OFFICIAL ABSTRACT and CERTIFICATION

Optimizing Classification Efficacy of Image Classifiers Through the Usage of Neural Style Transfer in Image Preprocessing

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Currently, machine learning models are becoming incredibly prevalent in the industry due to their usefulness in providing quick access to classifications and calculations, with one common implementation being in the classification of tumors as benign or malignant. However, such neural image classifiers require a large amount of data, which is often difficult to obtain. Thus, image data augmentation has been used to artificially increase the data sets used in training image classifiers. Also utilizing machine learning, Neural Style Transfer allows for the recreation of an image in a different style, commonly used in recreating images in the styles of famous artists. The purpose of this study was to assess the efficacy of image classifiers when data was augmented using varying intensities of Neural Style Transfer, compared to common methods of static image augmentation. Images of scorpions, crabs, and butterflies were accessed from the Caltech-101 Image Classification Dataset. Style transfer was performed on 30 images of each class, transferring style from Wassily Kandinsky's Composition VII. Classifiers were trained on 10 images along with their augmented counterparts, and tested on the unused images within each used class in the Caltech dataset. Style transfer was tested at content-to-style ratios of 10^9, 10^8, and 10^7, in order of increasing intensity. The control classifier was trained only on the original images without any augmentation. The precision and recall values were analyzed for each class within the networks, and were used to show that the neural style transfer process increases the classification accuracy of image classifiers.

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