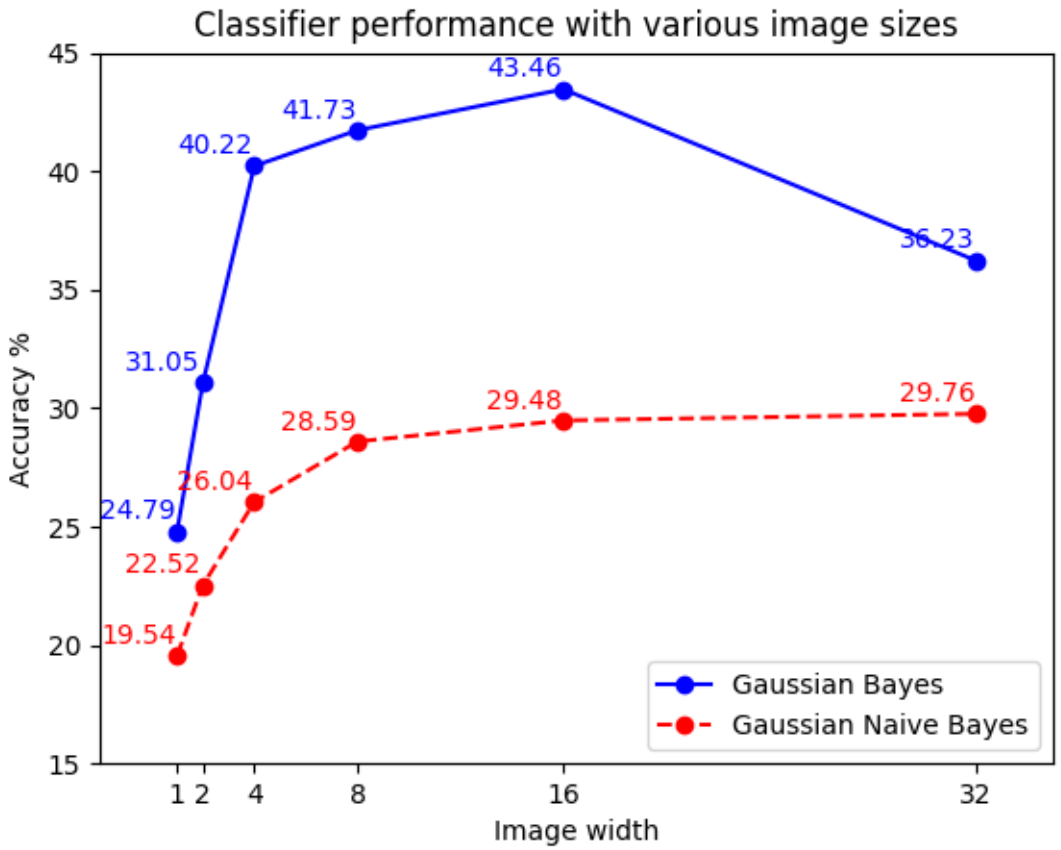
DATA.ML.100 – Exercises 3

CIFAR-10 – Bayesian classifier (super powerful) (20 points)

Here is the graph that compares Bayes & Naive Bayes classifier's accuracy for 1x1 to 32x32 images:



Also some screenshots to verify that I used my own code:

```
154     pool = Pool(4)
155     classified=pool.map(bclassify, testX)
156     classified=np.concatenate(classified)
157     bacc=class_acc(classified, testY)
158     baccuracy.append(round(bacc*100,2))
159
160     print('Evaluate Gaussian Naive Bayes model...')
161     pool = Pool(4)
162     classified=pool.map(nbclassify, testX)
163     classified=np.concatenate(classified)
164     nbacc=class_acc(classified, testY)
165     nbaccuracy.append(round(nbacc*100,2))
166
167     print('{}x{} Gaussian Bayes-classifier accuracy: {
```

Line 170, Column 59

```
[tuomas@localhost Ex3]$ python task3.py
Estimating model parameters for 1x1 images...
Resizing test images...
Evaluate Gaussian Bayes model...
Bayes classifier Classifying...
Bayes classifier Classifying...
Bayes classifier Classifying...
Bayes classifier Classifying...
Evaluate Gaussian Naive Bayes model...
Naive Bayes classifier Classifying...
Naive Bayes classifier Classifying...
Naive Bayes classifier Classifying...
Naive Bayes classifier Classifying...
1x1 Gaussian Bayes-classifier accuracy: 24.79%
1x1 Gaussian Naive Bayes-classifier accuracy: 19.54%
Estimating model parameters for 2x2 images...
```

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```
133
134
135
136
137
138   # Define these as a global variables.
139   start=time.time()
140   trainX, trainY = load_whole_trainset()
141   testX1, testY = load_testset()
142
143   ns=[1,2,4,8,16,32]
144   nbaccuracy=[]
145   baccuracy=[]
146   for n in ns:
```

Line 170, Column 59

```
Estimating model parameters for 2x2 images...
Resizing test images...
Evaluate Gaussian Bayes model...
Bayes classifier Classifying...
Bayes classifier Classifying...
Bayes classifier Classifying...
Bayes classifier Classifying...
Evaluate Gaussian Naive Bayes model...
Naive Bayes classifier Classifying...
Naive Bayes classifier Classifying...
Naive Bayes classifier Classifying...
Naive Bayes classifier Classifying...
2x2 Gaussian Bayes-classifier accuracy: 31.05%
2x2 Gaussian Naive Bayes-classifier accuracy: 22.52%
Estimating model parameters for 4x4 images...
Resizing test images...
```

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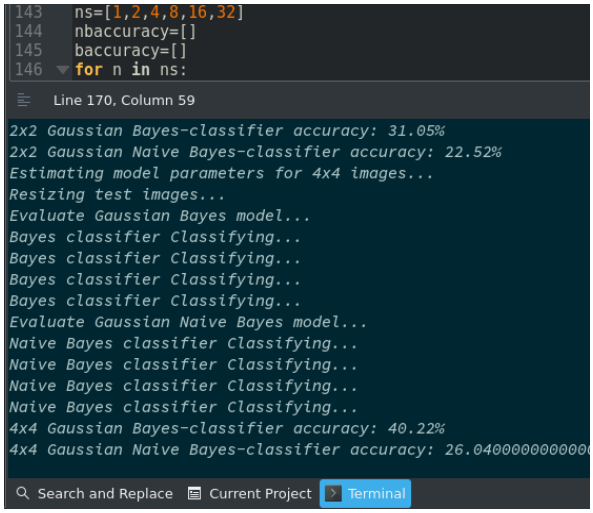

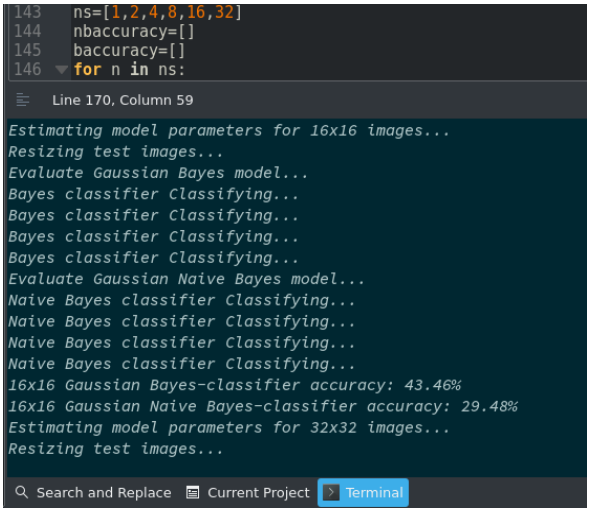

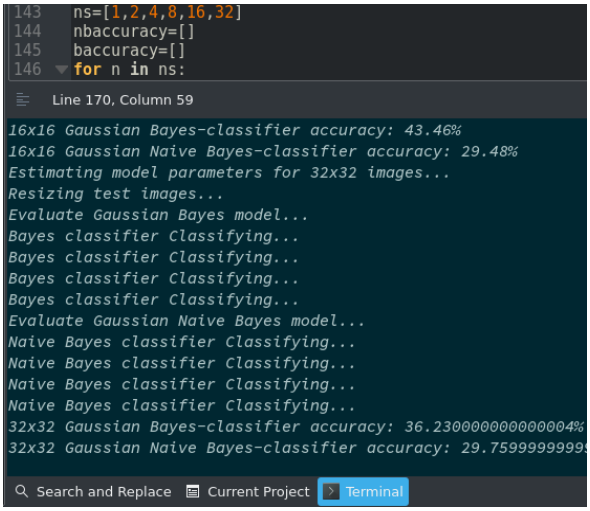

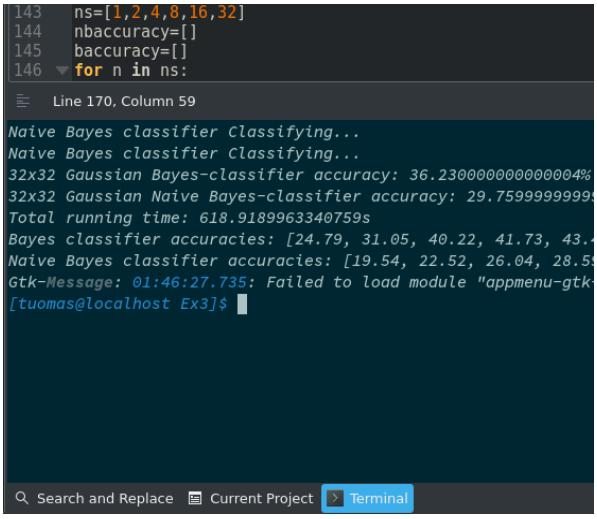

Classification were performed on 4 threads and by utilizing nympy’s vectorization features.

Actual classification part is quite fast (excluding 32x32 images). I didn't had time to optimize the image preprocessing steps, so it somewhat slows the program (overall run time ~619 s).