Case-Based Reasoning Approach for Thalassaemia Diagnosis

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ABSTRAK

Thesis ini mencadangkan sebuah model penaakulan berasakan kes untuk diagnosis Thalassaemia. Model ini direkabentuk dan sebuah prototaip (TDS) dibina bagi menguji ketepatan diagnosis model tersebut. Dua method persamaan lokal digabungkan dengan dua persamaan global dan diuji untuk mendapatkan mengenalpasti model yang sesuai. Nilai K yang berpatutan juga dikenalpasti untuk model ini. Akhirnya, pengujian menggunakan teknik *'leave-one-out'* dilakukan ke atas kes-kes sebenar daipada Hospital Besar Alor Star dan hasil ujian ketepatan diagnosisnya mencapai 88%. Hasil ujian ini menunjukkan bahawa teknik penaakulan berasaskan kes berpotensi untuk digunakan dalam diagnosis penyakit Thalassaemia.

ABSTRACT

This thesis proposes a Case-based Reasoning model for medical diagnosis, particularly for Thalassaemia diagnosis. The model is designed and a prototype is developed to test the diagnosis accuracy of the model. Two local similarity combined with two global similarity is evaluated to identify the suitable similarity function for the model. The appropriate K value for Nearest Neighbour also identified for this model. Finally, the testing done using leave one out method on Thalassaemia cases from Alor Star General Hospital and the testing demonstrates 88% of diagnosis accuracy. The results show that case-based reasoning model has a great potential to be implemented in diagnosing Thalassaemia cases.

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List of Abbreviations

AI	Artificial Intelligence
CBR	Case-Based Reasoning
TAM	Thalassaemia Association of Malaysia
FBP	Full Blood Picture
HB	Hemoglobin
BP	Back-Propagation Neural Network
TDS	Thalassaemia Diagnosis Support
TRBC	Total Red Blood Count
MCV	Mean Corpuscular Volume of red Cells
MCH	Mean Corpuscular Haemoglobin
MCHC	Mean Corpuscular Haemoglobin Concentration
ALDEHBF	Alkaline Denaturation for Haemoglobin Feotus
HBEL	Haemoglobin Electrophoresis
HBA2S	Haemoglobin A2 Estimation
HINC	Heamoglobin Inclusion
k-NN	k Nearest Neighbour
SEFE	Serum Ferritin
RWBC	Ratio Local Similarity and Weighted Block-City Global Similarity
EWBC	Euclidean Local Similarity and Weighted Block-City Global Similarity
EE	Euclidean Local and Global Similarity
RE	Ratio Local Similarity and Euclidean Global Similarity

CHAPTER 1

INTRODUCTION

Case-based reasoning (CBR) is an Artificial Intelligence (AI) technique for high-level reasoning and a knowledge-based paradigm that emerges from the desire to imitate human reasoning in decision making. CBR is known as a subset of Knowledge-based system (Turban, 1995), relies on past similar cases to identify problem solutions. Instead of relying solely on general knowledge, CBR utilizes the specific knowledge of previous experiences or cases to solve new problems by remembering previous similar cases (Leake, 1996; Kolodner, 1993; Riesback, and Schank, 1989). Previous cases are frequently reused to solve current problems and resemble human thought processes. The previous similar cases are reviewed and adapted to solve the current problem. CBR also provides explanation by displaying the collection of cases used to derive the solution (Kolodner, 1991). Furthermore, the case-based reasoning technique is also capable of retaining the new experiences that have been solved for future reference (Manickam and Abidi, 1999).

The study of CBR has been motivated by the desire to model human behavior and to develop technologies that enhance the effectiveness of AI systems (Leake, 1996). According to Aamodt and Plaza, case-base reasoning is one of reasoning techniques in AI that enables the reuse of the stored past cases to derive decisions on the current problem (Aamodt and Plaza, 1994). In real life, human think and solve new problems by remembering previous similar situations that occur in the past as a guide to their decision making process. Once the most similar experiences are identified, the

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