The impact of ultrasonography preparations on the accuracy of deep learning model in classifying hepatic lesions

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Abstract

Ultrasound plays a vital role in hepatic lesion assessment; however, it limits in distinguishing between hepatic benign and malignant tumors. As a result, deep learning was proposed to address this limitation, in which the hepatic lesion diagnosis could be improved. However, the low accuracy of deep learning models remains and there is currently no research looking into how appropriate ultrasonography data preparation improves the model's accuracy. As such, we aim to assess the impact of ultrasonography data preparing methods on the deep learning model's performance in hepatic lesion classification. This study is conducting in 2020-2022. We have retrospectively collected ultrasound images of chronic hepatitis B patients, participating in the Hepatocyte Cancer Surveillance Program at Chulabhorn hospital. The data includes 500 images (100 images for each lesions) of normal liver, hepatocellular carcinoma (HCC), Hepatic hemangioma, hepatic cyst, and FFS (Focal Fatty Sparing), which were clinically confirmed by Computed tomography and/or MRI. For image processing, all images will be cropped to the same size of 224x224 to remove patient information and make the image size homogeneity. We will employ four existing methods for data preparing, including Min-Max Normalization, Scaling Standardization, Contrast Limited Adaptive Histogram Equalization, and Adaptive Weighted Median Filter. Then, the preprocessed images will be used as an input data for a pre-trained deep learning network (ResNet50) to measure the accuracy of the model in classifying hepatic lesions, running in MATLAB. In order to establish the optimal approach for data preparation, the accuracy of RestNet50 testing with four different types of data sets will be compared. We expect that the performance of deep learning model would be improved using an appropriate data preparation method in this study.

Keywords : Deep leaning, Ultrasound, Classification, Data preparation