DIAGNOSING HEPATITIS USING HYBRID FUZZY-CBR

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ABSTRAK

Penduduk Malaysia pada masa ini dianggarkan 28.9 juta dengan bilangan pakar perubatan adalah 2.500 dan 20.280 doktor. Bilangan nisbah ini yang menyebabkan pesakit perlu menunggu lebih lama di hospital-hospital kerajaan dan klinik sebelum mereka boleh berjumpa doktor atau pakar perubatan. Bagi menyelesaikan masalah ini, Kementerian Kesihatan telah memberi jaminan untuk mengurangkan masa menunggu pemeriksaan pesakit dari 45 minit hingga 30 minit dengan menyediakan peruntukan bajet yang besar kepada sektor perubatan. Bajet ini akan digunakan sama ada untuk membeli peralatan baru yang boleh bekerja dengan kapasiti besar atau menaik taraf kelengkapan lama untuk bekerja dengan lebih cepat atau membina hospital baru untuk merawat lebih ramai pesakit atau mengupah doktor lain dari luar negara. Oleh sebab itu dan Hari Hepatitis Sedunia WHO yang akan datang pada 28 Julai 2012, kajian ini mencadangkan penggunaan kepintaran buatan hibrid yang mengabungkan Logik Kabur dan Kes Berasaskan Penaakulan (CBR) yang boleh disepadukan dalam sistem diagnosis untuk mengklasifikasikan keadaan pesakit dengan menggunakan pengukuran teknik *fuzzy* dan persamaan yang berdasarkan gejala semasa pesakit hepatitis. Fokus kajian ini adalah untuk membangunkan sistem sokongan keputusan automatik yang boleh digunakan oleh doktor dan pakar klinikal untuk mempercepatkan pemprosesan diagnosis. Hasilnya, prototaip yang dikenali sebagai Sistem Kepintaran Sokongan Keputusan Perubatan (IMDSS) menggunakan *Fuzzy-CBR* enjin untuk tujuan diagnosis telah dibangunkan, disahkan dan dinilai dalam kajian ini. Dapatan melalui pengesahan dan fasa penilaian menunjukkan bahawa IMDSS boleh dipercayai dalam membantu doktor dan perubatan semasa proses diagnosis. Malah, diagnosis pesakit telah menjadi lebih mudah daripada proses manual dan senang digunakan.

Kata Kunci: Hepatitis, Logik Kabur, Kes Berasaskan Penaakulan, Kepintaran Buatan Hibrid, Kementerian Kesihatan, Sektor Perubatan.

ABSTRACT

The Malaysia populations are currently estimated to be 28.9 million with a number of medical specialists is 2,500 and 20,280 doctors. This ratio figures to cause patients need to wait longer in government hospitals and clinics before they can meet doctor or medical specialist. In order to resolve this problem, Ministry of Health has pledged to reduce waiting time of patient examination from 45 minutes to 30 minutes by provide allocation of large budget to the medical sector. This budget will be used either to buy new equipment, which can work with large capacity or upgrade the old equipment to work faster or build the new hospital to tend more patients or hire other doctors from overseas. Due to that reason and the coming which World Hepatitis Day on 28 July 2012, this study proposes a the use of hybrid intelligent, which combine Fuzzy Logic and Case-Based Reasoning (CBR) approach that could be integrated in the diagnosis system to classify patient condition by using fuzzy technique and similarity measurement based on current symptoms of a hepatitis patient. Focus of this study is to develop an automated decision support system that can be used by the doctors to accelerate diagnosis processing. As a result, a prototype called Intelligent Medical Decision Support System (IMDSS) using Fuzzy-CBR engine for diagnosis purposes has been developed, validated and evaluated in this study. The finding through validation and evaluation phase indicates that IMDSS is reliable in assisting doctors during the diagnosis process. In fact, the diagnosis of a patient has become easier than the manual process and easy to use.

Keywords: Hepatitis, Fuzzy Logic, Case-Based Reasoning, Hybrid Intelligent, Ministry of Health, Medical Domain.

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LIST OF ABBREVIATIONS

AHP	Analytical Hierarchy Process
ANFIS	Adaptive Neuro-Fuzzy Inference System
ANN	Artificial Neural Network
CART	Classification and Regression Tree
CBR	Case-Based Reasoning
EC	Evolutionary Computation
FACO	Fuzzy Based Ant Miner Algorithm
FIS	Fuzzy Inference System
FL	Fuzzy Logic
FS	Feature Selection
GA	Genetic Algorithm
GRNN	Generalized Regression Neural Network
GUI	Graphical User Interface
HBV	Hepatitis B Viral
IMDSS	Intelligent Medical Decision Support System
LDA	Linear Discriminant Analysis
LFDA	Local Fisher Discriminant Analysis
LSSVM	Least Square Support Vector Machine Classifier
LVQ	Learning Vector Quantization
ML	Machine Learning
NC	Neural Computing
NIC	Nonlinear Integral Classifier
PNN	Probabilistic Neural Networks
PR	Probabilistic Reasoning
PSO	Particle Swarm Optimization
RBEF	Radial Basis Network Exact Fit
RBF	Radial Basis Functions
RS	Rough Set
SA	Simulated Annealing
SC	Soft computing

SVM	Support Vector Machines
RBR	Rule-Based Reasoning
TAM	Technology Acceptance Model
UML	Unified Modeling Language

CHAPTER 1

INTRODUCTION

This chapter describes the background of the study which includes problem statement, project question, objective, scope and the significance of this project.

1.1 Overview of the Project

To date, there are five main hepatitis viruses, referred to as types A, B, C, D and E. These five types are of the greatest concern because of the burden of illness and death they cause and the potential for outbreaks and epidemic spread (World Health Organization, 2012). Currently, hepatitis B and C are two main strong viruses that have caused approximately one million people to die in a year. 500 million people around the world are currently infected with chronic hepatitis B or C and one in three people have been exposed to one or both viruses (World Health Alliance, 2012). Unlike hepatitis C, hepatitis B can be prevented through effective vaccination.

The rates of preference of Soft omputing (SC) methodologies in medicine are found as 68% of fuzzy logic-neural networks, 27% of neural networks-genetic algorithm and 5% of the fuzzy logic-genetic algorithm (Yardimci, 2009). In medical practice, the effectiveness and efficiency of different medical diagnosis are important due to the impact of this singular decision that will lead to the disease prognosis (Uzoka *et. al.*, 2011). Doctors have the different way of doing the examination to the patient due to his/her knowledge and experience in the medical field (O'Malley, 2005).

SC is defined as a collection of techniques which uses the human mind as a model and aims at formalizing our cognitive processes, operating in an environment that is subject to uncertainty and imprecision (Cabrera, *et. al.*, 2009). Its objective is to study, model and analyze complex phenomena for which conventional methods have not yielded low cost, analytic, and complete solutions. In fact, the guiding principle of SC is to exploit the tolerance for imprecision and uncertainty to achieve tractability, robustness, and low solution cost (Zadeh, 1994). These systems are the ones that model the real world and are of most interest to the modern science (Bonissone *et. al.*, 1999). Component of SC is Fuzzy Logic (FL), Neural Computing

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