Automated Breast Cancer Detection Using Thermal Images and Explainable CNN

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Abstract: *Breast cancer remains a leading cause of mortality among women worldwide, necessitating the development of non-invasive, cost-effective, and accurate early detection systems. Infrared thermography has emerged as a promising diagnostic adjunct, capturing physiological changes in breast tissue through heat patterns. However, the "black-box" nature of traditional Deep Learning models often hinders their clinical adoption. This paper proposes a fully automated framework for breast cancer detection using thermal images and an Explainable Convolutional Neural Network (X-CNN). The proposed system utilizes a CNN architecture to classify thermograms into healthy and malignant categories. To bridge the gap between algorithmic prediction and clinical trust, we integrate Explainable AI (XAI) techniques to provide visual justifications for the model's decisions, highlighting specific thermal anomalies. Experimental results on the Kaggle database demonstrate that our model achieves an accuracy of 80 %. By combining high-performance automation with interpretability, this system offers a transparent diagnostic tool that can assist radiologists in early-stage breast cancer screening.*

Keywords: Breast Cancer, Infrared Thermography, Deep Learning, Explainable AI (XAI), CNN, Computer-Aided Diagnosis