Multi Agent System to Predict, Diagnose and Prevent Malnutrition

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Abstract- the aim of the application is to introduce a new framework that will work under e-government initiatives and will use Agent Technology and Data Mining techniques to reduce malnutrition in children. The information gathered here can be used by the responsible parties to develop more successful strategies for reducing malnutrition in the region. As a solution, we implement a model that reliably classifies and predicts disease in a short period of time, allowing patients to receive a fast diagnosis based on the results.

Keywords – Malnutrition, Data Mining, E-Government, Multi Agent System

I. INTRODUCTION

Healthcare is the preservation or development of health via avoiding, diagnosis, and medical care of diseases, sickness, injury, and other physical and mental debilitation human beings. These days, malnutrition ailments are a standout among the most real issues looked at by our society. The quantity of patients with undernourishment or over nutrition, illnesses developing step by step however never decreases. In addition, this sort of maladies causes in excess of 500,000 passing in India every year and is presently the main foundation of death in India. Recently, the healthcare domain has been offering better facilities for people 24*7 throughout the world in a friendly and beneficial way. But, unfortunately piles of people suffer from various Malnutrition diseases. There is an increase in these diseases due to the negligence of their health. Our periods have been seeing excess of immedicable and grim medical problems.

II. LITERATURE SURVEY

“Knowledge Extraction to Mitigate Child Malnutrition in Developing Countries” Malnutrition in children is a major public health issue because it hinders their physical and mental growth, which has a direct impact on a country's economic and social development, as "today's children are tomorrow's citizens"[1]. The goal is to eliminate child malnutrition based on research of Sri Lankan kids under the age of five. Data mining methods and techniques were

used to retrieve the data as well as some secret information. The aim of this project is to create a conceptual framework using the information gathered from the literature.

“A Sustainable Solution for Monitoring Malnutrition in Children in Developing Countries”. According to a UNICEF survey, there are 101 million underweight children under the age of five [2].India is a developing country that ranks second in the world in terms of the number of malnourished children, which is a frightening statistic. Despite the fact that the Indian government has initiated several initiatives to combat malnutrition, determining the extent of malnutrition is a difficult job. In this article, the author focuses on a technical approach that was created to track children's development in a simple and cost-effective manner.

“IT Application to Mapping the Potential of Malnutrition Problems” The major symptom of malnutrition in children is abnormalities in toddlers' weight over a period of time [3]. This paper aims to develop an information technology model to coordinate the potential for malnutrition-related problems As a result of this initiative, a web-based essence framework with a cross-platform knowledge model and a mobile application-based sustenance system has been created. The output data is a jumbled series of potential malnutrition conditions across the country.

“A survey on nutrition monitoring and dietary management system” Diet and diet are important aspects of a child's health and development. It will not only result in the healthy growth of children but will also help to reduce the risk of deadly diseases such as obesity, cancer, heart related disease, cancer etc [4].This survey provides information about advancement of IOT in the field of healthcare industry which is very beneficial. Numerous and variety of systems for monitoring the nutrition to predict and estimate the calories have been developed by using machine learning and deep learning based techniques.

“A Field Potential Analysis Study of the Effects of Prenatal Protein Malnutrition on Maturation of the Dentate Granule Cell Response” Unlike the immense majority of cells composes the rat central nervous system [5]. For several years, neuroanatomical studies have shown that early malnutrition has a negative impact on the hippocampus. A major reduction in the size of cells extracted from the dentate gyrus, as well as a reduction in the degree of dendrite branching, has been observed. This research aims to contribute to the field of electrophysiological characterization and to assess the significance of prenatal protein in assessing neuronal transmission across the perforate route.

“Tackling Child Malnutrition: An innovative accession for training health workers using ICT” India’s performance in the field of maternal and child health is more below than expected [6].India's performance in the areas of child health and maternal treatment falls short of expectations. According to the NFHS-4 (‘National Family Health Survey-4,') 30.7 percent of children under the age of six in Maharashtra are stunned. This problem is more prevalent among tribal communities and people living in rural areas. One of the shortcomings of the ‘National Rural Health Task' is the ineffectiveness of the training given to ‘Anganawadi Workers' (AWW), ‘ASHA Workers', and their supervisors. This paper outlines the characteristics of a groundbreaking approach to video-based training for all employees using ‘Information and Communication Technologies' (ICT).

“Multi Agent System to Reduce Malnutrition (MASRM) in Children” In our government system, there is a dearth of healthcare-related information technology programs. There is still a lot of room for change in the e-government system [7].To combat malnutrition, we need to design an architecture (‘MASRM') for an upgraded multi-agent framework. This can be useful for diagnosing malnutrition in children and providing dietary guidance to malnourished patients in a simple manner.

“Characteristics and Causes of Malnutrition across Indian States: A Cluster Scrutiny Based on Indian Demographic and Health Survey Data”. The attempt made here is twofold within this frame of reference [8]. To begin, determine whether Indian states can be grouped based on four anthropometric malnutrition parameters. Second, if the clusters developed in this way show different reasons for malnutrition elements. The data from the Indian-DHS (Demographic Health Survey) is used in the study. As a result of the findings, policymakers will be able to take a more targeted approach to malnutrition in various clusters of states.

III. METHODOLOGY

3.1 Architecture Diagram –

E-health care is a difficult task that requires the distribution of medical information, data, and resources among care recipients, specialists, and medical staff. Furthermore, an e-health care platform is a series of open architecture, multi-systems with heterogeneous modules, stable infrastructure, and bio-signals obtained from patients. The e-government initiative created the app to educate people about nutrition and make it easier for them to verify their children's nutritional status. An architecture diagram is a graphical representation of a set of ideas, principles, elements, and components that make up architecture. A coherent collection of principles for a structure is referred to as architecture. These ideas are visualized at four different levels of abstraction.

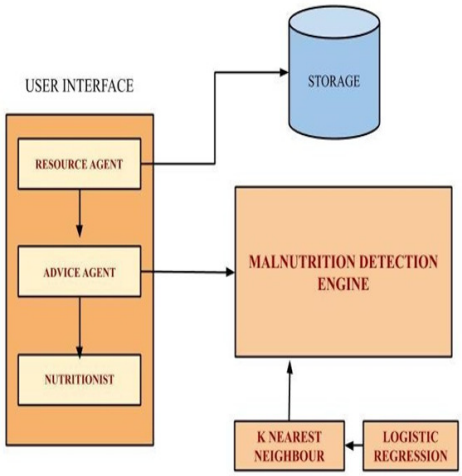

Fig 3.1 Architectural design

The system has following users:

1. Resource Agent collects each child's details in his allocated region. Feeds collected information for respective child and forwards it to the Advice Agent.
2. Advice Agent runs the Detection Engine Process (which will detect if the child is Malnourished or not) on daily bases to filter Malnourished Children's data & to generate output file. This file will go to Nutritionist for his inputs on nutritional advice for affected children, which is forwarded to the Resource Agent.
3. Resource Agent collects nutritional suggestions from advice agent and pass on to respective child/patient
4. Advice Agent keeps track of all the Malnourished Children's data and generates reports in PDF, Excel etc to share it with Government/Admin as per needs.

3.2 K-Nearest Neighbors Algorithm–

The number of training data samples is denoted by m. Assume that p is an unknown stage.

1. Arrange the training samples in a data point array arr []. This implies that each of the array's elements represents a tuple (x, y).
2. From 0 to m, for i=0 to m:
3. Determine the Euclidean distance d (arr[i], p).
4. Create a set of S of K smallest distances. Each of these distances corresponds to a data point that has already been classified.
5. Find the majority label among S and return it.

The data flow diagram (fig 3.2) shows the inter-activities between the external agents and the system that acts as source of data and data sinks. The system's relations with the outside world are only adapted in terms of data flows across the system boundary in the context diagram. The control flow diagram shows all of the processes in a single process but provides little information on how they work internally.

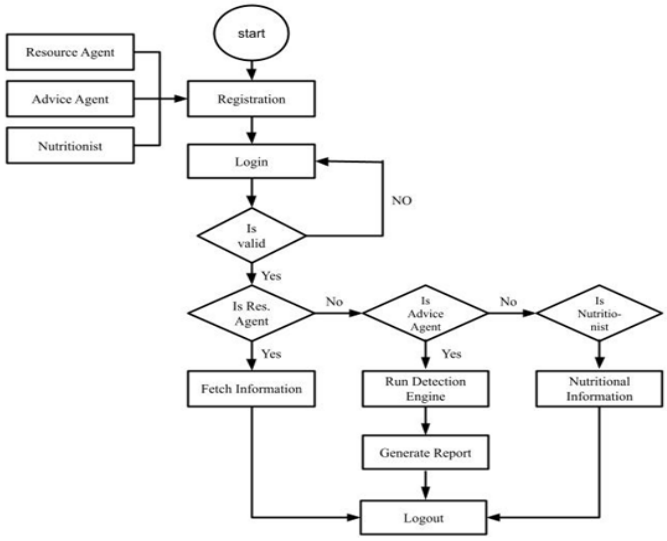

Fig 3.2 Flow Design

IV. IMPLEMENTATION

The improved skeleton that has been suggested will be implemented as a web-based framework. As a result, users will be able to access the system. The framework would be implemented so that it is made up of just one container. Each container is represented by three people: a Resource Agent, an Advice Agent, and a Nutritionist.

4.1 Hardware requirements-

- RAM: 1GB or above
- Hard disk: 10 GB or above
- Processor: 2.4 GHZ or above

4.2 Software requirements-

- Front end: Anaconda
- Back end: SQLite

4.3 Software interfaces-

- Editor-Jupiter Notebook.
- Language-Python

V. Results

Fig.5.1 Detection Engine

Fig.5.2 Nutritional Suggestion

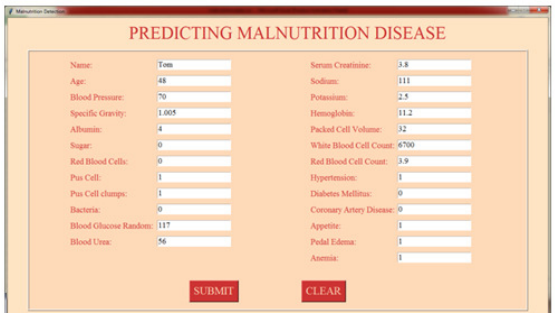

Fig.5.3 Patient details

Fig.5.4 Overall Outcome

Fig 5.1 shows page after adding the patient detail, we run the detection engine to predict whether the patient is diagnosed with malnutrition or not.

Fig 5.2 shows when the patient is diagnosed with malnutrition the nutritional suggestions are put up on the screen such as the diet plan for the malnourished patient.

Fig 5.3 shows have the details about patient which is used for detecting whether the patient is malnourished or not and the details will contain name, age, blood pressure, red blood cell ,anemia etc.

Fig 5.4 shows the overall report of the patient. It consists of the patient detail, test report and the nutritional suggestion. It is the complete report of the patient.

VI. ANALYSIS

Comparing the existing system and the methods used, advantages and disadvantages are listed below. The methodology used in the proposed system is more efficient, compared to the existing system.

6.1 Advantages-

- Explored the likelihood of using artificial intelligence.[1]
- This approach is very effective when compared to baseline.[2]
- The approach has efficient feature extraction mechanism.[3]
- Automated nutrition monitoring and meal prediction.[4]
- Automated computer vision system.[5]
- Liquid food nutrients were predicted.[6]
- The accuracy for single food portion is 99%.[7]
- IMg2 calories app that determines calorie intake and estimation.[8]

6.2 Disadvantages-

- The data is limited to the particular time; context and only limited features are considered.[1]
- The data set is limited to small category and lacks realistic scenarios.[2]
- Lacks mobility.[3]
- Psychological monitoring mechanism is not incorporated.[4]
- It lacks user customization and is GPSS dependent.[5]
- The nutrients are estimated through percentage.[6]
- The database is limited.[7]
- Has limited cuisine varieties and mixed food images is not considered.[8]

6.3 Methodology-

- Entropy based gain ratio concept.[1]
- Pipelined approach.[2]
- Fuzzy c means clustering.[3]
- Neural networks, deep learning.[4]
- SVM.[5]
- Scio –NIR sensor and regression.[6]
- Convolutional neural networks.[7]
- K means clustering and SVM.[8]

VII. Conclusion and Future Scope

7.1 Conclusion-

Previously, it was impossible to incorporate and synchronize all aspects of healthcare into a single, seamless organization. But Multi-agent systems provide a variety of tools that make them suitable for resolving a wide range of healthcare problems. Data is organized and directed for the benefit of patients, but it is also dependent on government specifications and the user's assigned authentication. The Multi Agent system is further enhanced in order to provide critical details about the patient's specific nutritional status.. It will also provide people with a convenient way to verify their child's nutritional status. Incorporating rule-based classification methods to detect malnutrition improves the Multi Agent scheme even further.

7.2 Future Scope-

- In the future, researchers will be able to use an automated data provisioning mechanism to provide data for the task-oriented data mart
- Permitting priorities to hotspots where a high portion of the population suffers from malnutrition, hunger.
- Boosting progress towards an open and fair trading system internationally.

VIII. References

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