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Assessing Performance of Data Augmentation Techniques for a Convolutional Network Trained for Recognizing Humans in Drone Images

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Abstract : In recent years, we have seen growing interest in recognizing humans in drone images for post-disaster search and rescue operations. Deep learning algorithms have shown great promise in this area, but they often require large amounts of labeled data to train the models. To keep the data acquisition cost low, augmentation techniques can be used to create additional data from existing images. There are many techniques of such that can help generate variations of an original image to improve the performance of deep learning algorithms. While data augmentation is potentially assumed to improve the accuracy and robustness of the models, it is important to ensure that the performance gains are not outweighed by the additional computational cost or complexity of implementing the techniques. To this end, it is important to evaluate the impact of data augmentation on the performance of the deep learning models. In this paper, we evaluated the most currently available 2D data augmentation techniques on a standard convolutional network which was trained for recognizing humans in drone images. The techniques include rotation, scaling, random cropping, flipping, shifting, and their combination. The results showed that the augmented models perform 1-3% better compared to a base network. However, as the augmented images only contain the human parts already visible in the original images, a new data augmentation approach is needed to include the invisible parts of the human body. Thus, we suggest a new method that employs simulated 3D human models to generate new data for training the network.

Keywords : human recognition, deep learning, drones, disaster mitigation
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