International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2019 IJSRCSEIT | Volume 5 | Issue 2 | ISSN : 2456-3307
DOI : https://doi.org/10.32628/CSEIT1952264

Clinical Decision Support Systems

Pratibha Tiwari, Nishant Shah, Evanglelin Samuel, Poojan Shah, Yask Patel, Pratibha Tiwari
Department of Computer Science and Engineering Parul University, Limda, Waghodia Gujarat, India

ABSTRACT

Nowadays, every field is digitizing their data for easy access at anytime and anywhere or even for enclosed cabinet servers, especially the health care sector. But, that is not the only reason health care sector is computerizing its data. These huge chucks of records are used for research purposes. Many hospitals are working with education institutes with research departments (Damian Borbolla et.al 2010).CDSS performs Knowledge-based analyses on these EHRs and running disease prediction models on these data is done. There may be many complications. We have reviewed the problems faced by such system from previous researches and implemented systems.

Keywords : Clinical Decision Support System, Decision Support System, Disease Prediction, Machine Learning.

I. INTRODUCTION

The medical records of thousands of patients are recorded digitally day-to-day which is known as computerized physician order entry (CPOE), while previous data is being stored in the electronic health records (EHRs). The benefits of doing so is to use these big data for data science and machine learning analysis [3].These EHRs are implemented into machine learning algorithms which are used for disease prediction.

Decision Support System (DSS) in health care domain or Clinical Decision Support System (CDSS) a type of software system that supports the decision-making of a clinician or health care professional. These systems are commonly defined as any type of application system that presents analytic data to help doctors or other medical professionals make decisions.

II. BACKGROUND

Over the years, four architectural phases of CDSS have been evolved.

Namely,

1) Standalone decision support systems beginning in 1959 known as computerized physician [1].
2) Integrated systems, beginning in 1967 [1].
3) Standards-based system, beginning in 1989 [1].
4) Service models, beginning in 2005 [1].

These architectural phases depict how the DSS interacts with CPOEs or EHRs.

III. METHODS AND MATERIAL

3. Problem

Recurring problems in CDSS are as follows:

3.1 Fixed knowledge representation

Knowledge-based data discovery requires fixed knowledge representation, there are also terminology issues and EHR maybe located on different sources. This leads to difficulties in transferring from one place to another [1].

3.2 Missing values

The conversion of health records into EHR can result in some missing values. The manual entry of data such as pharmacy entries into the database, results in errors, incorrect or missing values and. Also, some patients may not have conducted all the examinations. But, machine learning algorithm requires one to have complete dataset and most of them does not consider records with missing values. Generally, data scientists were required to fill missing values with either zero or average of other values.

Missing data problem has a better solution. the authors (Uiwon Hwang et.al 2018) are motivated to develop general adverbial networks (GANs). In GAN, a discriminator is used against such missing and/or fake data in EHRs. No other framework has used discriminator for missing data imputation till date. The author proposes auxiliary classifier GANs, a stacked encoder and an unsupervised learning algorithm in their framework.

3.3 Imbalanced Dataset

In some cases, the dataset used for disease prediction maybe imbalanced which maybe lead to less accurate result. The EHR dataset maybe cohort and so it gives biased results. One must have access to varied record of patients with varied symptoms and lab report results to increase the efficient output. These ideal datasets may not be always available.

3.4 Cost

Developing a full-fledged CPOE system for a CDSS can be very costly but not as costly as purchasing one."Brigham and Womens Hospital has reported cost of 1.9 million USB for developing and implementing CPOE in 1992, with ongoing maintenance costs of 500,000 USB per year, although this was incremental to what was already highly developed clinical system [6].Although, the medical error rates have drastically decreased [2].

3.5 Effectiveness

This study (Kensaku Kawamoto et.al 2005) shows that some parameters or features are more important for effective prediction of disease. Success rate of CDSS with and without primary features and found that it was just over 0.05 [5].

IV.CONCLUSION

In this survey paper, we described CDSS being implemented into CPOEs and EHRs and the issues that can occur in doing so.So, one must account for these problems.

V. REFERENCES

[1]. Wright, A. and Sittig, D. (2008). A four-phase model of the evolution of clinical decision support architectures. International Journal of Medical Informatics, 77(10), pp.641-649.

[2]. Kaushal, R., Shojania, K. and Bates, D. (2003). Effects of Computerized Physician Order Entry and Clinical Decision Support Systems on Medication Safety. Archives of Internal Medicine, 163(12), p.1409.

[3]. Hwang, U., Choi, S., Lee, H. and Yoon, S. (2019). Adversarial Training for Disease Prediction from Electronic Health Records with Missing Data. [online] arXiv.org. Available at: https://arxiv.org/abs/1711.04126 [Accessed 26 Feb. 2019].

[4]. Chen, Y., Lin, C., Wang, K., Rahman, L., Lee, D., Chung, W. and Lin, H. (2018). Design of a Clinical Decision Support System for Fracture Prediction Using Imbalanced Dataset.Journal of Healthcare Engineering, 2018, pp.1-13.

[5]. Kawamoto, K., Houlihan, C., Balas, E. and Lobach, D. (2019). Improving clinical prac- tice using clinical decision support systems: a systematic review of trials to identify features critical to success.

[6]. Gaser J, Teich JM, Kupermsn G.Impact of Information events on medical care. In: Proceedings on the 1996 IMMS Annual Conference. Chicago, III: Healthcare Information and Management Systems Society; 1996:1-9.

[7]. Borbolla, Damian Otero, Carlos Lobach, David Kawamoto, Kensaku M Gomez Saldao, Ana Staccia, Gustavo Gastn, Lpez Figar, Silvana Luna, Daniel Quirs, Fernn. (2010). Implementation of a clinical decision support system using a service model: Results of a feasibility study. Studies in health technology and informatics. 160. 816-20. 10.3233/978- 1-60750-588-4-816.

Cite this article as :

Pratibha Tiwari, Nishant Shah, Evanglelin Samuel, Poojan Shah, Yask Patel, Pratibha Tiwari, "Clinical Decision Support Systems ", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 5 Issue 2, pp. 993-995, March-April 2019. Available at doi :
https://doi.org/10.32628/CSEIT1952264
Journal URL : http://ijsrcseit.com/CSEIT1952264