

**UNIVERSITI TEKNOLOGI MARA**

**DETECTION OF CALCIFICATIONS  
IN DIGITAL BREAST  
TOMOSYNTHESIS IMAGES USING  
A NEW APPROACH OF IMAGE  
FILTERING**

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## ABSTRACT

Breast cancer is the world's second leading cause of death among cancers primarily affecting women. Calcifications are the most important subject in the early stages of breast cancer detection; thus, calcification detection is important because it leads to early treatment and increases the survival rate for breast cancer patients. Digital Breast Tomosynthesis (DBT) is the screening technique that move the device to specific angles and produced images that have been shown to improve the overlapping issue in mammogram. This is important to obtain a clearer view of calcifications. However, due to movement of device to a specific angle as well as patients' movement, blurry artefact and noises might unavoidably produce. The primary goal of this research is to propose a calcifications detection system based on convolutional neural networks (CNN) while employing a novel approach to image filtering techniques on DBT images. To overcome the unsatisfied quality of the images, this study proposed new filtering techniques for DBT image enhancement. The new filtering techniques are adaptations of Non-Linear Unsharp Masking (NLUM) and Fuzzy Weighted Median Filter (FWMF) to enhance DBT images and calcifications. Furthermore, the improved DBT images will be fed into the CNN model adapted from the previous study. Following that, the performance of both the enhancement stage and the detection process is evaluated, and finally, the radiologist performs the validation process. The proposed enhancement techniques outperformed conventional filtering techniques for both NLUM and FWMF, which produced average PSNR values of 66.39915 and 96.226764, respectively. The newly proposed Adaptive FWMF can be used to enhance calcifications, but modified NLUM can be used to enhance the entire DBT image, including the clear form of breast glands, breast fat, and ligament, according to qualitative results. The filtering techniques are then applied to the CNN model, and the mean Average Precision (mAP) and Log Average Miss Rate (LAMR) values are recorded in the results. The outcome of this study demonstrated the capability and reliability of the proposed methods particularly for radiologists, of overcoming the problems and limitations associated with the diagnosis of breast cancer disease, both in terms of the visibility of calcifications and the detection process of calcifications.

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