

Domain background

For distribution centers, it is crucial to have an accurate record of its inventory. In addition to counting the items manually, recent advancement of image processing has made automating this task possible. Distribution centers often use robots to move objects in bins as a part of their operations, and the robots can capture bin images that can be used to automatically count the number of items in each bin.

Problem statement

Given images of bins containing one to five items, predict the number of items in the bin with higher than 50% accuracy.

Datasets and inputs

The dataset used by the project is a subset of the [Amazon Bin Image Dataset](#). It contains over 10,000 images of bins in an operating Amazon Fulfillment Center and the label is number of items in each bin. The images are RGB images of various sizes and the labels have values 1-5. The label distribution is shown in the table below:

Label	1	2	3	4	5
Count	1228	2299	2666	2373	1875

Solution statement:

Use supervised deep learning models to classify bin images into different count categories. Image processing and model training will be done on AWS SageMaker.

Benchmark model:

A resnet 34 layer architecture trained from scratch that classify the images as one of 6 categories (0 – 5 objects) got 55.67% accuracy.

Evaluation metrics:

The performance of the models will be evaluated using accuracy.

$$\text{Accuracy: } \frac{1}{N} \sum_{i=1}^N 1[p_i == g_i]$$

Project Design:

First the dataset will be studied and preprocessed. Then use transfer learning on popular image processing neural networks to classify the images. Compare different model architectures and hyperparameters to find the best performing model. Then test the model on test data.