

# Data mining in Nutrition and dietetics

B. ShamreenAhamed<sup>1</sup>, Dr.Jayashree<sup>2</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Professor

Rajalakshmi Engineering College, Thandalam, Chennai, Tamil Nadu, India

**Abstract - Data Mining is a powerful concept that can be used in the development and growth of various studies related to health and fitness. One of the major understandings that have evolved over the years is that data mining can be used as a platform for identifying as well as treating diseases and problems caused by food items that are taken by human beings. This paper has a survey regarding the various categories or areas where data mining can be used for health related services.**

**Keywords: Data Mining, Health, Treating Diseases**

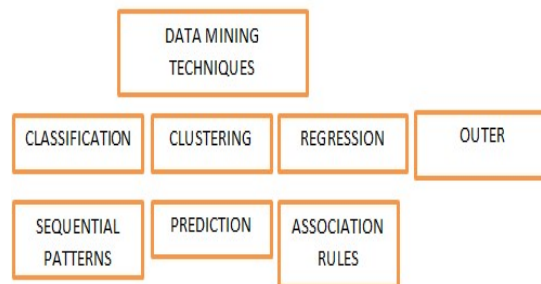
## I. INTRODUCTION

Data mining is the mechanism of discovering the different patterns in data that is large in size and sets that contain various techniques at the corresponding steps of machine learning, statistics, and database systems<sup>[2]</sup>. It is a method of obtaining the information at various subfields of computer science and statistics from a data set and transforms the data into an explicit model that can be used later<sup>[4]</sup>.

Data mining is a step by step analysis of the KDD (knowledge discovery in databases). This concept of Data Mining has been used in several fields of research including Nutrition. The concepts related to nutrition can have a varied effect on the usage of the mining information or data used<sup>[10]</sup>.

Knowledge discovery began by identifying how people process the information using frames, protocols, tags and networks. Based on processing of data, knowledge discovery is divided into four phases like a) knowledge acquisition, b) knowledge base, c) knowledge dissemination and d) knowledge application<sup>[20]</sup>.

In developing countries, many national development plans have included nutrition considerations for decades<sup>[5]</sup>. This has led to a major thrust from the governments to promote nutrition education activities. Many public nutrition research institutes have stepped up their efforts to educate the public by conducting workshops which includes various techniques like giving lectures, providing questionnaires, etc., to train the participants in the most basic and important concepts of nutrition and dietetics<sup>[7]</sup>.



### a) *Techniques of Data Mining*

In this paper we focus on the various applications involving the present knowledge about the child and how it improves after the training session<sup>[5]</sup>. This has been used to detect what kind of participant in the training session perform well/poorly and to determine if training has been successful and what improvements can be made in future training sessions<sup>[11]</sup>.

### b) *Nutrition Therapy:*

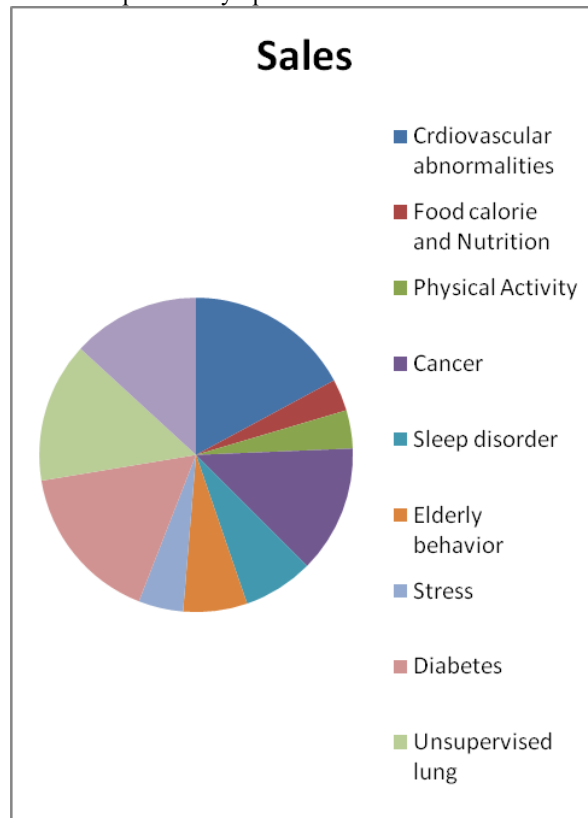
In terms of Nutrition Therapy, the estimate and analysis of the status of health in various areas throughout the world is a massive challenge for information technology<sup>[11]</sup>. Data mining, plays a vital role in health care industry since it really has the potential to generate a knowledge-rich environment that reduces medical errors, decreases costs by increasing efficiency, improves the quality of clinical decisions and significantly enhances patient's outcomes and quality of life<sup>[1]</sup>.

This study falls within the context of nutrition evaluation and its main goal is to apply classification algorithms in order to predict if a nutrition specialist is needed for a particular patient. One of the tools resorted in this study was the Waikato Environment for Knowledge Analysis (Weka in advance) Workbench since it allows to quickly try out and compare different machine learning solutions[3].

The tasks involved in the development of this project included data preparation, data pre-processing, data transformation and cleaning, application of several classifiers and its respective evaluation through performance measures that include the confusion matrix, accuracy, error rate, and others. The accomplished results showed to be quite optimistic presenting promising values of performance measures, specifically an accuracy around 91%[9].

c) *Machine Learning and Nutrition:*

In the healthcare industry, the patient's nutrition is a key factor in their treatment process[9]. Every user has their own specific nutritional needs and requirements. An appropriate nutrition policy can therefore help the patient's recovery process and alleviate possible symptoms



d) Pie Chart of Sales

e) *Intelligent Nutrition*

In the healthcare industry, the patient's nutrition is a key factor in their treatment process. Every user has their own specific nutritional needs and requirements. An appropriate nutrition policy can therefore help the patient's recovery process and alleviate possible symptoms. Food recommender systems are platforms that offer personalised suggestions of recipes to users[2]. However, there is a lack of usage of recipe recommendation systems in the healthcare sector. Multiple challenges in representing the domain of food and the patient's needs make it complicated to implement these systems. The present project aims to develop a platform for an intelligent planning of the user's meals, based on their clinical conditions.

The application of machine learning algorithms on nutrition, in healthcare services and continuous care is thus a key topic of research. This platform will be tested and deployed at the Social Cafeteria of Vila Verde (Cantina Social da Santa Casa da Misericórdia de Vila Verde). The development of this project will use the Design Science Research (DSR) investigation methodology, ensuring that the solution to the problem accomplishes all

needs and requirements of the professionals, while elucidating new knowledge both for the institution and the scientific community.

#### f) *Toddler Nutrition*

Growth and development process for toddler become the key point for growth and development in the next period. Nutrition needs must be given precisely, so children have a good nutrition status. Nutrition status monitoring for toddlers could be done with Anthropometry calculations, based on 3 index, weight for age (WFA), height for age (HFA), and weight for height (WFA). According to survey from DesaTunjungtirto'sPosyandu (PosPelayananTerpadu/Integrated Service Post), they have not done the calculation of nutrition status, based on Anthropometry standards. To make it easier, we can use classification method.

Classification is one of the data mining methods that find models or functions process that explain or differentiate the data class, its function is for predicting class from one unknown label object. Naïve Bayes is one of the popular classification algorithms and categorized as 10 best algorithms for data mining.

The purpose of this research is to classified the toddlers's nutrition status based on 3 anthropometry index used Naïve Bayes algorithm. This classification will be tested with k-fold cross validation method to know the success of classification process.

According to the results, can be concluded that the process of the toddler nutrition status classification, for each index, have 88%accuracy for WFA index, 64% accuracy for HFA index and 68% accuracy for WFH index.

## II. PERFORMANCE MEASURES

One of the most important concepts of Data Mining is the assessment of the algorithms. The components that are mostly used in obtaining the results of classification algorithms used are: confusion matrix, learning curves and receiver operating curves (ROC). The confusion matrix displays the number of predictions that are correct and wrong, developed by the model compared with the actual methods in the test data. Confusion matrix with two classes True and False is presented in Table II. The correctly obtained values that are relative to the total number of predicted values given by Precision parameter assume values between 0 and 1. Precision equal to 0 specifies that the model has no predictive power, it is not conclusive [8].

## III. FUTURE ENHANCEMENTS

Food is a major source of energy to initiate and manage tissue growth, and to regularizethe processes of the body. Nutritious food is foundation of health. Therefore, enough nutrients must be circulated in the human body to meet its desired needs[12]. Nutrition is related to various factors such as infant, child and maternal health, it also involves stronger immune system to fight diseases, have a safer pregnancy and childbirth. It leads to lower risk of non-communicable diseases (such as stroke, diabetes and cardiovascular disease) and longevity. Breastfeeding for babies in first 6 months of life is essential to lay down a good health foundation for the upcoming years.

Breastfeeding has a various advantages like lower risk of respiratory tract infections ,diarrhea , sudden infant death syndrome, allergies (e.g. asthma), obesity, Type 1 & 2 diabetes in later life, etc. It providespreservation against breast and ovarian cancer between the mother and the baby, and hip fractures in later life.

There are experiments conducted for proving the association between prolonged breastfeeding and decrease postmenopausal risk factors for cardiovascular (CV) disease. Early life under-nutrition is a hidden cause associated with most of young child deaths[13].

It becomes difficult for them to carry out physical work , to study and progress in school, engage in employment in adulthood and their capacity to resist to diseases becomes very low. This gives rise to poor diet and nutrition along with obesity, which become important causes for many non-communicable diseases (NCDs) like cancer, stroke, diabetes, ischemic heart disease, hypertension etc[6]

## IV. CONCLUSION

An integrated method is necessary in order to develop the idea of healthy nutrition in a country. There are several Multi-sectoral approaches that are recently invented to involve all the age groups, considering their cultural diversity in food habits and their capacity for earning is required to make people know the consequence of not having healthy nutrition[4]. The steps for such healthy nutrition should be taken right from childhood in schools, child care centres and families so that the foundation for healthy eating habits is started in right age and can be stimulated in future generations effectively. The nutritious foods should be made available at low cost and must be established by policy making, mobilizing community and health education.

## REFERENCES

- [1] T. D. Pratiwi, Masrul, and E. Yerizel, "Hubungan Pola Asuh Ibu dengan Status Gizi Balita di Wilayah Kerja Puskesmas Belimbing Kota Padang," *J. Kesehat. Andalas*, vol. 5, no. 3, pp. 661–665, 2016.
- [2] Kemenkes, Keputusan Menteri Kesehatan Republik Indonesia Nomor: 1995/Menkes/ SK/XII/2010 tentang Standar Antropometri Penilaian Status Gizi Anak. 2011.
- [3] E. L. Amalia, H. S. Dachlan, B. Santoso, and G. Ag, "Integrasi Sistem Pakard dan Algoritma Genetika untuk Mengidentifikasi Status Gizi pada Balita," *J. EECCIS*, vol. 8, no. 1, pp. 1–6, 2014. I. Kavakiotis, O. Tsave, A. Salifoglou, N. Maglaveras, I. Vlahavas, and I. Chouvarda, "Machine learning and data mining methods in diabetes research," *Computational and Structural Biotechnology Journal*, 2017.
- [4] Miranda, J. Machado, M. Esteves, F. and A. Abelha, "Mobile Collaborative Augmented Reality and Business Intelligence: A System to Support Elderly People Self-care", in *Advances in Intelligent Systems and Computing*, Springer, 2018 (accepted). CNS, "2016 Global Nutrition Report," in Chinese Nutrition Society, 2016.
- [5] WHO, "Global Status Report on Noncommunicable Diseases (2014)," in World Health Organization, 2014.
- [6] S. Balsari, P. Vemulapalli, M. Gofine et al., "A Retrospective Analysis of Hypertension Screening at a Mass Gathering in India: Implications for Non-communicable Disease Control Strategies," *Journal of Human Hypertension*, vol. 31, no. 11, pp. 750–753, 2017.
- [7] J. Neves, H. Vicente, M. Esteves, F. Ferraz, A. Abelha, J. Machado, J. Machado, J. Neves, J. Ribeiro, and L. Sampaio, "A Deep-Big Data Approach to Health Care in the AI Age," *Mobile Networks and Applications*, vol. 23, no. 4, pp. 1123–1128, 8 2018.
- [8] M. Esteves, A. Abelha, and J. Machado, "The development of a pervasive Web application to alert patients based on business intelligence clinical indicators: a case study in a health institution," *Wireless Networks*, 1 2019.
- [9] NCI Dictionary of Cancer Terms, "Definition of medical nutrition therapy - NCI Dictionary of Cancer Terms - National Cancer Institute," p. 1, 2018.
- [10] F. I. Mustapha, "NCD CME, NIH Research Week 2014." 2014. a S. Sarvestani, a a Safavi, N. M. Parandeh, and M. Salehi, "Predicting breast cancer recurrence using data mining techniques, *Softw. Technol. Eng. ICSTE 2010 2nd Int. Conf.*, vol. 2, pp. 10–110, 2010.
- [11] A. Sa-ngasoongsong and J. Chongwatpol, "An Analysis of Diabetes Risk Factors Using Data Mining Approach," pp. 1–11, 2012.
- [12] H. D. Masethe and M. A. Masethe, "Prediction of Heart Disease using Classification Algorithms," vol. II, pp. 22–24, 2014.
- [13] A. K. Sigurdardottir, H. Jonsdottir, and R. Benediktsson, "Outcomes of educational interventions in type 2 diabetes: WEKA data-mining analysis," *Patient education and counseling*, 2007, pp. 21–31.
- [14] S. Oliveira, F. Portela, M. F. Santos, J. Machado, A. Abelha, A. Silva, and F. Rua, "Clustering data mining models to identify patterns in weaning patient failures," *International journal of biology and biomedical engineering*, 2016.
- [15] A. E. Sari, "Pengklasifikasian Kondisi Kesehatan Balita Menggunakan Naive Bayes Classification," *Simki-Techsain*, vol. 01, no. 07, pp. 2–11, 2017.
- [16] Wikipedia contributors, "SWOT analysis," 2019. [https://en.wikipedia.org/w/index.php?title=SWOT\\_analysis&oldid=885318472](https://en.wikipedia.org/w/index.php?title=SWOT_analysis&oldid=885318472)
- [17] R. Peixoto, F. Portela, M. F. Santos, A. Abelha, J. Machado and F. R. Martins. Predicting resurgeries in Intensive Care using Data Mining. 16th International Conference on Biomedical Engineering (ICBME 2016). Singapore. Springer, IFMBE, 2016.
- [18] Reis, R., Mendonça, A., Ferreira, D. L. A., Peixoto, H., & Machado, J. (2017) "Business Intelligence for Nutrition Therapy". In *Next-Generation Mobile and Pervasive Healthcare Solutions* (pp. 203-218). IGI Global.
- [19] S. Tellier, A. Kiaby Lars, P. Nissen et al., "Basic Concepts and Current Challenges of Public Health in Humanitarian Action," *International Humanitarian Action*, pp. 229–317, 2017.
- [20] K Jayashree, R Abirami, P Rajeswari Challenges and Solutions of Big Data and IoT Handbook of Research on Big Data and the IoT, 264-272