

Project Proposal: Inventory Monitoring at Distribution Centers

Domain Background:

The domain background for the Amazon inventory monitoring project is related to supply chain management and inventory control. Amazon, which is one of the world's largest and most technologically advanced corporations, inventory monitoring is crucial to ensure that products are available for customers to purchase and that there is no excess or shortage of inventory.

If there is any company that is capable of deploying robotics at scale it is Amazon. Over the long run this could generate billions of dollars in increased revenue and reduced cost. Amazon has a long history of being a leader in AI and Machine Learning so it is very realistic a model like this could be deployed at Amazon.

Personally I have developed a significant interest in continuing to grow my skills and knowledge in Computer Vision as it has been the focus of many projects in the nanodegree.

Problem Statement:

Specifically the problem is to use computer vision to count the number of items in a small to mid sized cardboard box. In the training data set given in the starter notebook for this project the amount of items can be 1,2,3,4 or 5. The ability of a Deep Learning based Computer Vision model to correctly classify the amount of items in a box is quantifiable, measurable, and replicable.

Solution Statement:

My solution to this problem will be to finetune a ResNet50 model on the given Amazon Bin dataset which is provided in the project starter files and has been collected and released by Amazon itself. Given more time and resources it would be interesting to try many different models Or possibly an AutoML solution.

Datasets and Inputs:

Here is a link to the Amazon Bin Dataset <https://registry.opendata.aws/amazon-bin-imagery/>.

From the website:

"The Amazon Bin Image Dataset contains over 500,000 images and metadata from bins of a pod in an operating Amazon Fulfillment Center. The bin images in this dataset are captured as robot units carry pods as part of normal Amazon Fulfillment Center operations."

Some additional information from the official git hub page for the data set:

“Amazon uses a random storage scheme where items are placed into accessible bins with available space, so the contents of each bin are random, rather than organized by specific product types. Thus, each bin image may show only one type of product or a diverse range of products. Occasionally, items are misplaced while being handled, so the contents of some bin images may not match the recorded inventory of that bin”

Referenced github link: <https://github.com/aws-labs/open-data-docs/tree/main/docs/aft-vbi-pds>

Benchmark Model:

Given we have 5 classes we can start with a simple baseline of 20% accuracy from random guessing. This is a standard practice in classification problems. We could also use the resnet50 as a baseline and use a more modern and powerful model like the EfficientNet as another option. Given the resources for this project we can only run a small amount of training runs so we will use 20% from random guessing as the baseline.

Evaluation Metrics:

We will measure the success of the computer vision model using the % accuracy to predict each class label: 1,2,3,4 or 5.

Project Design:

This is one of the suggested projects from Udacity so the project design has been outlined in the Udacity course page. Here is some information from the Udacity page for the project:

“Pipeline

To finish this project, you will have to perform the following tasks:

1. Upload Training Data: First you will have to upload the training data to an S3 bucket.
2. Model Training Script: Once you have done that, you will have to write a script to train a model on that dataset.
3. Train in SageMaker: Finally, you will have to use SageMaker to run that training script and train your model”