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TBMI26 - Lab2 Report

1. Plot how the classification accuracy on training data and test data depend on the number of weak classifier (in the same plot). Be sure to include the number of training data (non-faces + faces) and the number of Haar-Features.

Number of training data: 200
Number of Haar-features: 70
Max weights: 3 times initial weights
This results in the following plot:
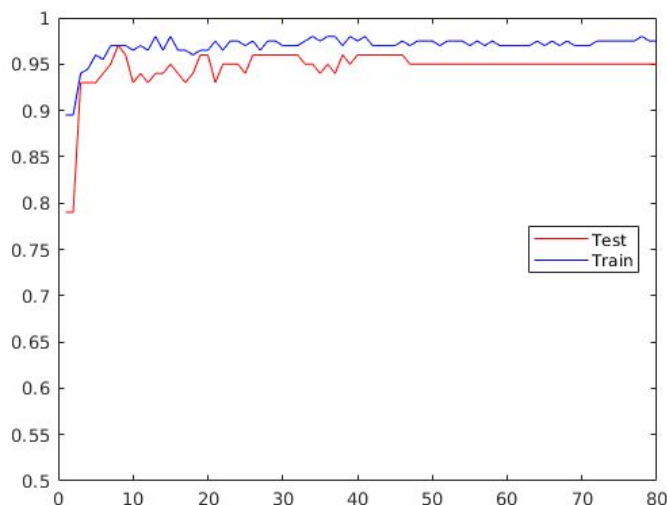
We can see that the amount of classifiers doesn't really impact the performance after about 10 classifiers.

2.   How many weak classifiers did you chose before testing the data?

Judging from the train error it stalls out at about 10-15 classifiers. If we increase the weight limit it can actually reach 100% accuracy for the training data but the risk of overtraining might also increase. Because increased weight limit can allow individual samples to have a big impact on the overall classifier.

**3.   How many weak classifiers did you use for final strong classifier? Why?**

15 classifiers seems like a sweet spot when comparing based on the previous plot where we wanted to find out the optimal amount of weak classifier.

4.   What is the accuracy on the test data after applying the optimized strong classifier?

The accuracy on the test data after applying the strong classifier is at worst 0.94 and at best 0.98. The amount of weak classifier used was 15.

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5.   Plot some of the misclassified faces and non-faces that seem hard to classify correctly.

To see how which images are hardest to classify we run training several times and store results each time. The plot below shows all the test image indexes on the X-axis and the amount of times they were wrongly classified on the Y-axis.
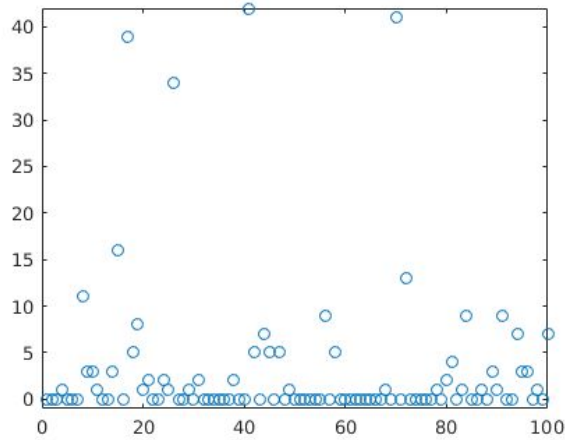

By training the classifiers 50 different times, with randomly generated haar features each time, we can see in the above plot that at least 4 faces are very hard to classify since they are incorrectly classified 33-40 times out of 50. Examples images of difficult images to classify correctly are presented below:

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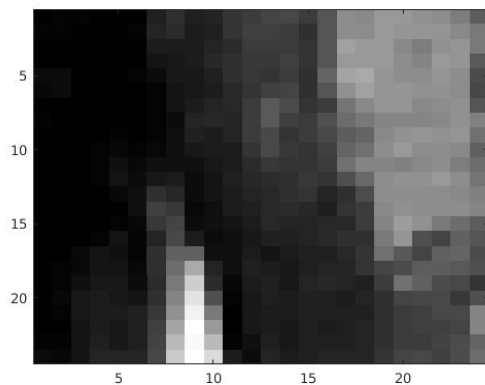
6.   Defend your results. Are they reasonable?

Yes, since our results never fail to get above atleast 92% accuracy on the test data and it usually hovers around 96% accuracy. The plot below shows 50 different training occasions with number of classifiers on X-axis and accuracy on the Y-axis. It is hard to see but almost every test result actually gets a maximum accuracy of above 92%, but not always on the 15th classifier.
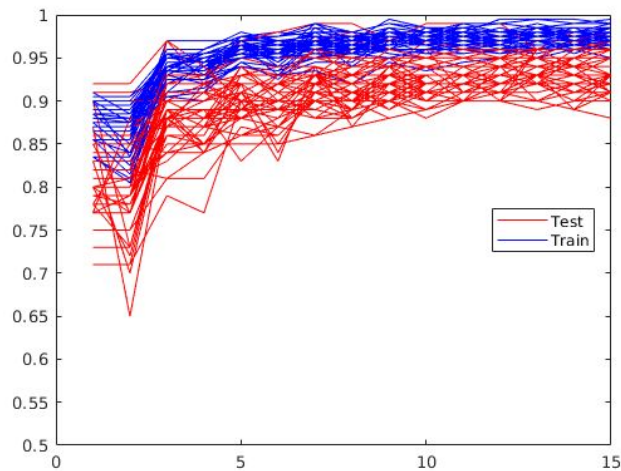
7.   Can we expect perfect results?

No, always getting 100% accuracy is extremely difficult. If not impossible. Even humans themselves will classify an image wrong since it might be really hard to tell what it is. It might be a very unusual angle that the face is in and that makes it hard to distinguish for example.

And where do you draw the line for what a face is? Does it have to be an image of a real face, or can it also be a cartoon drawing of a face? Like a stick figure face or a smiley for example, is that considered to be a face and who is to decide?