Deep learning based mitosis classification using microscopic histopathological images from different scanners

S. Kobalarasa [1,*]

[1] Department of Physical Science, University of Vavuniya, Sri Lanka.
[*] Corresponding author email: ksinthu60@gmail.com

Abstract: The most prevalent and significant cause of death in women is breast cancer. The death rate can be decreased with early detection of breast cancer. The mitotic cell count during the diagnosis is a crucial biomarker for determining the stage, prognosis, and aggressiveness of breast cancer. High-resolution microscopes are used by pathologists to manually inspect histopathology images for the presence of mitotic cells. Deep learning-based approaches that automatically categorize mitotic cells in histopathology images have been developed to address these issues. The variety of images brought on by the tissue preparation seriously hurt this performance. Particularly amongst different laboratories, this is noteworthy. Variable colour representation and other image properties between various kinds of whole slide scanners are the main causes of a domain shift. In this study, we propose a deep learning-based approach for mitotic detection using microscopic histopathology images from different scanners. The proposed approach is evaluated on the UMC Utrecht benchmark dataset by MICCAI. The dataset consists of 200 cases of human breast cancer and images scanned by four different scanners. 1721 mitotic images and 2714 non-mitotic images were extracted from whole side images. The dataset was augmented to increase the training data and be balanced. The *VGG16* pre-trained model is utilized to transfer the learned classification knowledge to histopathology images. *VGG16* is a convolutional neural network. The proposed system could be able to detect mitotic and non-mitotic cells with 64.6% accuracy and 73.3% specificity. The classification system was evaluated with four different scanner images compared with previous studies. The proposed deep learning architecture performed well in experiments, and its performance will continue to be enhanced until a fully automated complete system is achieved, which is the focus of substantial future development.

Keywords: Cell division classification, CNN, Microscopic images, Mitotic cell classification.