

DATASET OF ANNOTATED IMAGES OF SUNDRY OBJECTS — BENCHMARK FOR PERFORMANCE DEGRADATION CAUSED BY DOMAIN SHIFTS

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Paper under double-blind review

ABSTRACT

In the real-world implementation of image recognition tasks, in the shift from the development environment to the production environment, performance degradation is often observed. A cause analysis demonstrates that even a small difference among the data, pertaining to the domain shift, exerts a highly adverse effect on the performance. To avoid this degradation, domain adaptation technologies can be adopted. However, the various limitations associated with real data, such as those corresponding to the privacy, copyright aspects, and accessibility, hinder the evaluation of the existing methods and development of novel methods. To facilitate the technology evaluation and development, we created a novel dataset that involves several types of domain shifts designed based on the observations of real applications. The dataset consists of 160,000 images of 100 class sundries (miscellaneous products). A total of 80,000 images are available for training and testing. The classification task for 100 classes is considerably more difficult than that for 50 classes, because each product has a similar confusing product. Each image involves meta-data regarding the environment: illumination conditions, camera angle, and product conditions. Artificial domain shifts can be created using these meta-data. We evaluated the classification accuracy for 100 classes by using the MLP, VGG16, ResNet50, DenseNet121, and SENet50 with basic data-augmentation methods. In the absence of a domain shift, the MLP achieved an accuracy of approximately 55%, whereas the other architectures achieved an accuracy of approximately 90%-95%. In the presence of domain shifts, a performance degradation up to approximately 60% was observed. These results are consistent with real-world phenomena, and therefore, the proposed dataset is expected to be an effective benchmark to evaluate technologies against domain shifts. The dataset will be released with another dataset consisting of 45,000 CG images of 10 classes of existing cars.

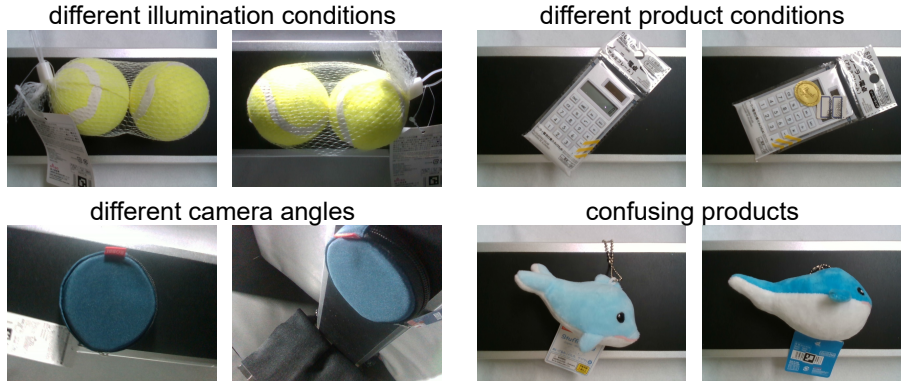


Figure 1: Examples of the images in the dataset