

## Enhancing Breast Cancer Detection Through Automated Classification with Optimized CNN Hyperparameters

Khadija Aguerchi  
MSC Laboratory, Cadi Ayyad  
University,  
Marrakech, 40000, Morocco;  
khadija.aguerchi@ced.uca.ma

Younes Jabrane  
MSC Laboratory, Cadi Ayyad  
University,  
Marrakech, 40000, Morocco;  
\*y.jabrane@uca.ma

Maryam Habba  
MSC Laboratory, Cadi Ayyad  
University,  
Marrakech, 40000, Morocco;  
m.habba@uca.ma

### *Abstract—*

Breast cancer, a prevalent affliction among women, underscores the critical importance of early detection, which significantly enhances survival rates and treatment efficacy across all cancer types. Advances in screening and treatment modalities have notably reduced breast cancer mortality by 30%. Convolutional Neural Networks (CNNs) have emerged as powerful tools for diverse applications due to their ability to automatically extract image features and perform classification tasks. Various strategies have been explored to bolster the precision of deep CNNs. This paper investigates the use of Particle Swarm Optimization (PSO) to fine-tune CNN hyperparameters for automated breast cancer image classification. A model is developed for automated classification based on magnification levels, distinguishing between benign and malignant samples. Individual models are trained with optimized hyperparameters corresponding to different image magnifications (40x, 100x, 200x, and 400x). The dataset is partitioned into 80% for training and 20% for testing. Performance evaluation metrics including Accuracy, Precision, Recall, and F1-score are utilized to select the most effective model for automation. Experimental findings affirm the efficacy of our proposed approach in achieving favorable outcomes.

*Keywords—Breast cancer; Convolutional Neural Networks; Particle swarm optimization (PSO).*