INVENTORY MONITORING AT DISTRIBUTION CENTRES

Project's Domain Background

The distribution centre is a vital aspect of the supply chain, where the movement of goods is critical to the business's success. The use of robotics in the movement of objects can improve efficiency and accuracy, but it requires an automated system that can count the number of objects in each bin. This project aims to develop a machine-learning model that can accurately count the number of objects in each bin.

Problem Statement

The primary problem in distribution centres is accurately counting objects in bins. The manual counting of things can lead to errors and consume a lot of time, and it is not scalable. Therefore, this project aims to automate the object counting process using machine learning algorithms.

Datasets and Inputs

The Amazon Bin Image Dataset, consisting of 500,000 images of bins containing one or more objects, will be used as the primary dataset for this project. The metadata file will provide additional information such as the number of objects, dimensions, and type of object. There are 133 different classes and hence, labels, in this dataset (eg. Affenpinscher).

Solution Statement

The solution proposed for this project is to build a machine-learning model that can accurately count the number of objects in each bin. The model will be trained on the Amazon Bin Image Dataset using SageMaker, where the training data will be preprocessed before training the model. The model will then predict the number of objects in each bin.

Benchmark Model

A simple benchmark model for this project could be a rule-based model that uses the dimensions of the bin and the objects to estimate the number of objects. This model could be used to compare the accuracy of the machine learning model. Though no works have been found publicly available on this dataset, I imagine a pre-trained computer vision model such as ResNet or ImageNet would be a good place to start in comparing my work to previous work on this dataset.

Evaluation Metrics

The evaluation metrics for this project will be the mean squared error (MSE) and the model's accuracy. MSE will be used to evaluate the regression performance of the model, while accuracy will be used to assess the classification performance of the model.

Project Design

The project design will involve the following steps:

1. Preprocessing the dataset to remove any irrelevant data and augment the data to increase the dataset size
2. Splitting the dataset into training and testing sets
3. Choosing a model architecture and hyperparameters for the model
4. Training the model on the training set using SageMaker
5. Evaluating the model performance on the testing set using MSE and accuracy metrics
6. Improving the model performance by tuning hyperparameters and choosing better architectures
7. Deploying the model on SageMaker and using it to predict the number of objects in new bins.

Conclusion

In conclusion, this project aims to build a machine-learning model that can count the number of objects in bins, which is essential for tracking inventory and ensuring delivery consignments have the correct number of items. Using the Amazon Bin Image Dataset and SageMaker, this project will demonstrate end-to-end machine-learning engineering skills learned in this nanodegree.