

# Homework 1: Face Detection

## Report Template

Please keep the title of each section and delete examples. Note that please keep the questions listed in Part III.

### Part I. Implementation (6%):

- Please screenshot your code snippets of **Part 1, Part 2, Part 4**, and explain your implementation. For example,

```
151      # Begin your code (Part 2)
152      """
153      |       Explained your code here.
154      """
155      # Your implementation.
156      # Your implementation.
157      # Your implementation.
158
159      # End your code (Part 2)
```

### Part II. Results & Analysis (12%):

- Please screenshot the results. For instance,

```
Run No. of Iteration: 9
Chose classifier: Weak Clf (threshold=0, polarity=1, Haar feature (positive regions=[RectangleRegion(10, 1, 2, 13)], negative regions=[RectangleRegion(8, 1, 2, 13)]) with accuracy: 150.000000 and alpha: 9.854630
Run No. of Iteration: 10
Chose classifier: Weak Clf (threshold=0, polarity=1, Haar feature (positive regions=[RectangleRegion(6, 2, 3, 2)], negative regions=[RectangleRegion(3, 2, 3, 2)]) with accuracy: 73.000000 and alpha: 8.660264

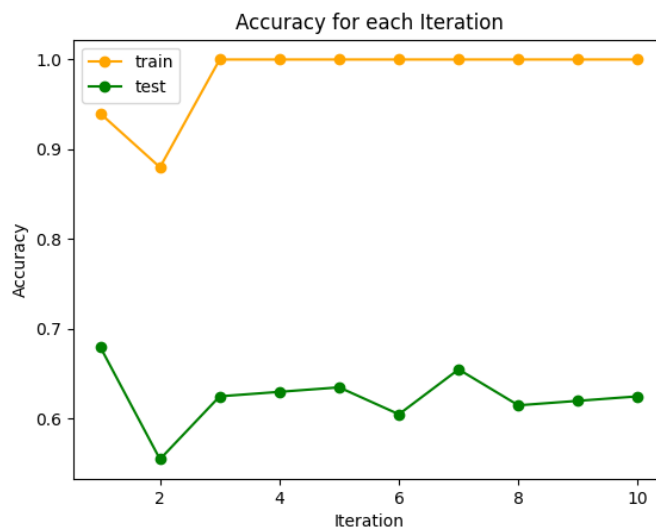
Evaluate your classifier with training dataset
False Positive Rate: 23/100 (0.230000)
False Negative Rate: 25/100 (0.250000)
Accuracy: 152/200 (0.760000)

Evaluate your classifier with test dataset
False Positive Rate: 42/100 (0.420000)
False Negative Rate: 76/100 (0.760000)
Accuracy: 82/200 (0.410000)
```



- Your analysis or observation.  
Please **discuss the performance difference** between the training and testing dataset, and present the results using **a table** or **chart** as follows.

200張	train data accuracy	test data accuracy
method 1 t=1	94.0%	68.0%
method 1 t=2	88.0%	55.5%
method 1 t=3	100.0%	62.5%
method 1 t=4	100.0%	63.0%
method 1 t=5	100.0%	63.5%
method 1 t=6	100.0%	60.5%
method 1 t=7	100.0%	65.5%
method 1 t=8	100.0%	61.5%
method 1 t=9	100.0%	62.0%
method 1 t=10	100.0%	62.5%



### Part III. Answer the questions (12%):

1. Please describe a problem you encountered and how you solved it.
2. What are the limitations of the **Viola-Jones' algorithm**?
3. Based on **Viola-Jones' algorithm**, how to improve the accuracy except increasing the training dataset and changing the parameter  $T$ ?
4. Please propose another possible **face detection** method (no matter how good or bad, please come up with an idea). Please discuss the pros and cons of the idea you proposed, compared to the Adaboost algorithm.