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Notice for the PhD Viva Voce Examination

Ms Kavipriya K (Registration Number: 1942044), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Saturday, 8 June 2024 at 12.30 pm in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Computational Methods for Detection and Recognition of Coronary Artery Stenosis in Angiogram Images**
Discipline	:	**Computer Science**
External Examiner (Outside Karnataka)	:	**Dr Saroj Kumar Biswas** Associate Professor Department of Computer Science and Engineering National Institute of Technology – Silchar Assam - 788010
External Examiner (Within Karnataka)	:	**Dr D S Guru** Professor Department of Computer Science University of Mysore Manasagangotri Mysore - 570 006 Karnataka
Supervisor	:	**Dr Manjunatha Hiremath** Assistant Professor Department of Computer Science School of Sciences CHRIST (Deemed to be University) Bengaluru, Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru

Date: 05 June 2024

ABSTRACT

Coronary Artery Disease (CAD) is caused by stenosis of the coronary artery's lumen. This heart disease is one of the reasons for the highest mortality worldwide. This illness manifests as stenosis or plaque in the coronary arteries and causes atherosclerosis. It damages or clogs the heart arteries, causing a lack of blood flow to the heart muscles and leading to a heart attack. There are different medical modalities to diagnose the heart artery disease. A standard method used by the cardiologist to diagnose the severity of this disease is coronary angiography. An X-ray machine is used to capture the angiogram image at various angles during cardiac catheterization. Experts examine the data and offers different opinions. However, most of the angiogram videos consist of unclear images with artifacts, and because of the complex structure of the arteries, medical experts fail to get accurate information about the damages and blockages in arteries. Based on the cardiologist's suggestions, a computational model is proposed as a secondary method to detect and recognize the stenosis level from the coronary angiogram images.

The proposed model is Coronary Artery Stenosis Detection Using Digital Image Processing (CASDDIP). This model can recognize and spot the stenosis in the coronary angiogram image with a high accuracy of 98.06%. It is experimented with a real-time dataset to achieve better accuracy than existing models. A dataset, such as angiogram videos and images of patients under varying age groups, is used to train the model. These videos are acquired from the healthcare center with due consent. The proposed CASDDIP model consists of four modules:

- Keyframe Extraction and Preprocessing
- Coronary Artery Segmentation
- Feature Extraction and Stenosis Detection
- Stenosis Level Classification

Initially, a novel keyframe extraction method is proposed to find the keyframe from the angiogram video. Next, a hybrid segmentation method is presented in this research to extract the coronary artery region from the image. Next, a method is proposed to detect the stenosis by extracting and fusing different features. Detected stenosis is categorized using the proposed stenosis level classification method. This CASDDIP model is a supporting tool to help the cardiologist during diagnosis.

Keywords: Coronary Artery Disease, Coronary Angiogram, Stenosis, Keyframe Extraction, Preprocessing, Segmentation, Stenosis Detection.

Publications:

1. **K. Kavipriya** and M. Hiremath, "Analysis of benchmark image pre-processing techniques for coronary angiogram images," in 2021 International Conference on Innovative Trends in Information Technology, ICITIIT 2021, 2021. doi: 10.1109/ICITIIT51526.2021.9399602.
2. **K. Kavipriya** and M. Hiremath, "Advanced Computational Method to Extract Heart Artery Region," International Journal of Engineering Trends and Technology, vol. 70, no. 6, 2022, doi: 10.14445/22315381/IJETT-V70I6P237.
3. **K. Kavipriya** and M. Hiremath, "Identification of coronary artery stenosis based on hybrid segmentation and feature fusion," Automatika, vol. 64, no. 3, 2023, doi: 10.1080/00051144.2023.2205727.
4. **K. Kavipriya** and M. Hiremath, A Novel Approach for Segmenting Coronary Artery from Angiogram Videos, vol. 528. 2022. doi: 10.1007/978-981-19-5845-8_14.
5. **K. Kavipriya** and M. Hiremath, "Computational Method to Extract the Keyframe from Angiogram video," Journal of Algebraic Statistics, vol. 13, no. 3, pp. 3088–3097, 2022.