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Computer-Aided Diagnosis of Breast Cancer via Mammography

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Abstract

Zambia faces a critical shortage of radiologists and limited mammography infrastructure. This has resulted in significant diagnostic delays and in turn to high mortality rates due to late-stage breast cancer presentation [1]. This study aimed to develop and validate a computer-aided diagnosis (CAD) system utilizing the YOLOv11 deep learning architecture to automate the detection and classification of breast cancer lesions in mammograms [2]. A quantitative research design was employed, using a dataset of 4,060 anonymized mammograms collected from Maina Soko Hospital in Lusaka, Zambia. The model was developed using a progressive training strategy, incorporating curriculum learning [3] and utilized both manual and model-assisted annotation to identify masses, calcifications, and architectural distortions. The CAD system achieved robust performance results, reaching an accuracy of 71.4%, precision of 72.2%, recall of 70.8%, and an F1-score of 71.1%. While the progressive training strategy successfully improved detection of underrepresented lesions like architectural distortions, the model faced challenges with small lesions and false positive results. These findings demonstrate that deep learning-based CAD systems can enhance radiological workflows in resource-limited environments through fast, automated screening .

Keywords: Breast Cancer, YOLOv11, Computer-Aided Diagnosis (CAD), Mammography, Zambia.

Category: Radiation and Health Physics

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