

Analysis and Modeling of Contextual Activity Pattern for Identifying Lifestyle Disorders

Apeksha V. Sakhare¹ and Dr. Ashish K. Sharma²

¹Research Scholar, Computer Science and Engineering, G H Raisonni University Amravati, MH, India

¹Assistant Professor, Computer Science and Engineering, G H Raisonni College of Engineering, Nagpur, MH, India.
Email:apeksha.sakhare@raisonni.net

²Associate Professor, School of Engineering and Technology, G H Raisonni University Amravati, MH, India
Email: ashishk.sharma@raisonni.net

Abstract—Nowadays with the help of various government health records and surveys, it has been found that the root cause of the various severe diseases (non-communicable) very frequently occur in the early age of humans and adolescents has not even aware of any symptoms or signs. This type of disease has a root cause of human irregular and very unhealthy, unorganized lifestyle and diet pattern. From the data analysis done on health information collected by various government organizations, it has been found that 309889 adolescents between ages 12-18 (53.8 female genders) from approx. 70 countries have been suffering from this non-communicable disease. Medical departments or health care organizations are producing a very wide amount of health-based data every day which be used for identifying or recognizing or predicting this disease which has no early signs or symptoms during some of its growing stages. This hidden data of healthcare organizations will be useful for taking decisions effectively for affected person treatment and recovery procedure. Here the main challenge is how to extract the hidden data from the collected health records, there some sort of data mining and machine learning technique is required. The expected outcome of our research work is that if the disease is detected and identified at its early stage it can be cured very effectively and easily with more accuracy and thus reducing the risk factor of life of a patient and the cost of treatment required to cure the disease. Early recognition of disease will also increase the percentage rate of cure from a disease of a patient and also decreases the risk of loss of life of a patient. This research paper provides a brief introduction of lifestyle Health problems and its cause. Our proposed research work includes a review of various techniques used by different research scholars, a working block diagram with a brief description of the diagram, and at the end, we have concluded with future work and the scope of our research work. This research can be very helpful for society as an early prediction of diseases can reduce the death rates of the patient.

Index Terms— first term, second term, third term, fourth term, fifth term and sixth term.

I. INTRODUCTION

According to the WHO (World Health Organization) report, Noncommunicable diseases kill 41 million people each year, similar to 71% deaths worldwide. Noncommunicable Diseases are also called as chronic diseases which are of long duration and has adverse effect on human health. The medical field requires much more

attention from research scholars as health is the most important factor of human life [1]. The famous quote “Health is wealth” is a major ideology of everyone's life. As health plays a very important role it should be maintained as well by every human being, but now a day's very busy lifestyle, disturbing and hectic schedule of everyone life. Recent studies show that so many diseases in the human body are already present from the childhood of a person due to like a lack of important nutrients in children's food diet, lack of physical activity, and various other lifestyle factors. All these different factors are most commonly studied by various research scholars in context to find various factors related to health. Recently all India health organization has released a review report that describes a unique research environment where diet and disturbed physical movements, and various other lifestyle patterns have been studied thoroughly for determining the effect on cognition learning on health disorders generated due to these factors [2]. This deep explored study provides a research scholar a new point of view of the collection of knowledge connecting to the specified lifestyle disturbances in physical activities, health fitness level, sleeping routine, dietary and nutritional routine, and various influences of social-economic, and cultural factors related to health and learning. Healthcare organizations manufacture a very large amount of different types of health care devices for ease of human life. These industries also generated a wide amount of data of patients daily which can be used mostly to extract data for generating or predicting disease order, pattern from which a patient can be suffered in the future. Now a day's research area is becoming very ideal and elaborated in various fields. Information Technology, data processing, artificial This type of hidden data provided by the healthcare industry will be later can be used for making an effective decision for health issues developed in patients in the future and this area of the healthcare industry needs lots of improvements by using the important and useful information in caring and treatment of affected patients in an effective manner. Quality Function Deployment (QFD) is strong decision making tool that has been applied in various fields. The use of QFD as strong decision making tool has been illustrated by [3,4]. Thus, QFD also fits the bill for healthcare industry. The overall process of extracting the important and useful data from bulky information of healthcare industries is practically a very crucial challenging task. Therefore different type of data mining methods, algorithm and various types of the machine learning algorithm is much needed for this fruitful data extraction from the bulky data [5,6]. The use of data mining has been reported by many researchers. Moreover, how the data mining can be used for forecasting is demonstrated by [7,8]. The main motive of this paper is to study and discuss various types of models already available in the market for disease prediction so that early treatment can be started, therefore which reduces the risk factor of patient life in a very effective manner also the cost of treatment is also reduced due to early recognition & detection of disease. Nowadays machine-learning algorithm with probabilistic modeling technique is much learned and studied by various research scholars which use LSTM-RNN (Long short term Memory-Recurrent neural network) and two back-to-back (Feedback designed) neural network for early prediction of various disease[9]. Nowadays so many monitoring system for human's daily lifestyle routine for a very vast period of time that may be very helpful for the following purposes as given below:-

1. **Early recognition of the human's Lifestyle:** Overall a person can be in a high way of life-based illness when they lead a specific sort of style. Nonetheless, the early signs and manifestations of this way of life illness with the unpredictable example of the way of life. With the assistance of long-term exercises observing framework it is feasible to recognize such style. Also, perceived the danger of the illness before the genuine sickness showed up.
2. **Prevention of lifestyle diseases:** It is feasible to forestall a sickness at the primary spot with the distinguishing proof of the way of life. A solid way of life and active work help forestall heftiness, coronary illness, hypertension, diabetes, colon malignancy, and untimely mortality [10]. An individual can evaluate his/her way of life and become mindful of any unpredictable examples however checking day-by-day action designs.
3. **Management of lifestyle diseases:** An individual who has a way of life sickness should make changes to guarantee a solid way of life. For instance, there is no solution for type 2 diabetes, however, it tends to be viably constrained by keeping up typical blood- glucose levels. This can be accomplished through weight control by following a nutritious and adjusted eating regimen, alongside standard and rigid exercise[11].

II LITERATURE SURVEY

Developing prediction models for different types of prediction of an disease needed specified types of models, even though if this is basically a mental models based on previously collected data ,experience ,or based on any expert opinion and advices for any sort of back-to back eve elope calculations and measurements. Overview of the different Methods is discussed in the following table.

TABLE I. OVERVIEW OF DIFFERENT METHODS

Author	Techniques/Method	Pros	Cons
Author Kasteren, T.; Noulas, A.; Englebienne, G.; Kröse (2012) [9]	Sustainable and long-term human activities control and monitor system can be defined as a human activity observation system on a daily routine basis for a much longer duration time. Basically this type of health monitoring system is having a different types of applications. On the basis of these type of application the healthcare monitoring and observation system is divided into two different types:- (1). Disease recognition and management system. (2). Human health Monitoring System	1. System is very simple to design and development. 2. It has a accurate result .	1. Development of these type of system is not a cost effective. 2. Very easy to operate by any end user.
Author McKeever, S.; Ye, J.; Coyle, L.; Bleakley, C.; Dobson, (2013) [10]	Human's daily routine activity-based lifestyle pattern monitoring system. In this types lifestyle pattern monitoring system, the daily routine lifestyle pattern will be measured by using analytic and statistical information collected in healthcare monitoring system.	1. System operate ability is very much flexible. 2. System development is very much cost –effective.	1. Extracting useful data from healthcare system for statistical analysis is a very difficult task. 2. For storing and processing data vast amount of memory is needed.
Author Lombriser, C.; Bharatula, N.B.; Roggen, D.; Troster, Get al.(2014) [11]	Infrared installed Motion Sensor based Lifestyle monitoring system (IMSLMS):- In this system He then estimated circadian activity rhythm based on the average amount of time a resident spent in each room, and also on the activity level given by the average number of motion events per room. Large deviations from this average time or number are considered as abnormal patterns	1. Such system has much accurate result when obtained in suitable environmental conditions. 2. Very easy to operate and much cost effective.	1. System sustainability effects in different environment situations. Infrared system is much expensive for installations and maintenance.
Author Zhao, K., and D. He. 2014 [12]	(IMDS) Infrared human activity movement detector: This system is based on infrared sensor based system that has been set inside the bed, chair, door of an human house to detect the various activity of human's daily life activities. It recognizes the activity by using rule based algorithm. Abnormal activities is monitored and recognized by an Gaussian algorithm.	1. This type of system has much accuracy if the algorithm is implement in proper manner. 2. Less expensive system.	1. System spends much of the in recognizes human normal and abnormal behavior, hence required much more time. 2. Required ample amount of data storage capacity.
Author , Zafar, Raheel, Nidal Kamel, Mohamad Naufal, Aamir Saeed Malik, and Faruque Reza. (2015) [13]	Infrared based feature extraction system:- This type of system basically extracts the different featured values of human daily life activity. These activities are labeled as activity various level, mobility level, & non- responsive activity level with the help of motion sensors. The level of human activity level depicts how many no. of times a human (subject) has been captured in installed cameras where as mobility level attributes will depicts the human movements angle of direction.	1. Extracted features when process using algorithm can give much excellent result	1. System consumes much time on detecting various levels of motion of an user. 2. Specific type of machine learning required for feature extraction process.

III. PROPOSED METHOD

After discussing the various method and models given by various research scholars, we had concluded that all the discussed models can be only deal with various abnormalities in human behaviours, but they are not capable of detecting the reason behind these abnormalities and the later-on effect of these abnormalities in patient's life in future. In brief, these types of systems can monitor the change in behavioral patterns in inpatient life and recognize any type of abnormality in their behavior but not the basic cause of that abnormal behavior. Hence in our research work, we are proposing a healthcare model for supervising the various lifestyle pattern for identifying the disease that can be caused due to this disturbing lifestyle pattern with long-term lifestyle pattern monitoring of a human being anywhere in the place [12,13].

As shown in figure (1), our proposed model will be based of hierarchical layered model. It has three different layers of working blocks. Each block has its own specific working strategies. Although each layer has distinct functionalities all the layers are connected to each other. These three layers has following modules:

A. Activity Classifier module

This module identify the various activity pattern of user after providing the dataset for lifestyle activities[14,15].

B. Activity Pattern generation module

This module is responsible for identifying various attributes and parameters for example user's daily activity routine life style pattern, regular activity frequency pattern, grades of frequency of user activity etc, and then will process these attributes and provides this output to the lifestyle disease pattern block for further processing[16,17].

C. Lifestyle pattern Disease recognition Module

This processing block or layer of our proposed architecture is responsible for predicting or recognizing the lifestyle pattern disease. It will also determines the probable risk for disease that can be caused due to changes in lifestyle pattern of an user [18,19].

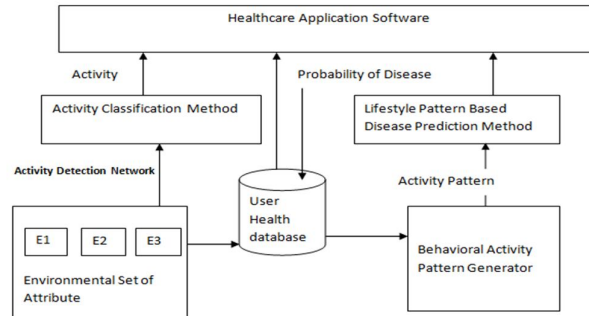


Figure 1. Overall Systematic block diagram of a Proposed Model

TABLE II. AN EXAMPLE OF DISEASE AFFECTED ACTIVITY (DAA) OF DIABETES AND DEPRESSION

Lifestyle Pattern Disease	Early Symptoms and Signs	Disease Affected Activity
Diabetes	1.Increased in Rate of Water Intake 2.Sudden increase of food Intake 3.Lots of fatigue 4.Sudden rise in Urination 5.Sudden Loss in Weight	1.Frequent need of Drinking 2. Frequent need of Food Intake. 3.Frequent need of Sleeping and rest 4.Frequent need of Urination/Toilet 5. Frequently Losing weight
Depression	1. Much of drowsiness. 2. Too much Down Feeling 3. Loss of interest in daily activities. 4. Changes in amount of sleeping hours (Either too much taking sleep or taking very much less sleep.) 5.Less appetite of sudden change in weight	1. Mild illumination in doing daily routine activity. 2. Too much travelling or leaving house, spending time alone in a dark place, not talking to anyone, giving illogical reason for being alone. 3. Frequent change in frequency of doing daily routine work. 4. Taking lots of sleep or even not sleeping an hour. 5. Sudden change in weight (Either overeating hence gaining weight or very much less eating and losing weight).

IV. CONCLUSION

A long-duration lifestyle pattern monitoring system of a user is very much helpful for handling disturbed lifestyle pattern diseases. In this study, we have reviewed the various models already implemented by various research scholars with their advantages and disadvantages. It is realized that various models have monitoring module of behavioral and lifestyle pattern of a user as well as disease caused by that disturbing lifestyle pattern. However, none of the models used thus far can detect the cause of disease affected in user health.

To deal with the issue the study proposes a model that comprises of three working module designed in a hierarchical model manner. Each module has a different working capacity. Here we had described the simple working model in brief. In future work, we will try to develop the model using any machine learning algorithm for predicting the user lifestyle pattern and change in their behavioral pattern.

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