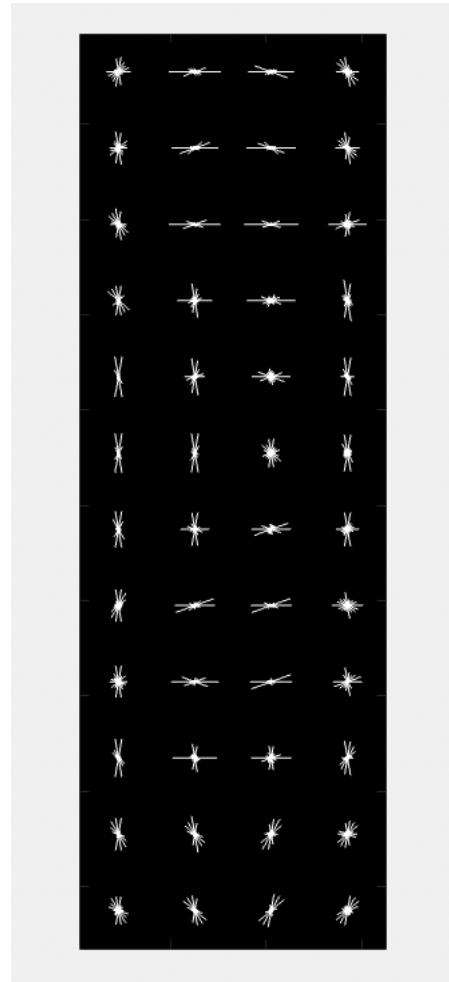


1.

a.



ps7-1-a.png

length of HOG feature vector: 1188

b.

The dimension of X_train is $100 * 1188$ (100 images and the length of HOG feature vector is 1188).

The dimension of Y_train is $100 * 1$.

d.



ps7-1-d-1.png

Right.



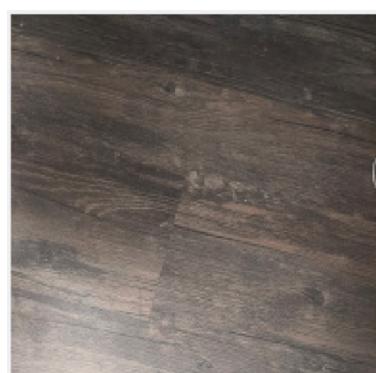
ps7-1-d-2.png

False positive. Detected the screwdriver.



ps7-1-d-3.png

False positive. Detected the notebook.



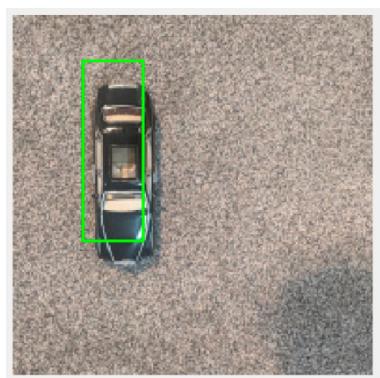
ps7-1-d-4.png

Right



ps7-1-d-5.png

Right.



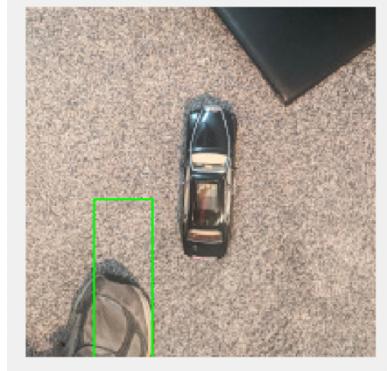
ps7-1-d-6.png

Right



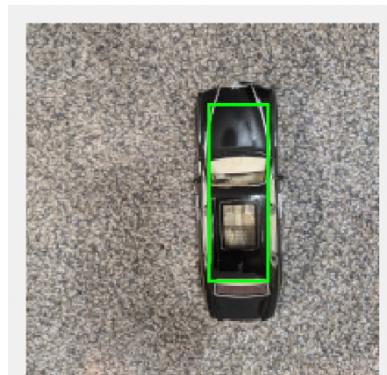
ps7-1-d-7.png

Right



ps7-1-d-8.png

False negatives. Missed the car and detected the shoe.



ps7-1-d-9.png

Right.

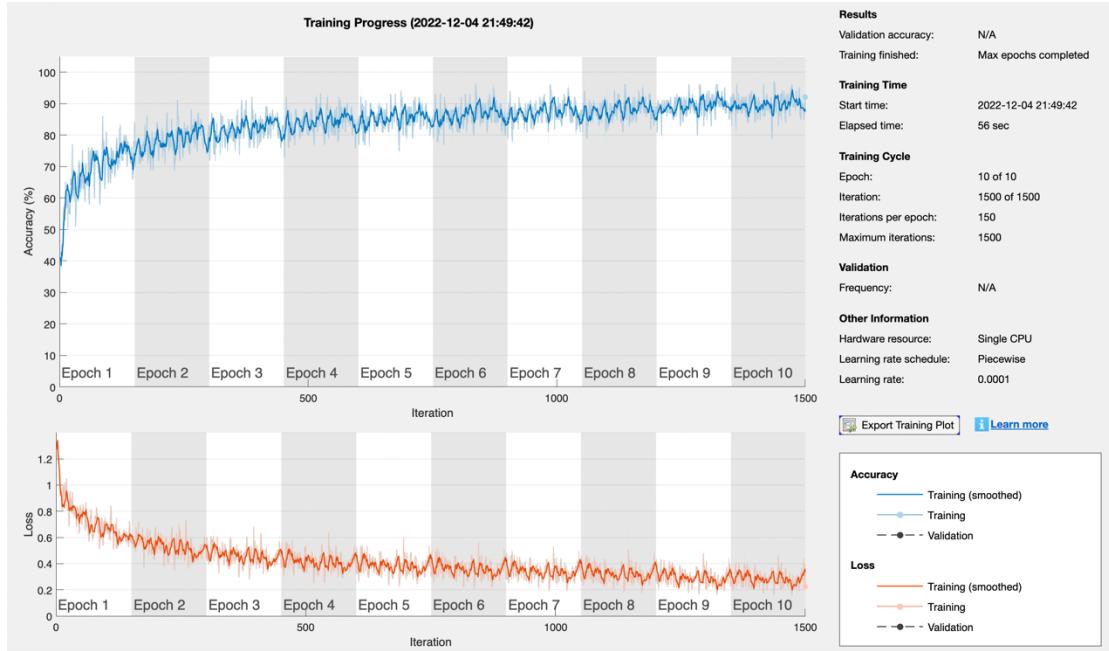


ps7-1-d-9.png

To improve the accuracy, I think it is important to expand the train dataset, so that the model can be more accurate which can lead to a better detect result and avoid misdetection. Moreover, the value of threshold is important, it can avoid to detect target when the image actually do not have it, so maybe I need a better threshold next time.

2.

a.



ps7-2-a-1.png

```
layers =
```

```
12x1 Layer array with layers:
```

| | | |
|----|-----------------------|---|
| 1 | Image Input | 32x32x3 images with 'zerocenter' normalization |
| 2 | Convolution | 16 3x3 convolutions with stride [1 1] and padding 'same' |
| 3 | Batch Normalization | Batch normalization |
| 4 | ReLU | ReLU |
| 5 | Max Pooling | 2x2 max pooling with stride [2 2] and padding [0 0 0 0] |
| 6 | Convolution | 16 3x3 convolutions with stride [1 1] and padding [0 0 0 0] |
| 7 | Batch Normalization | Batch normalization |
| 8 | ReLU | ReLU |
| 9 | Max Pooling | 2x2 max pooling with stride [2 2] and padding [0 0 0 0] |
| 10 | Fully Connected | 3 fully connected layer |
| 11 | Softmax | softmax |
| 12 | Classification Output | crossentropyex |

ps7-2-a-2.png

The accuracy is increased from 40.00% to 93.00% after 10 epochs.

b.

```
testing_accuracy =
```

0.8577

The accuracy is 85.77%

To enhance the accuracy, first way I think is to expand the dataset size. And a suitable batch_size is also very important. Also, maybe increase the epochs also works. The last one is the structure of the network, which is the most important one.

C.



ps7-2-c.png