

Quality of Service Enhanced Framework for Disease Detection and Drug Discovery

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Abstract— Disease detection frameworks having blend of distinct fields of concerned research are the need of hour as the domain is very challenging and essential for the human race. Its expanding every day and its impact is much bigger than the earlier era. Quality of service(QoS) is an important consideration for designing sophisticated futuristic healthcare systems. One such quality parameter of reliability is consolidated in this disease detection framework incorporating information-centric networking of medical knowledge-base and protein/gene knowledge-base. The proposed framework is designed and implemented keeping in view of research progress of two highly interrelated research areas which are often not used together but can be combined to formulate an efficient disease detection system. Machine learning and deep learning is also incorporated to improve the quality of service parameter in terms of accuracy and reliability of the system. Various ML configurations formed a test bed for the accuracy check at different system settings indicating a perfect mix for a specific detection requirement. Results indicate promising detection rate of 71% combined accuracy and a remarkable 97% accuracy rate for specific single class detection along with the improvement in reliability factor.

Keywords— ICN, Disease detection, Drug discovery, Machine Learning, Quality of Service.

I. INTRODUCTION

Health care systems are developed and worked upon for excellence since ages. Emergence of new technology boosts the process of up-gradation and refinement of such systems. This research focus on exploring some of the avenues of advanced healthcare system setups.

First focus is integration of genetic biomarkers of disease detection in the form of use of existing and evolving research with conventional disease detection strategies and drug discovery process.

Second concern is use of more suitable ICN for exchange of information between various health care modules. Third important consideration is enhancing QoS parameters by exploring previous benchmarks for their QoS parameters limitations and incorporating their remedies in ICN layer itself.

Fourth and final task is design of a framework which integrates the aforementioned tasks and fulfils important QoS parameters of reliability and scalability among other parameters.

II. RELATED WORK

Bengt Ahlgrem. et al. [1] in 2012 conducted a review of information centric networking (QoS) thereby elucidating two important factors viz. Scalability and cost of content distribution. The main development to introduce scalability and limit cost of communication is adoption of content distribution networks (CDN). Authors have surveyed network approaches that introduced hop to hop transport along with caching and enhanced reliability of network

Oscar Gama et al. in 2008 revealed the need of providing Quality of Service for e-healthcare systems. They have surveyed several mechanisms using wireless sensor networks to improve certain QoS parameters like packet loss ratio, transmission delay, bandwidth availability and minimum sampling rate for ECG signals.

In 2012 A. A. Hamed et al. [6] proposed T-Recs System which was the very interesting concept of drug recommender system for users. It was time aware twitter-based drug recommender system which uses the tweet sentiments at regular time stamp and based on that tweets data classifier

provide the recommendations using white box approach decision tree approach. Using the data mining approach, the system provided the alternate medicine product to the user. Their recommendations using this approach promoted public health as well as awareness in the public domain.

In 2012 R.C. Chen et al. [7] proposed the recommender system for anti diabetic drugs selection based on domain ontology and the SWRL (semantic web rule language). In proposed recommender system the medicine consultant data/information was transferred in to the anti diabetic drugs knowledge system. The system has the capability to scrutinize the symptoms of diabetes and recommend the appropriate drug to user among the related drugs. The medication recommender system, based on domain ontology, employ the knowledge and facilitate the user as well as helps in practice for the management of diabetes. The recommender system acquired the help of SWRL (semantic web rule language) and the JESS (Java expert system shell) to prescribe the prescription for the patients.

In 2012 R. Chen et al. [8] expressed the need of personalised medicines and suggested the system biology which describe the personalized medicines for future health care system on individual patients. The author suggested that the advancement in the technology boosted the area's of personalised medicine, which shifted the paradigms of health care systems from disease detection and its treatments to the predictive as well as preventive medicines also the personalized health recommender system. The author also envisioned that the whole genome would be the collaborative part of the patient medical record system and the health of the patient regularly examined at home or at clinic and the data generated through regular monitoring system will be stored in DBMS's at ending station like hospitals, and the medical experts at hospitals can use it for individual diagnosis and treatment purposes as well as can act as the health information service provider.

In 2012 L.M. Ma'aruf et al. [9] proposed the expert diet prescription system which identified the illness by directly or through symptoms and recommend the appropriated diet or diet plan corresponding to the illness. The author enlightened the use of fruits/food instead of Drugs because drugs have to much side effects of the human body, so they recommended the need of diet expert system instead of drug recommender system because the long queues at hospitals have alarming situation. The author considered the various illness and creates the database or knowledge base for malaria, diabetes, goiter, cancer, measles, heart disease and cholera, and developed the recommender system with the help of MYSQL, PHP and wamp server. Their expert diet system can be used by anyone at anywhere either for professional use or even for personal use. The system have great benefit towards the society, and improve the lifestyle of people those who properly utilized it.

In 2012 C. Doulaverakis et al. [10] proposed the drug recommender system based on ontology. They suggested that how semantic web technology and OWL is a better match for drug recommender system. In the ontology specially OWL can easily encapsulate or express the medical issues or the medical information and the rule based reasoning can easily encode as well as capture the drug-drug interaction information which can be helpful for medical decisions as well as assistance to expert of domain. The author used the GalenOWL the semantic web based technology for their discovery. They express their views over the importance to use semantic web and OWL for drug recommender server. They qualitatively compare and comparatively express the GalenOWL and GalenD rules, their prediction about semantic web technology as compare to traditionally business logic revealed the importance of semantic web on the basis of time and memory requirements. Finally they revealed that Galen OWL is also capable for drug-disease interaction discovery.

In 2012 A. S. Hussein et al. [11] proposed the reliable and accurate recommender system for the CDD (chronic disease diagnosis) specially in the case of diabetes. They use the decision tree classification approach to grab the peak accuracy in disease risk prediction and random forest algorithm for mining their recommendation. To provide an accurate recommendation on medical data is a challenging task because of the real-time complex, large, unbalance, missing and noisy data. So they consider the attribute selection methodology to reduce the complexity of real-time unbalance data which leads improvement in prediction of the recommended model. They suggested how information and communication technology growth and its advancement opens the doors for researcher in the areas of E-Health monitoring systems. Those who used the emerged recommender system, their lifestyle and health got improved because of its predicting capability and appropriate recommendations for consumers.

In 2005 K. Shimada et al. [12] proposed the drug recommender system for patients those who have infectious diseases. They proposed the decision support system which helps the doctors to select first line drug in appropriate way. Their recommender system classifies the patient capability to resist themselves from transferable/infectious diseases by considering risk level for infection.

In 2014 Y. Zhang et al. [13] proposed the COMER (cloud based medicine recommendation) which is cloud-based recommender system for online purchasing the medicines. The author expressed their views on QoE (Quality of Experience) and suggested the importance of cloud-based recommender system in case of personalized medicine recommendations. With the rapid growth in e-commerce people prefer to buy medicines online because of the easiness of such broad area, but to buy medicine online blindly having