EECE5644 Abstract

For our final project, we will explore the problem of image classification under distribution shift. We will use the popular CIFAR10 dataset, which includes 60000 32x32 RGB images representing one of 10 classes. The list of classes includes 7 types of animals and 3 types of vehicles. These classes are well separated and most modern methods achieve nearly perfect accuracy on the validation set of CIFAR10. To make the problem more interesting, we consider evaluation on the CIFAR10-C benchmark [1], which includes the same 60000 images with varying levels of image corruptions, such as blur or JPEG compression artifacts. There are 15 different types of corruptions each with 5 increasing levels of severity. As these corruptions are common in open-world scenarios, it is important to understand which classification methods generalize best under these conditions.

To understand the data, we propose starting with a visualization of the features for each class before and after each corruption has been applied. For extracting features, we may use an off-the-shelf trained neural network or shallow image model, though we note that this is not the focus of our project but a necessary component of image classification. We can visualize these features via dimensionality reduction methods such as PCA or LDA. With this understanding of the distribution shift, we can better select algorithms for classification. We would like to understand which classification methods (e.g. Logistic Regression, LDA, SVMs) perform best under each severity level of corruption. We can also see if it is more reasonable to build conditional models for each corruption, to reduce the complexity of the problem. We can potentially predict the type of corruption applied to feed into this conditional classifier, either using another discriminative model or a clustering approach.

CIFAR10-C Benchmark Paper

[1] - https://arxiv.org/pdf/1903.12261.pdf