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Research on Clinical Decision Making and Pattern Recognition in Health Care

The world of integrating computing into healthcare has been a grand interest of mine. I am eager to demonstrate my research on Clinical Decision Making and Pattern Recognition in Health Care. These topics come to a middle stance of bettering patients’ health care experience and their journey. A common goal shared amongst professionals is the efficiency with which work can be done. Currently, there is emerging technology that may help solve tasks more efficiently; however, we will find that errors exist and there is yet more work to be done. With the help of consistently progressing machines, health care becomes more accessible for patients.

Pattern recognition can be described as a collection of data which is typically used to make informative decisions. Such concept is used in machine learning and frequently occupied by health care. Machine learning has helped with health status, screening, diagnosis, prevention, and everything in between. Quite similarly, information is gathered from such systems and clinical decisions are made. These systems serve not only for a patient’s wellness but for the time efficiency of a physician. Accessing information is crucial to making decisions as can be seen when a physician is looking for a patient’s medical records. In Shortrliffe’s article, he states that this is accessed much better with decision support systems, in other words, database systems.

Human health is important and fortunately there are sources to help individuals when an issue occurs. Some discoveries I made were health technologies that assist individuals either with diagnosis or tracking specific information. Some of them include magnetic resonance imaging (MRI) scans, eye trackers, applications to monitor sleep, prosthetic limbs, and devices that help visually impaired individuals. One of my favorites in which I would like to discover more about is using machine learning to help diagnose autism spectrum disorder (ASD). In the article, Using Machine Learning for Motion Analysis to Early Detect Autism Spectrum Disorder: A Systematic Review, tables are available to show the different devices used to detect ASD in the early stages. One example of motion analysis in ASD was an optoelectronic system with 8 infrared-motion analysis cameras used to measure duration, velocity, and acceleration. Another device was the Tobii T120 eye-tracker used to examine the duration of eye fixation.

In its full effect, the use of pattern recognition using machine learning helps clinicians proceed with health evaluations and treatment according to the article, A Review of Machine Learning and Deep Learning Approaches on Mental Health Diagnosis. Although machine learning supports new discoveries, there are drawbacks with the devices used to detect irregularities in health. As we are familiar with the development of machine learning, models are trained with data. An issue arises when enough data isn’t collected from a variety of populations. For instance, MRI scans may differ in less clear results when scanning males and females. This is because of the different biological physique between males and females. With our continuous use of machine learning, vast amounts of testing will be required to consider every population.

When approaching a problem, it is important to understand the situation before anything. Hence, I believe research and observations are a reliable source to make decisions. I was particularly interested in detecting ASD at an early age because I have firsthand experience interacting with my cousin and close friends. It affected my family members because they had been unaware that autism was the reason for the child’s behavior. From my observations, I noticed fast motor movement and failure of back-and-forth conversations. I would like to explore more on this topic and eventually make a positive impact with some ideas I have. Building on top of machine learning models, I believe it would be helpful to obtain motion analysis, mood recognition, and intellectual disability in a device that monitors individuals with ASD. A closer look into this would be something that parents or caregivers can get a hold of to place on patients that way these tests can be done at home and not restricted to a healthcare visit.

My first thoughts for improvement while reading about clinical decision-making, was data collection to improve patient visits. One method to accomplish this consists of gathering audio recordings from patient visits. This idea stems from the data collection in which I have performed in my research project at my university, New Mexico State University. My research program focuses on integrating computational thinking into courses of high school level students. I have examined students’ growth through a questionnaire that is confidentially recorded. The step forward here would be applying artificial intelligence (AI) to the patients’ recordings. The model would recognize keywords which would then help clinicians better understand patient needs. This methodology is like that of recording phone calls, which I’m sure a lot of us have experience when getting assistance from a company.

After deeper research, bringing pattern recognition tools into healthcare, especially through machine learning, offers a big chance to improve how doctors make decisions and care for patients. These technologies can make healthcare more efficient and accessible by helping to detect conditions like autism spectrum disorder early and improving the accuracy of diagnoses through better data collection. However, there are still challenges to overcome, such as making sure the data used is diverse and thoroughly tested across different groups of people. My interest in this field, influenced by personal experiences and my studies, motivates me to help develop these technologies further.

Citations

CDC. “Clinical Testing and Diagnosis for Autism Spectrum Disorder.” *Autism Spectrum Disorder (ASD)*, 27 Feb. 2024, [www.cdc.gov/autism/hcp/diagnosis/index.html#:~:text=Diagnosing%20autism%20spectrum%20disorder%20(ASD](http://www.cdc.gov/autism/hcp/diagnosis/index.html#:~:text=Diagnosing%20autism%20spectrum%20disorder%20(ASD).

Iyortsuun, Ngumimi Karen, et al. “A Review of Machine Learning and Deep Learning Approaches on Mental Health Diagnosis.” *Healthcare*, vol. 11, no. 3, 17 Jan. 2023, p. 285, <https://doi.org/10.3390/healthcare11030285>.

Simeoli, R., Rega, A., Cerasuolo, M. *et al.* Using Machine Learning for Motion Analysis to Early Detect Autism Spectrum Disorder: A Systematic Review. *Rev J Autism Dev Disord* (2024). <https://doi.org/10.1007/s40489-024-00435-4>

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Shortliffe, Edward H. "Computer Programs to Support Clinical Decision Making-Reply." JAMA The Journal of the American Medical Association, August 1987, DOI: 10.1001/jama.1987.03400170060016.