Medical Diagnosis using Neural Networks

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***Abstract* - People these days are technically advanced and computers are widely available. People are more prone to diseases due to changing environment. Expert consultation is not timely available. All the diseases have an associated set of some symptoms. A system can be developed using neural networks. The patients can input the symptoms observed and the system can recognize disease depending on the set of symptoms without the need of a medical expert. The patients gives set of symptoms which the patient observes. Depending on the set of symptoms selected the system selects a disease. We give the input as the set of symptoms and the output is a disease. The system can be further enhanced by using a layer of medicines for the diseases. On recognizing the disease, the system can then further select a medicine. The system can be used in emergency situations where medical consultation is not easily available.**

***Index Terms* - Medical Diagnosis System, Computer Aided Diagnosis / Computer Aided Detection, Fuzzy Neural Networks, Diseases, Symptoms, Medical Image Processing, Pattern Analysis, Intelligent Systems**

I. INTRODUCTION

People are too busy these days and also consultation with an expert is either unavailable or not available in a timely fashion. Medical professionals are not available everywhere. Many emergency situations may arise in places where medical consultation is not easily available A computer aided diagnosis system can be developed using Neural Networks that simulates medical reasoning. Medical reasoning can be implemented using Neural Networks People can consult this system for common problems. The Patients input the symptoms and the system then recognizes the disease based on the set of symptoms selected. The system also gives first aid suggestion for medical emergencies. The basic aim of the system is to recognize disease based on the symptoms observed by the patient. The patient need not consult a doctor and can have doctor in their smartphone.

II. EXISTING SYSTEMS

CADe\CADx (Computer Aided Detection\Diagnosis) System

This system is aimed to detect a problem in the human body given the problem is already known. This system works on the principle of pattern recognition. Like if a patient has some kind of cyst in any part of the body, the system can look for pattern on the cyst that define it whether it is carcinomal cyst or not. The system can recognize the patterns and can say whether the cyst is carcinoma. This system aids doctors in interpretation of medical images.

The X-Ray machine or the CT scan machines produce a thousand of images. The radiologist has to go through all the images and evaluate them to find out problem. But the production of large number of images in is time consuming. The CADe system takes a thousands of images of the part causing problems and then compares it with the saved databases to recognize the problem. This is time consuming.

But this system may match a simple cyst to a carcinomal cyst because the patterns may match.

CDSSs (Computerized Clinical Decision Support Systems)

These are information systems designed to improve clinical decision making. Characteristics of individual patients are matched to a computerized knowledge base, and software algorithms generate patient-specific60recommendations. Practitioners, health care staff, or patients can manually enter patient characteristics into the computer system; alternatively, electronic medical records can be queried for retrieval of patient characteristics. These systems work on saved medical records data

III. RELATED PAPERS

- Verma B., “A computer-aided diagnosis system for digital mammograms based on fuzzy-neural and feature extraction techniques.” (2010)
- Amit X. Garg , “Computerized Clinical Decision Support Systems on Practitioner Performance and Patient Outcomes.” (2007)
- C. Ohmann , “Evaluation of automatic knowledge acquisition techniques in the diagnosis of acute abdominal pain.” (2007)

IV. PROPOSED SYSTEM

The system proposed is a system for diagnosis of diseases. All diseases have a set of associated symptoms. The patient needs to enter the observed symptoms and the system can recognize the disease. Whenever someone has some disease the human body responds to it by by giving symptoms. These symptoms can point towards a particular disease. Suppose a patient has the symptoms as fever and difficulty in micturation, the patient might have an urinary tract infection, if this is further enhanced by vomiting, the patient might have appendicitis. The System matches the set of symptoms to the disease. The patient needs to input the set of symptoms and the system calculates a score of symptoms based on the symptoms and gives a ranking to the diseases, and the selects the best scoring disease that is the most probable disease.

The system is works on the principle of artificial neural networks which simulate human thinking and reasoning. These networks work like the neurons in our brain and simulate medical reasoning.

The input nodes are the set of symptoms and the outpit nodes are the diseases as recognized by the system based on the set of symptoms. The system gives a value to the diseases and calculates the total a score to all the symptoms and gives a ranking to all the diseases and selects the best ranking disease based on the set of symptoms.The system will help those people living in areas where medical facilities and not available or not available as required. The system will help people recognize diseases as soon as possible so that it's not late and does not lead to a bigger problem later. The patients can then consult a doctor if it's really a big issue.

The system works as follows:

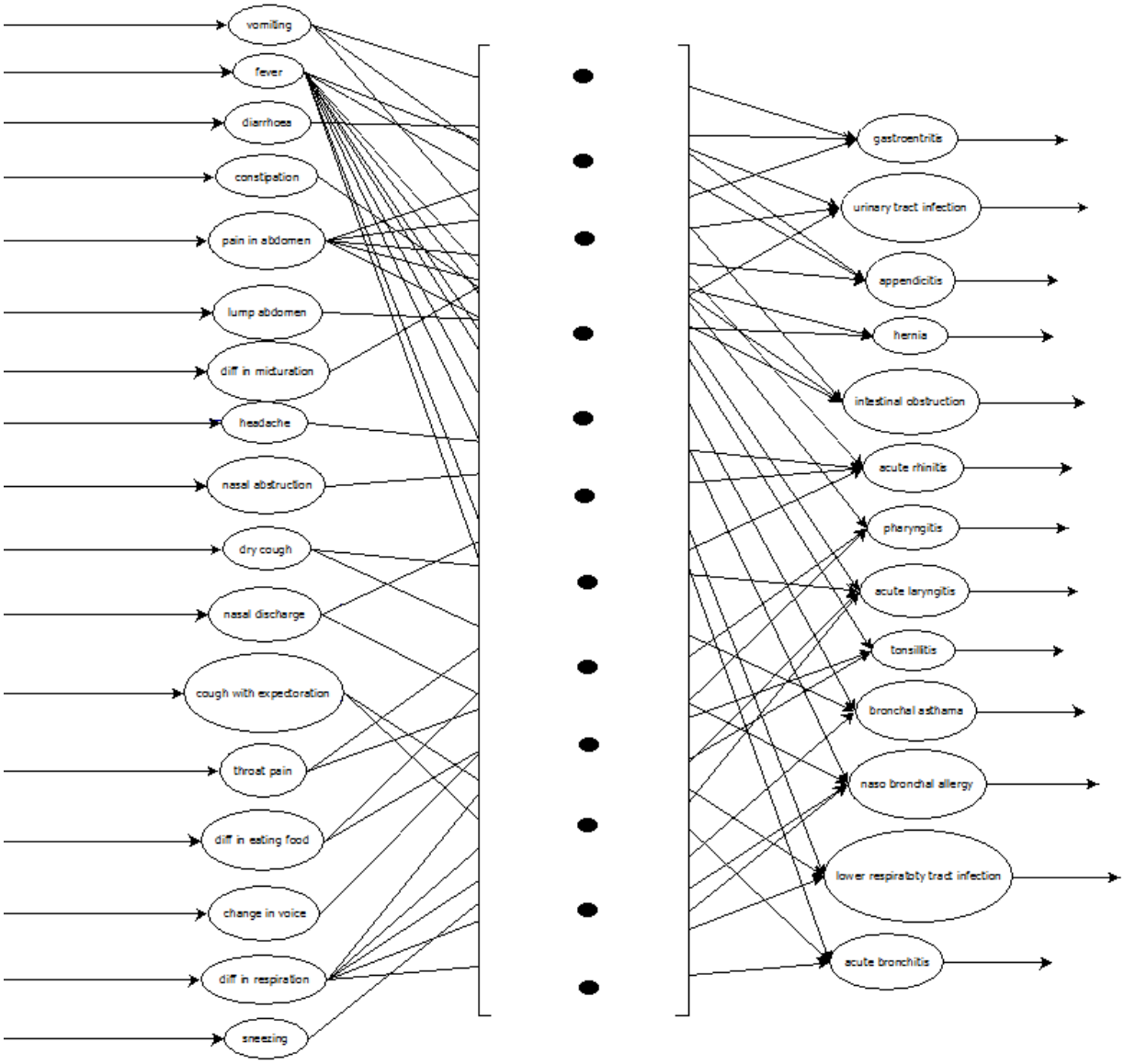
Programs can be written to simulate medical reasoning. Such programs are typically catalogued in the form of complex "if ... then..." rules used in chains of deduction to reach a conclusion. The input goes as the set of symptoms and the output is the set of diseases based on the set of symptoms. The complex "if ... then..." statements select a disease based on the set of symptoms and the disease is recognized. The programs use complex "if ... then..." statements to implement the input of the symptoms. The inputs are then matched by the statements to find an associated disease. The complex statements help the system select the particular disease which the symptoms correspond to. The disease is thus selected based on the inputs using the complex statements.

Suppose there are n symptoms.

When the user enters the first symptom, the system goes in the loop and checks for corresponding (n-1) symptoms which are further compared with (n-2) symptoms and so on until the user finishes entering symptoms.

The system thus matches the set of symptoms using complex statements to a disease. All diseases are given a score based on the number of symptoms, the highest ranking disease based on the score is selected and given as output.

V. ARCHITECTIRE



VI. ALGORITHM

1. For each diagnosis determine the set of symptoms to be expected.
2. Give a score to each diagnosis by the number of symptoms resulting to the diagnosis.
3. Rank the diagnosis according to the scores obtained.
4. Select the highest score and check whether any one feature of the disease is present or absent.
5. Check for all features and then move to the next scoring diagnosis.
6. If a new diagnosis is found, begin with step 1 or otherwise stop and give the diagnosis as the result.

The above algorithm works as follows;
For each disease, we have a set of associated symptoms. When the patient inputs the observed symptoms the system calculates a score based on the number of observed symptoms. Like for a disease, let's take Gastroenteritis, the count of the number of symptoms is three (which are vomiting, diarrhoea and pain in abdomen), so the system knows that these particular three symptoms will be the result of the disease Gastroenteritis. Among these symptoms, if the diarrhoea is replaced by constipation, the system will recognize that the disease in not Gastroenteritis but it may be case of Intestinal Obstruction. If any subset of these symptoms is observed, the count is less than three, the system than ranks the diseases based on the count of the symptoms and then selects the highest scoring disease based on the set of symptoms observed.

{vomiting, diarrhoea, pain in abdomen} → Gastroenteritis (Count 3)
{vomiting, constipation, pain in abdomen} → Intestinal Obstruction (Count 3)
{fever, pain in abdomen, difficulty in micturition} → Urinary Tract Infection (Count 3)
{pain in abdomen, lump abdomen} → Hernia (Count 2)
{fever, dry cough, change in voice, difficulty in respiration} → Acute Laryngitis (Count 4)

{fever, dry cough, change in respiration} → Bronchial Asthma (Count 3)

Like in above examples for Acute Laryngitis (Count 4) and Bronchial Asthma (Count 3), the system ranks the diseases based in the count, if four symptoms are found, the system outputs Acute Laryngitis and if the count is three, the system outputs Bronchial Asthma.

VII. APPLICATIONS

The system for medical diagnosis using neural networks will help patients diagnose the disease without the need of a medical expert. The system can be deployed in smartphones, smartphones are cheap and nearly everyone has a smartphone. The System can be installed on the device. If there is any medical need, the patient can input the symptoms and the system can recognize the disease based on the set of symptoms and can suggest medicines to the user. The patient can check for the disease anytime, without the need of a medical expert. The system can also provide first aid suggestions for emergency situations. The system can provide help in areas where medical facilities are not available or not easily accessible.

People going for mountaineering can use the system for any emergencies as medical facilities are not available in these areas. By the time they get any medical help they can follow what the system says, as it is based on medical reasoning.

VIII. CONCLUSION

Medical Diagnosis System for diagnosis of diseases can be used to diagnose a disease based on the set of symptoms. All diseases have a set of symptoms associated with them. The system can simulate medical reasoning. The system can be used in remote areas where medical facilities are not easily available or not available in a timely fashion. The system gives a score to each of the diseases and gives a ranking to all the diseases based on the set of symptoms selected.

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