Section 4. Finally, Section 5 concludes the paper.

## 2 OVERVIEW OF LOW POWER WIDE AREA NETWORKS AND LORA TECHNOLOGY

The Low Power Wide Area Network is a new type of wireless communication network which allows long-range communication at a low bit rate [3], [4], [5]. It is designed to cover large coverage area, extends the battery's lifetime and also has low operational cost. The LPWAN technologies prove that the connectivity range of the LPWAN node can achieve up to 3 kilometres for the urban area. Meanwhile, for the rural area the range is more than 10 kilometres [6]. In the line of sight condition, the communication range is up to 20 kilometres [7], and it is still possible to achieve up to 30 kilometres range as reported in [8]. Generally, the characteristics of LPWAN technologies can be classified into three key features; long-range, low power, and scalability. The long-range communication between end nodes and gateway (the receiver) is achievable by LPWAN devices due to the star topology network and the used of modulation techniques in the wireless communication. LPWAN devices operate in the unlicensed ISM bands at 169 MHz, 433 MHz, 868/915 MHz, and 2.4 GHz. However, these frequencies vary depending on which region the devices are being used [9] for example; the recommended region are Europe, North America, Asia, etc. [10]. LoRaWAN™ 1.1 Regional Parameter document [11] describes the frequency allowed on most of the region for the ISM band. The document also includes the suggested channel plan for several selected countries. For example, the channel plan for Malaysia is Region Asia, 923 MHz with the range of frequency band between 919 – 924 MHz. The LPWAN technology developed by Semtech which is known as LoRa

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# Exposure To High Frequency Electromagnetic Fields, Biological Effect And Health Consequences In Taif , Saudi Arabia

Suheir A. M. Sayed, Nagwan Elhoussein, Wejdan Al thobaiti, Asmaa Basaba

**Abstract:** Background: Exposure to human-made electromagnetic fields (EMF) has increased over the past century. The widespread use of EMF sources has been accompanied by public debate about possible adverse effects on human health. The World Health Organization (WHO) established the International EMF Project to assess the scientific evidence of possible health effects of EMF in the frequency range from 0 to 300 GHz. Aims: To assess biological effect and health consequences of high frequency electromagnetic fields in Taif , Saudi Arabia. Setting and Design: This cross section study was conducted at population living in Taif city, Saudi Arabia. Methods and Material: A structured questionnaire was designed for data collection to this study by researchers based upon review of literature. It includes three parts ; Socio-demographic data, Location and exposure of the devices and consequences of high frequency electromagnetic fields. Questionnaire was randomly distributed through phone and emails to a sample of people living in Taif, their ages ranged from 10 years old and above, responded people were 373. Results: Out of 373 respondents there were 106 (28.4%) male and 267 (71.6%) female with common age group (21 - 30) years with percentage of (49.1%), most of participants used mobile phone 360(95.7%), with highest time duration between 5 -7 hours daily (26.3%), the common symptoms between participants was idle and lazy 185(49.2%), the most mobile phone users was students at university level with significant relation between them  $P \leq 0.05$  and most children with hyperactivity use video games with no significant relation between them  $P \leq 0.429$  Conclusion: In our search we found that; the mobile phone was most commonly used among students at university level with significant relation between them  $P \leq 0.05$  and the highest duration time between 5 – 7 hours daily, the common symptoms between the participant was idle and lazy, and most children with hyperactivity use video games with no significant relation between them  $P \leq 0.429$

**Key words:** Electromagnetic fields, biological effect, high frequency , mobile phone , university level , Taif city, Saudi Arabia.

## 1 INTRODUCTION

High recurrence electromagnetic fields are portions of the electromagnetic range between the low recurrence and the optical piece of the range. As this piece of the range is utilized for broadcasting and media transmission, it is named radio recurrence (RF) The RF range is characterized in the recurrence run between 9 kHz and 300 GHz.[1]Electromagnetic fields can be depicted as a progression of waves that waver at a specific recurrence and have a specific separation between one wave and the following – the wavelength. EMFs have an extremely wide scope of frequencies, stretching out from low recurrence power supply lines with wavelengths of somewhere in the range of several meters, through the radio and noticeable light frequencies, to exceptionally high-recurrence medicinal X-beams with wavelengths estimated in trillions of a meter. This range is appeared in the electromagnetic range. [2] The electromagnetic condition comprises of common radiation and man-made electromagnetic fields that are created either deliberately or as results of the utilization of electrical gadgets and frameworks. The regular electromagnetic condition starts from earthbound and extraterrestrial sources, for example, electrical releases in the world's climate and radiation from sun and space. Normal for regular fields is an exceptionally broadband range where arbitrary high pinnacle homeless people or blasts emerge over the clamor like continuum foundation. This regular foundation is requests of size underneath

nearby field levels delivered by man-made RF-sources considered here. The regular utilization of gadgets and frameworks transmitting radio recurrence (RF) electromagnetic fields is ceaselessly expanding. Sources producing abnormal amounts of electromagnetic fields are normally found in restorative applications and at specific working environments. Restorative gadgets utilized for attractive reverberation imaging, diathermy, hyperthermia, different sorts of RF removal, medical procedure, and judgments may cause large amounts of electromagnetic fields at the patients position or locally inside the patient's body [3]

Unlike ultraviolet light, gamma rays and X-rays which are in the ionizing part of the electromagnetic spectrum .For decades we have been lead to believe by our governments and many institutions that are supposed to protect us that there is some kind of magical cut-off point between ionizing and non-ionizing radiation, that ionizing radiation is dangerous but that non-ionizing radiation is perfectly harmless. Non-ionizing radiation is potentially very harmful. Some scientists even believe it to be more harmful than ionizing radiation due to the insidious way it impacts our life.[1] Nearly everybody encounters some introduction to electromagnetic fields of different frequencies brought about by the utilization of electrical gadgets and remote correspondence systems. The basic part of that introduction originates from electromagnetic radiofrequency radiation (EMRR) of different frequencies from the recurrence band ranging from 88 to 5700 MHz, discharged by different frameworks of present day remote innovations, for example, radio and television broadcasting, open cell versatile correspondence frameworks or remote access to the Internet. The utilization of such frameworks makes regular introduction EMRR present in both workplace and open spaces. [4] Genuine intense wellbeing impacts of abnormal state presentation normally present

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