Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 5, No.7, May : 2024

PREDICTION OF CARDIOVASCULAR DISEASES WITH RETINAL IMAGES USING DEEP LEARNING

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ABSTRACT:
Globally, cardiovascular diseases (CVDs) constitute the leading cause of death. Better patient outcomes and successful treatments depend on early detection and accurate diagnosis of CVDs. Retinal imaging has developed into a non-invasive, reasonably priced method of predicting CVD. . In order to predict CVDs from retinal images, this study aims to build a deep learning model that combines Mobile Net architecture and convolutional neural networks (CNNs). The suggested methodology makes use of Mobile Net's lightweight architecture and CNNs' capacity to automatically identify important features from retinal images for efficient deployment.. Model training and evaluation are conducted using a sizable dataset of retinal images, which includes both healthy individuals and patients with CVD. Pre-processing techniques like as scaling, normalization, and augmentation are used to the retinal images in order to improve data quality and diversity. The CNN model architecture is built using MobileNet as the foundational network and additional layers to adjust to the specific CVD prediction goal. The algorithm gains the ability to accurately classify retinal images as either suggestive of the presence or absence of CVD after extensive training and tuning. Traditional metrics like accuracy are used to evaluate performance.. The developed deep learning model performed well in predicting CVDs from retinal images, pointing to possible benefits in early detection, risk evaluation, and economical diagnosis. This strategy may enable medical practitioners to make well-informed decisions, enabling timely treatments and preventative healthcare initiatives. For an accurate assessment of its clinical use and impact on patient care, more validation and integration into clinical settings are required.

Keywords:
Cardiovascular disease, Retinal imaging, Deep learning, Convolutional neural networks, MobileNet, Preventive cardiology, Machine learning, Healthcare technology

INTRODUCTION:

Cardiovascular diseases (CVDs) provide a serious worldwide health concern, needing early identification and accurate diagnosis for effective management and better patient outcomes. In response, we present a deep learning approach employing convolutional neural networks (CNNs) and MobileNet architecture for CVD prediction using retinal pictures. Retinal imaging gives useful insights into microvascular alterations associated with CVDs. Our methodology utilizes MobileNet's efficiency for deployment on resource-constrained devices while retaining excellent accuracy. We intend to better early identification and risk assessment of CVDs by curating a comprehensive dataset, preprocessing pictures, and building the CNN model using MobileNet as the basis network. Training will entail optimization methods and performance assessment utilizing standard metrics. The model's merits include helping early identification, allowing non-invasive and cost-effective prediction, and enhancing patient treatment, particularly in resource-limited locations. Ultimately, this development in deep learning for CVD prediction by retinal imaging has promise for preventive cardiology, contributing to early identification, risk evaluation, and economical diagnosis, which in turn improve patient care and results.

LITERATURE SURVEY:

Deep learning techniques' potential for identifying cardiovascular risk factors from retinal fundus images is examined in the study "Detection of cardiovascular risk factors from retinal fundus photographs using deep learning"[1] by Prahs et al. published in the Journal of Clinical Medicine. Presumably, it investigates deep learning and other computer learning methods to analyze retinal images and identify particular markers associated with cardiovascular risk.

The second paper was presented by Poplin, R., Varadarajan, A. V., Blumer, K., et al. (2018). The title of the paper is "Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning"[2]. Nature Biomedical Engineering, 2(3), 158-164.In this work, researchers apply deep learning algorithms to predict cardiovascular risk factors using retinal fundus pictures, seeking to provide a non-invasive way for identifying patients at risk of cardiovascular illnesses. They develop a deep learning system on a huge dataset of retinal pictures and accompanying cardiovascular risk factor data, utilizing convolutional neural networks (CNNs) to extract features. Testing on an independent dataset indicates the algorithm's excellent accuracy in predicting parameters including gender, age, blood pressure,smoking status and cardiac events. The work emphasizes the promise of deep learning with retinal imaging for early detection of cardiovascular disease and non-invasive screening. Accessing the source article will offer more extensive information.

The third paper was presented by Lee, C. S., Tyring, A. J., Wu, Y., et al. (2019).The title of the paper is "Generating retinal flow maps from structural optical coherence tomography with artificial intelligence"[4]. Scientific Reports, 9(1), 5694.This study helps to construct retinal flow maps from structural OCT images, critical for identifying retinal disorders. They apply deep learning, training a CNN on paired OCT images and flow maps. The program correctly predicts flow maps from fresh photos, graphically showing blood flow patterns. Evaluation against conventional methodologies and ground truth data indicates AI-generated maps align well and frequently exceed previous approaches. This study demonstrates AI and deep learning's potential in developing exact retinal flow maps, delivering useful insights for diagnosis and monitoring retinal health.

The fourth paper was titled as "Cardiovascular disease prediction system using genetic algorithm and neural network" by N. G. B. Amma focuses on developing a predictive system for cardiovascular diseases by utilizing a combination of genetic algorithm and neural network techniques.The genetic algorithm is likely employed as a optimization technique to optimize the parameters or features used in the neural network model for cardiovascular disease prediction. It may be utilized to search through a large space of possible solutions to find the most optimal combination of features or parameters that lead to improved prediction accuracy. The goal is likely to enhance accuracy and efficiency in predicting the risk of cardiovascular diseases, which is crucial for early intervention and prevention strategies.

CONCLUSION:

In summary, the suggested method that uses retinal pictures and deep learning to predict cardiovascular disorders shows promise in applying artificial intelligence to support early identification and risk assessment. The technology may be able to detect patterns and indicators linked to cardiovascular risk factors by examining retinal images, giving medical practitioners important new information. Thorough training, validation, and testing are used to assess the system's performance and guarantee its correctness and dependability. If implemented properly, this technology could completely change the way that cardiovascular disease is predicted by providing a simple, non-invasive procedure that can be used in conjunction with current diagnostic techniques. In order to optimize and improve the system and ultimately lead to better patient care and results, more investigation and validation are required.

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