Amazon Inventory Reconciliation Using AI

CAPSTONE PROPOSAL

Mohanad Ahmed

1. Domain Background:

The emerging technology advancements force retailers to assess their current business approaches and systems, especially warehouse sophistication. As a key element of the entire supply chain, the main goal of the warehouse is to provide maximum effectiveness, along with productivity optimization, for satisfying the requirements of the omnichannel retailer.

But, according to Gartner, “60% of companies are dissatisfied with the fit between their supply chain planning objectives and supply planning capability.” Today, clients prefer accustomed full-cycle product offerings, which increases their loyalty to retailers that can offer the necessary products at any time. Therefore, companies must refine their warehouses to address the supply chain challenges.

To achieve organic expansion and growth, both retailers and warehouse managers need to assess the current state of the warehouse, uncover its potential challenges, and then build upon its major strengths. At the same time, managers should apply the right practices for providing accurate data, insights, or trends and diagnosing and resolving issues.

2. Problem Statement:

Inventory management is critical to Amazon’s success. Thus, the need arises to apply artificial intelligence to assure the correctness of deliveries.

Amazon Fulfillment Centers are bustling hubs of innovation that allow Amazon to deliver millions of products to over 100 countries worldwide. These products are randomly placed in bins, which are carried by robots.

Occasionally, items are misplaced while being handled, resulting in a mismatch: the recorded bin inventory, versus its actual content.

The project predicts the number of items in a bin, thus detecting any inventory variance. By correcting variance upon detection, Amazon will better serve its customers.

3. datasets and inputs:

Amazon has made public the Bin Image Dataset. It contains 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 operations. Bin Image dataset provides the metadata for each image from where number of items in bin can be derived.

4. Solution Statement:

Using pre-trained model (ResNet 34) for feature extractions from our images data by freezing all the weights of the neural network and only changes the classification layer so the model only needs to train these weights at the last classification layer, using Stochastic Gradient Descent with categorical cross entropy loss function for 5 classes only.

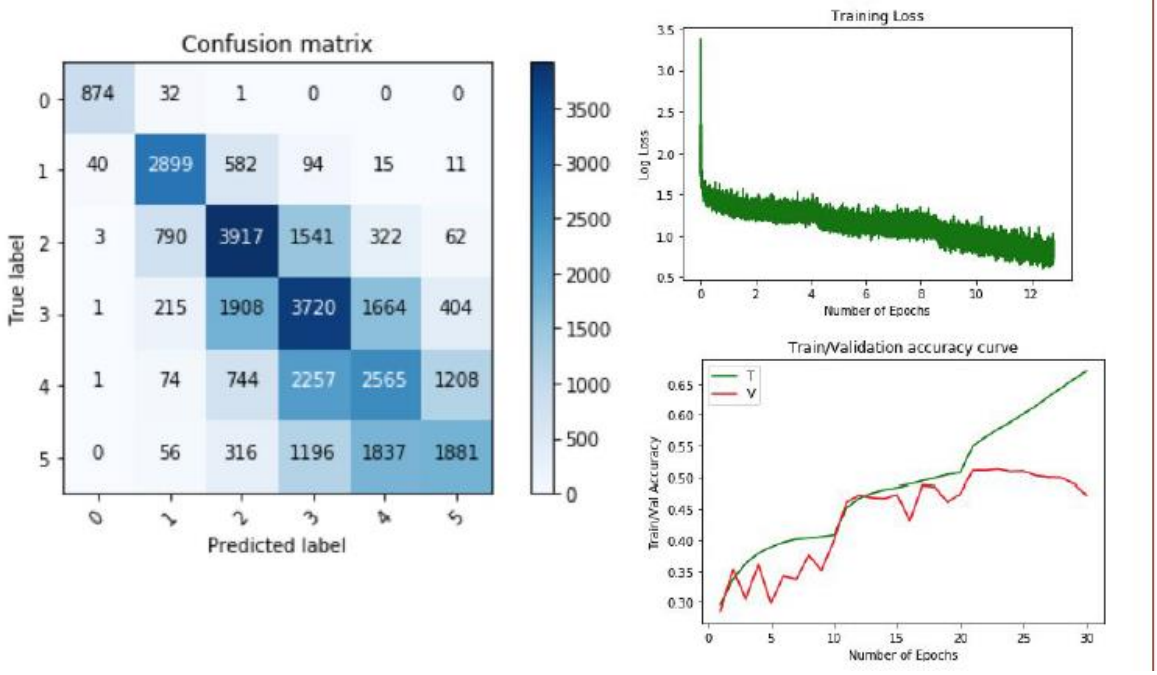
- The Algorithm will be built using Resnet 34 pretrained model.
- Deep Learning Framework – PyTorch.
- Implement Adam optimizer to train the model.
- A corresponding Sage Maker instance will be created and data will be fed from the S3 bucket.
- The model will also be tuned to find out the best hyper-parameters.

5. A benchmark model:

Refer to Stanford University Palo Alto, California results:

The project's repository is: https://github.com/OneNow/AIInventory-Reconciliation

Model	Epochs	Train Accuracy	Test Accuracy	Test Root Mean Square Error
ResNet 18 (SGD)	20	55.9	50.4	0.98
ResNet 34 (SGD)	22	55.2	51.2	0.99
ResNet 34 (SGDR)	36	57.8	53.8	0.94



6. Evaluation Metrics:

Since it is a classification problem, the overall accuracy of the classification and F1 score can be used to evaluate the performance of the trained model.

7. Workflow: