Robotic Inference

Badreddin Aboubakr

Abstract—This project is a part of Udacity-Robotics Nano Degree, using DIGITs (NVIDIA Deep Learning GPU Training System) a classifier should be built (and deployed later) with a dataset that has been acquired by the student

◆

1 INTRODUCTION

OBJECT recognition plays a big role in perception for Robots equipped with a camera recognition means giving a label then with this label the under-laying layers (decision makers) can make a decision that is appropriate to the seen object(turn around if an obstacle has been seen or take an article out conveyor belt if unwanted objects has been detected... .) in this project i will try to build a classifier that could recognize some of my books)

1.1 My Books classifier classifies

weather itis one of three books(The New Earth, Tschick, drachenlufer) or no book

2 BACKGROUND / FORMULATION

first the data should be divided into classes in my project i have 4 classes as following :

- The New Earth
- Tschick
- drachenlufer
- nobook

AlexNet convolutional neural network was chosen for both my data and supplied data , it contains 8 layers , first five are convolutional [1] 30 epochs with learning rate = 0.01 were enough to achieve high accuracy to the data set i collect for the supplied data learning rate = 0.01 wasn't enough to achieve accuracy of at least 75 % then a learning rate of 0.001 was chosen

3 DATA ACQUISITION

i used for a python script for Data Acquisition that uses Opencv to take pictures from the camera and save it automatically to a directory on a a a table with a fixed Camera above i took pictures for every class in my data set taking 25% from the data as validation set

TABLE 1
Data-Set

Class	Validation	Train	Total
The New Earth	48	143	191
Tschick	52	156	208
drachenlufer	53	160	213
no book	7	21	28

all images are colored and have the size of 640 x 480 during the training to they were resized to fit to AlexNet , which requires 256 x 256
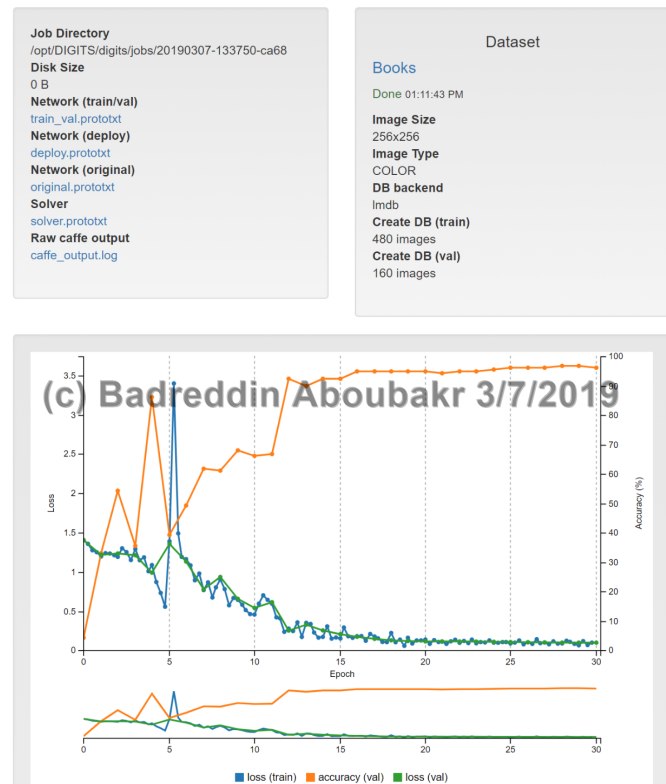
4 RESULTS

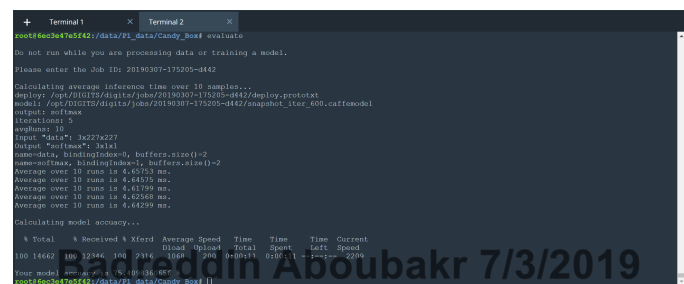Fig. 1. Result

on supplied dataset

Fig. 2. Result on the supplied dataset

the accuracy was 75.4098360656 % and inference time of : 4.62568 ms

5 DISCUSSION

Result was quit good and shows high accuracy this is because the data set has images rich of features and there were just 4 classes, on the other hand for the class "Nobook" I tried to classify a picture of no book in it using DIGIT classify once it showed less confident recognizing that there is no book on the table
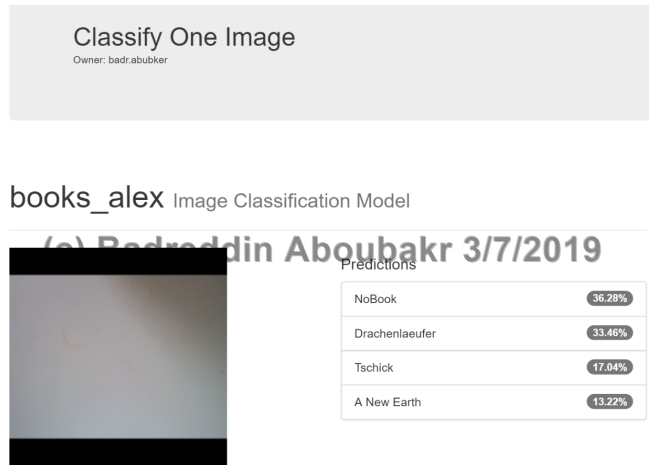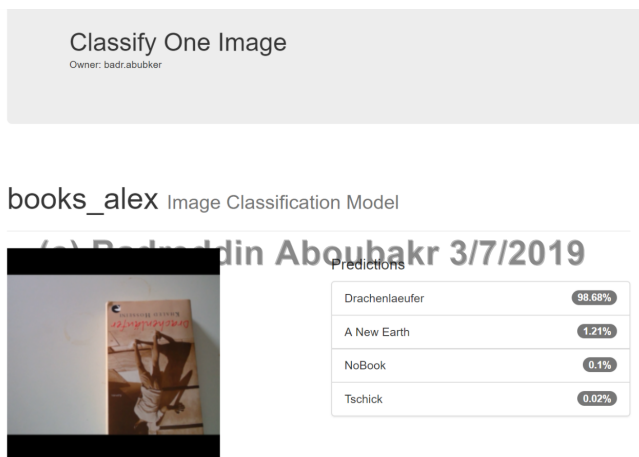

Fig. 3. Picture with no Book in it

this could've done better when taking pictures for books by not including the whole background of the table but focusing on the book by move the camera closer

6 CONCLUSION / FUTURE WORK

this Model would work on a conveyor belt to sort these three kinds of books (sure the Model could be bigger and could be used to sort more books) Future work would be recollect the data without a table behind and deploy the module on Jetson Tx2 with robotics arm to pick the right book

REFERENCES

[1] *wikipedia*.