Chapter 7

Artificial Neural Network for Medical Diagnosis

ABSTRACT

This chapter mentions AI which has various applications in medical diagnosis. One of the most impressive processing tools in this area is the Artificial Neural Network (ANN) that has improved the performance of the existing diagnosis systems. ANN as one of the advanced intelligent tools for medical diagnosis is a subject of researching for finding the algorithms for better medical diagnosis. Applications of ANN in pattern recognition, drug development and medical diagnosis such as hepatitis, cancer and heart diagnosis is wildly investigated by researchers. In this chapter, a brief explanation of ANN for diagnosis of same diseases is provided.

1 APPLICATIONS OF ARTIFICIAL NEURAL NETWORK IN MEDICAL RESEARCH

Consider an image processing task such as recognizing an everyday object projected against a background of other objects. This is a task that even a small child's brain can solve in a few tenths of a second. But building a conventional serial machine to perform as well is incredibly complex. However, that same child might NOT be capable of calculating 2+2=4, while the serial machine solves it in a few nanoseconds.

A fundamental difference between the image recognition problem and the addition problem is that the former is best solved in a parallel fashion, while simple mathematics is best done serially. Neurobiologists believe that the brain is similar

to a massively parallel analog computer, containing about 10^{10} simple processors, which each require a few milliseconds to respond to input. With neural network technology, we can use parallel processing methods to solve some real-world problems where it is very difficult to define a conventional algorithm.

Artificial neural network (ANN) is one of recent artificial intelligence techniques that has gained widely acceptance beginning from the 1990s. As has been explained in previous chapter, the ANN attempts to simulate the behavior of the human brain. The applications of ANN range from signal processing in communications to pattern recognition in Business, Engineering and Medicine. Also ANN has been widely applied to medical diagnosis/decision (Brause, 1997).

Also, as you read in the previous part that a branch of computer science, which intends to make computers more intelligent, is known as Artificial intelligence. Learning is the fundamental necessity for any intelligent behavior. A majority of contemporary researches are of the unanimous opinion that there can be no intelligence without learning. Numerous researches have supported the potential of AI in medicine, which is subsequently summarized:

- Proffers a laboratory to examine, organize, represent and catalogue the medical knowledge;
- Builds new tools to facilitate medical decision-making, training and research;
- Merges the medical, computer, cognitive and other scientific activities;
- Provides a content-rich discipline for future scientific medical specialty.

Numerous intelligent systems have been built so as to improve health care and proffer enhanced facilities at reduced cost. Intelligent systems were built to assist the users (chiefly doctors and patients) and to provide early detection and prediction to avoid serious illnesses. Manual practice of diagnosis in several disease domains have been outperformed by early studies in intelligent medical system such as MYCIN, CASNET, PIP and Internist-I. The studies in intelligent system were improved in the 1990s so as to apply the system for current needs. Several other studies merged two or more methodologies and applied the function to ensure system performance (Brause, 1997).

Almost all the physicians are confronted during their formation by the task of learning to diagnose. Here, they have to solve the problem of deducing certain diseases or formulating a treatment based on more or less specified observations and knowledge. Certainly, there is the standard knowledge of seminars, courses and books, but on one hand medical knowledge outdates quickly and on the other hand this does not replace own experience. For this task, certain basic difficulties have to be taken into account:

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