THE INFORMATION ON THE NOVEL CONTRIBUTIONS OF THE DISSERTATION

Ph.D. Student Name: Le Nhi Lam Thuy

Dissertation Title: **Coronary Vessel Segmentation and Abnormal Detection to Aid in Diagnosis.**

Major: Computer Science

Code: 9480101

Supervisor: Prof. Pham The Bao and Prof. Huynh Trung Hieu

Education institution: Industrial University of Ho Chi Minh City

Novelty of research in the dissertation:

- Successfully developed a solution method for coronary artery segmentation problem in data where both the background and objects are complex, with unclear color differences between the object and the background. Furthermore, the data contains the same type of object but with varying sizes, ranging from large to small. Smaller objects (with low contrast) also exhibit intensity differences compared to larger objects (with high contrast) of the same type. This solution is based on a coarse-to-fine approach for deep learning models, specifically utilizing the Unet model as described in the dissertation.
- Proposed and built a new vessel wall browsing algorithm based on considering the movement direction of pixels to detect abnormal regions on the segmented coronary artery edges. This is accompanied by algorithms for normalizing the position of artery segments. The algorithm can be applied to segmented images with or without edge extraction, where the edge extraction method may be traditional or deep learning methods.
- Built an appropriate deep learning model to classify whether a segmented coronary artery segment has abnormalities, and if so, where the abnormalities are located. This applies to data of segmented coronary artery segments with or without edge extraction.
- Proposed a method for detecting abnormal regions on coronary artery edges using a deep learning model combined with a soft voting method for data represented by information planes of unsegmented coronary artery images.