Robustness Testing of Object Detection and Image Classification using Data Augmentation and Deep Learning

Context: The resilience of a model is tested using robustness testing, a quality assurance process. Fault injection is a testing method that can check the robustness of a system. Injecting color noise, fog, and changing the ground sample distance are a few examples. The overall procedure is to input an image dataset, run object detection and classification models against test cases, and output the performance scores.

Problem: Due to the availability of training data for RGB images, neural networks and deep learning methods currently provide state-of-the-art object detection and classification results. However, it is challenging to obtain such large, labeled training samples for image data that cover beyond the visible spectrum (what our eye can see). In addition, two or more different objects can have the same color. A photograph of camouflage materials or a sugar-and-flour mixture are two examples. The student is expected to focus on testing methodologies for such object detection and classification models.

Task: With the help of data augmentation and deep learning techniques, this thesis looks at test cases for robustness testing on classification models developed for full and sub-pixel objects. The student is expected to work on publicly available datasets from sites such as Kaggle. Test cases based on a data augmentation and deep learning will be developed and implemented (Python or MATLAB implementation is preferred).

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