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Insights on Convolutional Neural Network for the Early Detection of Heart Disease

Esther Leuenberger*

Department of Information Science, University of Melbourne, Parkville VIC 3010, Australia

Introduction

Artificial intelligence was a revolutionary breakthrough for humanity that opened the door to a new world. It has accomplished wonders in every domain of life, from basic chat bots to autonomous vehicles and robots. Artificial Intelligence (AI) has aided all computer-aided learning and has strengthened the complex decision-making process. AI is a synthesis of several fields, including logistics, biology, linguistics, computer science, mathematics, engineering, and psychology. It has achieved remarkable results in speech and facial recognition, natural language processing, intelligent robots, and image recognition. The human brain's and AI's vision was aimed at the creation of great machines. These machines have made daily life easier and more convenient for humans. One of the techniques that has made this possible is machine learning. Machine learning refers to computers' ability to learn without being explicitly programmed. Computers learn from previous experiences and data in this AI technique. Because the amount of data is rapidly increasing, efficient data handling is required. Because of their inconsistency, uncertainty, imprecision, and similarity, humans can find it difficult to manually extract useful information from raw data.

Description

This is where machine learning comes in handy. With the abundance of data in the form of big data, its demand is increasing as it extracts more accurate, informative, and consistent information from raw data. The primary goal of machine learning is to enable machines to learn without being extensively programmed. Over the last few decades, machine learning has made remarkable advances in many fields, including preprocessing techniques and learning algorithms. Deep learning is one of the remarkable advances that have made AI smarter. Deep learning is a machine learning branch that was named in 2006. It was inspired by the human brain's structure, which contains neural networks [1-3]. It is a data-processing method that employs a multi-layer approach. The layers function as follows: a layer receives weighted input, transforms it into mostly nonlinear functions, and then sends the output to the next layer.

The availability of fine images with labelled datasets by professionals to train, test, and validate algorithms is critical in the field of computer vision. The scarcity of such datasets is frequently a limiting factor in research and projects. The same can be said for the medical field. The availability of professional resources is limited due to the scarcity of clinical diagnostic experts. For the past 30 years, much medical practise has been performed with the assistance of AI to improve the healthcare sector. Machine learning and deep learning advancements have also resulted in expanded opportunities for medicine. AI-based medical technologies are rapidly expanding and being used in clinical practise. This includes a wide range of multidisciplinary medical services, ranging from basic clinical practises like diagnosis to advanced practises like surgery and remote patient treatment. Medical technologies are assisting healthcare professionals and experts in identifying some of the most deadly diseases, such as cancer. Early diagnosis, simplification, improved treatment, and shorter hospital stays are making patients' lives easier.

One of the most amazing AI inventions is the robot. Robotics, like every other aspect of life, is increasingly becoming a part of medicine. AI and robots have enormous potential in the healthcare industry. Researchers use AI to quickly and efficiently process and respond to data in order to improve treatment outcomes for fatal diseases such as cancer and heart disease. Cardiovascular diseases (CVDs) or heart diseases are the leading cause of death worldwide. According to a World Health Organization (WHO) report from 2019, approximately 18 million people died that year as a result of CVDs, accounting for 32% of all deaths. Heart failure and stroke were responsible for 85% of them. Even physician doctors have difficulty diagnosing these diseases early and correctly. One-quarter of all people die suddenly, with no prior symptoms of heart disease [4,5]. As a result, it is critical to develop a system capable of detecting heart disease at an early stage. The most common type of heart disease is coronary artery disease (CAD). Several personal habits, such as smoking, diabetes, excessive alcohol consumption, little or no physical activity (obesity), stress, and high blood pressure, can all harm the heart and cause disease. Diagnosis of heart disease requires not only a lot of time and effort, but also a lot of money. Deep learning combined with image classification techniques can assist experts in obtaining valuable information about heart patients and in better diagnosing patients.

Conclusion

Heart disease prediction is an important area of ongoing research. In medical science, classification is an important and critical decision-making tool. Numerous facts are presented for the prediction of heart diseases. Scholars are still working on this topic. The following subsection highlights relevant cutting-edge heart-disease classification approaches. Single-nucleotide polymorphisms (SNPs) have been shown in studies to significantly modify the disease phenotype, which may refine cardiovascular disease (CVD) risk prediction in FH patients, even in the context of severe monogenic disease such as familial hypercholesterolemia (FH). The availability of phenotypic and genetic information showed promising prediction improvement. Combining phenotypic and genetic data with robust computational models can thus improve disease prediction in the area under a receiver operating characteristic curve (AUROC) and the area under a precision-recall curve (AUPRC).

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***Address for Correspondence:** Esther Leuenberger, Department of Information Science, University of Melbourne, Parkville VIC 3010, Australia, E-mail: EstherLeuenberger50@gmail.com*

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