Chapter 8.10
The Application of Machine Learning Technique for Malaria Diagnosis

C. Ugwu
University of Port Harcourt, Nigeria

N. L. Onyejegbu
University of Port Harcourt, Nigeria

I. C. Obagbuwa
Lagos State University, Nigeria

ABSTRACT

Healthcare delivery in African nations has long been a worldwide issue, which is why the United Nations and World Health Organization seek for ways to alleviate this problem and thereby reduce the number of lives that are lost every year due to poor health facilities and inadequate health care administration. Healthcare delivery concerns are most predominant in Nigeria and it became imperatively clear that the system of medical diagnosis must be automated. This paper explores the potential of machine learning technique (decision tree) in development of a malaria diagnostic system. The decision tree algorithm was used in the development of the knowledge base. Microsoft Access and Java programming language were used for database and user interfaces, respectively. During the diagnosis, symptoms are provided by the patient in the diagnostic system and a match is found in the knowledge base.

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1. INTRODUCTION

In most developing countries of the world, insufficiency of medical specialist has increased the mortality of patients who suffer from various diseases. The insufficiency of medical specialist will never be overcome within a short period of time. The institutions of higher learning could however, take an immediate step to produce as many doctors as possible. However, while waiting for students to become doctors and doctors to become specialist, many patients may die. Current practice for medical treatment requires patients to consult specialists for further diagnosis and treatment. Other medical practitioners may not

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have enough expertise or experience to deal with certain high-risk diseases. However, the waiting time for treatments normally takes a few days, weeks or even months. By the time the patients see the specialist the disease may have already spread out, as most of the high-risk diseases could only be cured at the early stage. Consequently, computer technology could be used to reduce the number of mortality and reduce the waiting time to see the specialist.

This paper explored the potential of information technology in the developments of a malaria diagnostic system using algorithms that could learn from experience. This algorithm is called decision tree which is a machine learning technique used in the design and development of software for the diagnostic model for malaria parasite. The software is not to replace the specialists or doctors but developed to assist medical practitioners in diagnosing and predicting patient condition from certain rules or experience.

2. LITERATURE REVIEW

The concepts of Artificial Intelligence in medicine have been researched upon in several respects. Hong (1988) summarized the potential of AI techniques in medicine as follows:

- Produces new tools to support medical decision making, training and research.
- Integrates activities in medical, computer, cognitive and other sciences, etc.

Early studies in intelligent medical system such as MYCIN, (ASNET, PIP and internist-I have shown to out perfume manual practice of diagnosis in several disease domain (Shortlitte, 1987).

Machine learning is a branch of *Artificial Intelligence*; Artificial intelligence (AI) is the science and technology whose goal is to develop computers that can think, see, perceive, hear, talk and feel etc. Anigbogu (2003) in order words, artificial intelligence involves developing a machine (computer system), which functions are normally associated with human intelligence, which include; reasoning, inference, hearing and problem solving etc (Patterson, 1990).

- *Diagnosis* is the identification of abnormal condition that afflicts a specific patient, based on manifested clinical data or lesions. If the final diagnosis agrees with a disease that afflicts a patient, the diagnostic process is correct; otherwise, a misdiagnosis occurred (Feder, 2006). The diagnostic algorithm will be based on disease models stored in the computer knowledge base including the name of disease with the cause, pathogenesis, lesion, pathophysiology, clinical data, syndromes, clinical presentation and complications.
- *Symptoms,* in a strict medical sense, are subjective clues (e.g. pain, nausea) that the patient experiences. These are revealed by the patient during history taking.
- *Signs* are objective clues (e.g. swelling, wheezing) that a clinician detects during steps of physical examination.
- *Results of test* are clues obtained through laboratory test and other techniques (Feder, 2006)
- A *Decision Tree* is a logical model represented as a binary (two-way split) tree that shows how the value of a target variable can be predicated by using the values of a set of predicator variables (Figure 1) (Quinlan, 1986).

3. MATERIALS /METHOD

The data used in the construction of the database were obtained from malaria research laboratory of University of Port Harcourt and also from our interactions and questions from five medical Doc-

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