UNIVERSITI TEKNOLOGI MARA
CAWANGAN PULAU PINANG

COMPARATIVE ANALYSIS OF CONVOLUTIONAL NEURAL NETWORK FRAMEWORKS FOR EFFICIENT CLASSIFICATION OF CALCIFICATION PATCHES IN DIGITAL BREAST TOMOSYNTHESIS IMAGES

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Breast cancer is the most common and rapidly spreading disease worldwide. Early detection significantly reduces fatality rates, motivating the development of deep learning algorithms for medical imaging analysis. Calcifications are the most important subject in early stages of breast cancer detection. This study focuses on classifying calcification and non-calcification patches in Digital Breast Tomosynthesis (DBT) images using Convolutional Neural Network (CNN) frameworks. A comparative analysis of CNN models including GoogleNet, SqueezeNet, modified GoogleNet and modified SqueezeNet is conducted to determine their classification performance. The CNN models are trained and validated using dataset from Advanced Medical and Dental Institute (AMDI), USM. Their classification performance is evaluated using evaluation metrics such as accuracy, precision, recall and F1-score. Results shows that modified GoogleNet outperforms other models, achieving accuracy, precision, recall and F1-score values of 97.04%, 91.99%, 96.83% and 94.23%, respectively. After classification, patches containing calcifications are further processes for localization using the You Only Look Once (YOLOv8) framework to demonstrate that these patched images contribute to the accurate detection of calcifications in DBT images. This study highlights the effectiveness of CNN-based frameworks for classifying calcification patches in DBT images. The findings demonstrate the potential of deep-learning models in supporting early breast cancer detection through accurate and efficient classification. The proposed method approach contributes to advancing medical imaging technologies aimed at improving diagnostic accuracy and patient outcomes.

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