# Computational Medical Diagnosis

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**Abstract**

Computers are increasingly being used in the medical industry. They are used to provide structure and efficiency to record management and patient organization to both hospitals and medical labs, but the intelligence and efficiency of computers is also advanced enough to be able to analyze massive quantities of information and produce intelligent, reasonable conclusions. Of course in the context of diagnosis and medication, the data can consist of human medical records and genetic sequencing of genetic material and conclusions be diagnoses and care planning. Analysis of this information is currently conducted by one or more highly trained doctors or medical experts. The cost of these trained professionals is relatively high compared to the time it takes to perform the analysis per patient. Using computers, with advanced algorithm and high level cognitive science research, we are able to replicate the team of specialists and come to the same results in significantly less time and hard work, freeing those professionals to be able to perform harder problems. Another advantage to have expert diagnostic systems is having available oversight for work done by human doctors. Research has shown a connection to linguistic expression and diagnostic correctness. A computer that is programmed to diagnose can evaluate a doctor's work and catch costly misdiagnoses before they can occur.

# 1 Introduction

Computational intelligence and capability is quickly becoming noticeable in today's society as a helpful tool. People are beginning to experiment uses in a range of industries and corners of society. We have Siri on our Smartphones, robotics taking over as the manufacturing work horse, and computer diagnostic tools becoming smart enough to help us fix the very computer that they live on. Programs are more and more capable of reading in available information, digesting it and coming to a helpful conclusion. There are network diagnostic tools to figure out why your computer cannot connect to the internet, and antivirus programs that analyze every inch of memory to snoop out malware, spyware, or even simple corruption in the file structure. They do this multiple multitudes of times faster than their human predecessors and with significantly increased efficiency. Computer programs don't become bored or fatigued- the only problem they run into is that they are as powerful and effective as the programmer that designed their algorithm.

Diagnostic tools are at the point where problems such as network connectivity and search and find algorithms are child's play. They are faster and meaner than ever before and history, and AI researches are starting to experiment with ways of applying these tools to human diagnostics. A program can read in massive amounts of information and make sense of it, which is essentially what human doctors are paid and trained for years to do. There are recognizable patterns in the data that result in diagnoses. The patterns are distinguishable through medial histories and current symptoms, both are sources of information that computers can read from quickly and efficiently. The advantage of computer diagnostics are more readily seen when the source of information is so massive and complex that it would take a human specialist a long and costly time to find the pattern and resulting conclusion (in context of the medical field, a medication or treatment plan). An example would be in the form of DNA sequencing and finding deeply hidden and complex diseases or cancers.

Using computers to aid in the diagnostic and treatment in the human medical field will increase productivity and effectiveness overall. Of course programs and algorithms cannot be trusted completely for some time- the wrong diagnosis can be come to whether it's a human or a computer. The speed and sheer scaling power of using computers is an advantage that the medical field needs

to take advantage of. Power artificial intelligence can aid in medical devices such an ultrasounds, aid in diagnoses of complex genetic diseases that would otherwise take a highly trained team of specialists, and even provide foresight and prevention of human mistakes in diagnosis.

# 2 Computer Aided Medical Tools

Humanity is by no means close to losing an entire profession. Doctors are still absolutely necessary for the health of a population, especially since production of AI and their respective robotics that pass the Turing Test, and can thusly replicate the feel of a human person, isn't within immediate site. Person to person contact is vastly preferred when it comes to health care rather than talking to a screen, even though I believe that a program could simulate that relationship well enough to be satisfactory. An advantage is algorithmically generated and thus highly personalized relationships with a medial device.

Human doctors are here to stay, so I digress. Doctors rely on their instruments and tools to accurately provide information so that they can make an accurate and well informed diagnosis. There is a moving trend towards high resolution, 3D imaging to provide information in a non-invasive, accurate way [5]. This method allows doctors to literally see what is going on within their patients. 3D imaging using ultrasound has no unwanted side-effects similar to radiology imaging and is incredibly accurate, especially in shallow areas [5].

## 2.1 Improved Imaging Analysis

Researchers are working on improving this technology using clusters of computers connected through a low latency network to increase computing power and speed up algorithm time. Images, and virtually all graphic algorithms, are better calculated in parallel because of the nature of the problem. By increasing calculation power, doctors can perform more detailed ultrasounds of their patients and potentially see results in real time [5].

# 3 Genetic Problem Solving

## 3.1 Quicker, Efficient Analysis

## 3.2 Solving Problems

# 4 Doctor Oversight

## 4.1 Linguistic Expression

## 4.2 Diagnostic Correctness

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