

UNIVERSITAT POLITÈCNICA DE CATALUNYA  
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UNIVERSITAT ROVIRA I VIRGILI

MASTER IN ARTIFICIAL INTELLIGENCE  
COMPUTATIONAL VISION

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# Face detection

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# 1 Exercise 1: Haar-like features and classification

## 1.1 Compute and visualize Haar-like features

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(Normalized) Integral image



Figure 1: Integral image

Question 1:

- Explain the obtained 2-dimensional plot on the feature space.
- Given this 2-dimensional plot, can we infer the defined Haar-like features are appropriate for face/non-face discrimination?

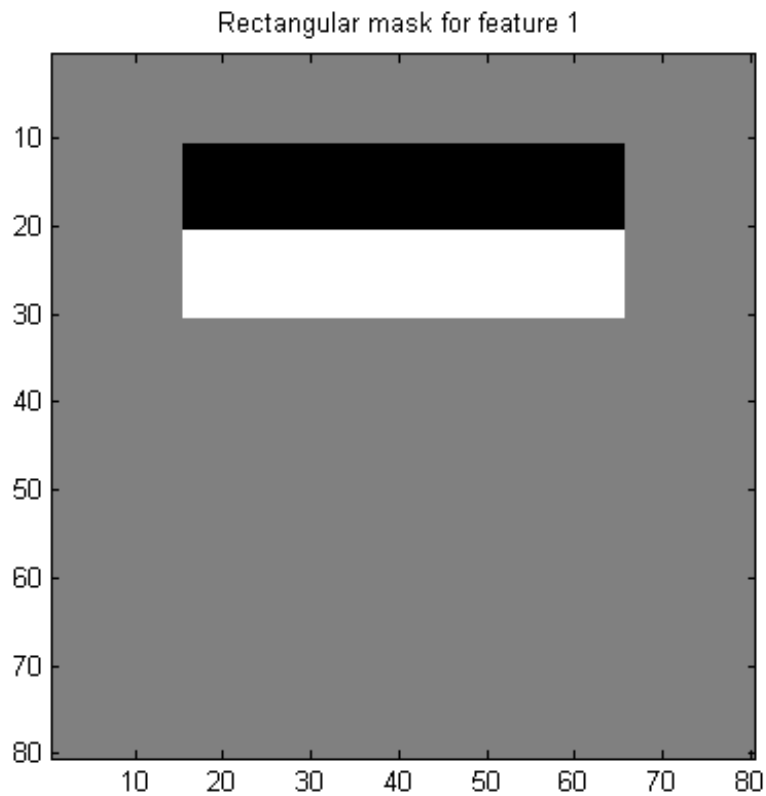
## 1.2 Classification in the feature space

Question 2:

Is the result good enough? Explain your response

Question 3:

What do you infer from the figure? Explain your response

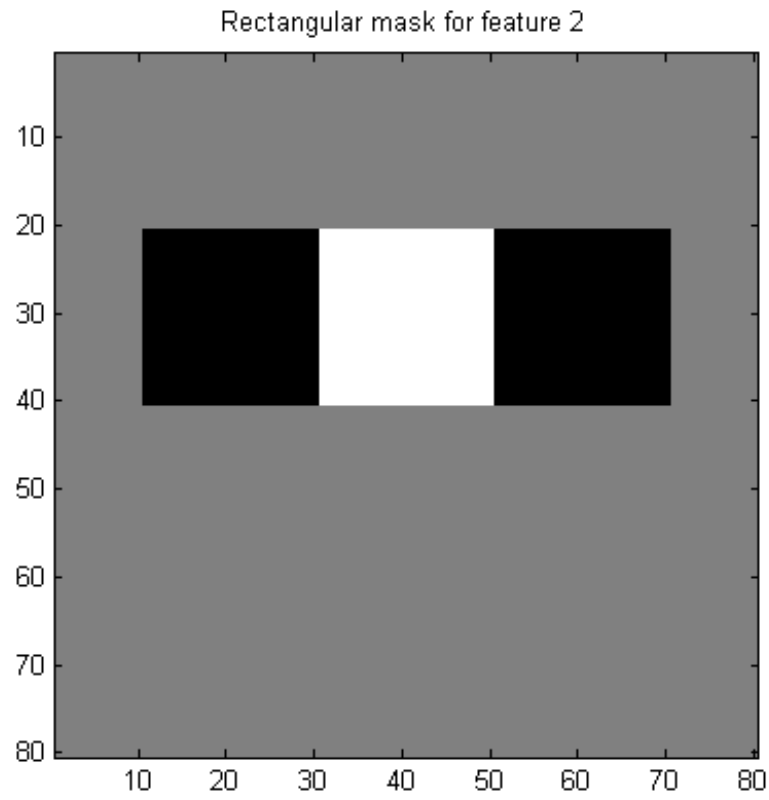


**Figure 2:** Mask for computing the first feature

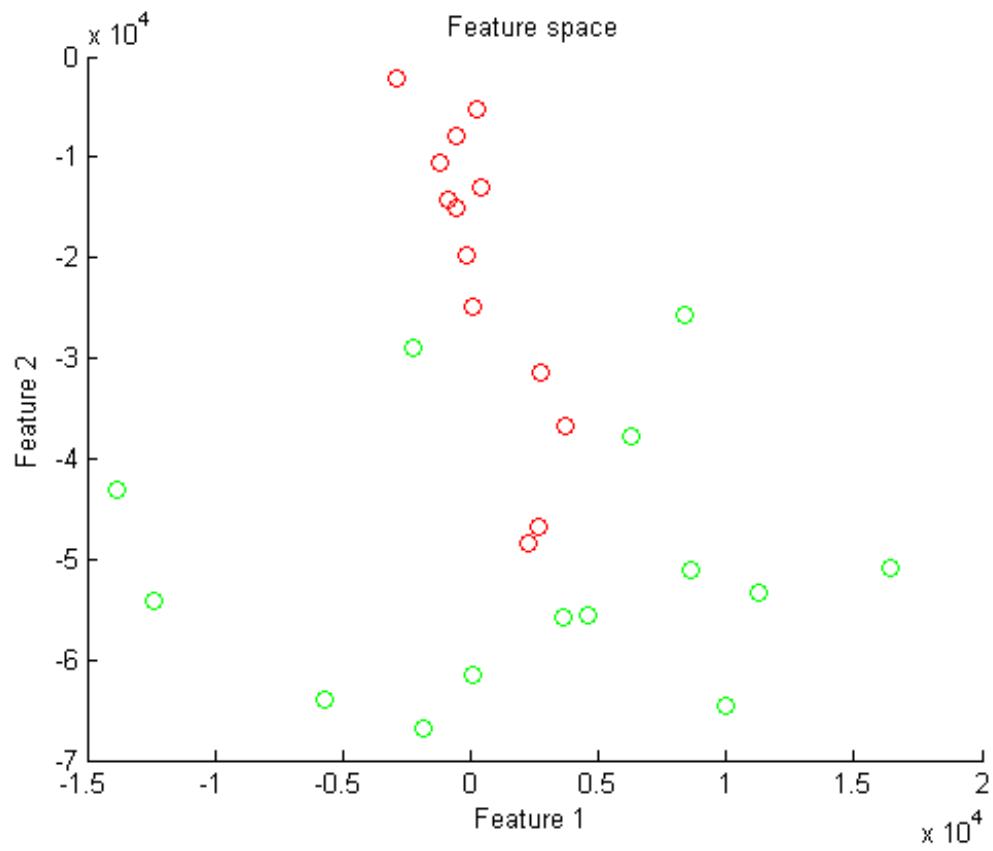
## 2 Exercise 2: Apply and evaluate Viola & Jones method on a video

Question 4:

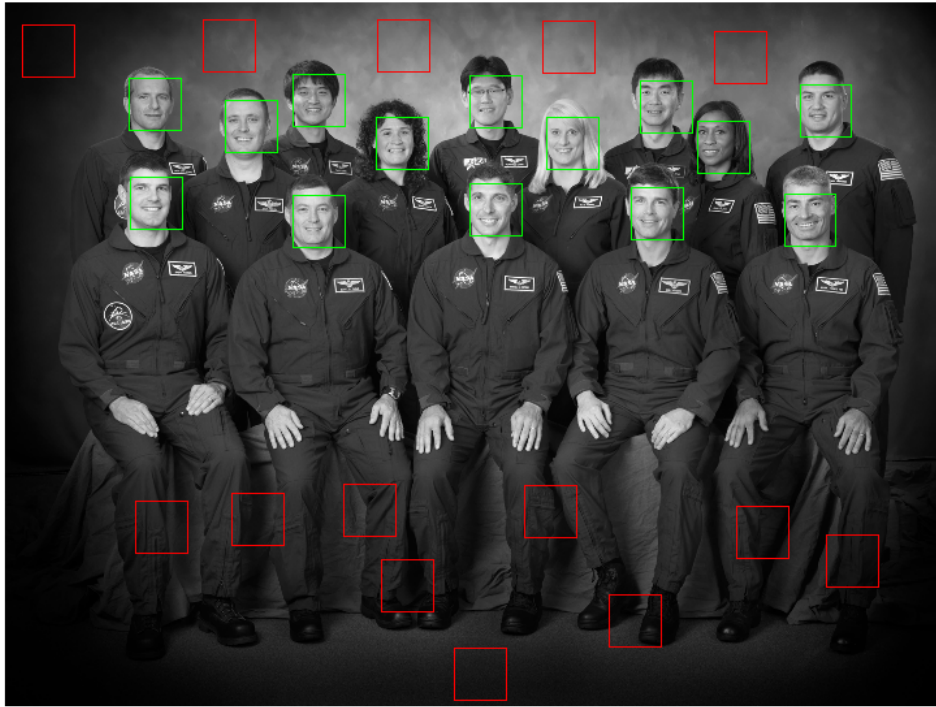
- Is the Viola & Jones method detecting faces in the video frames?
- When is the Viola & Jones method not able to detect the faces? Explain your response.



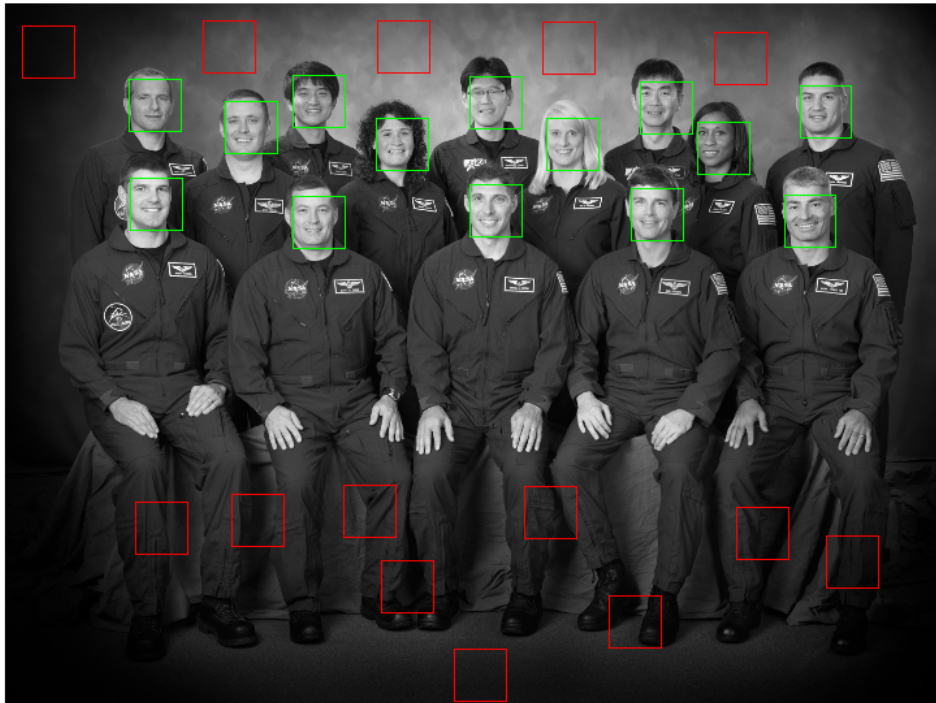
**Figure 3:** Mask for computing the second feature



**Figure 4:** Scatter plot of the features for faces and non-faces



**Figure 5:** Highlighted faces & non-faces



**Figure 6:** Highlighted faces & non-faces

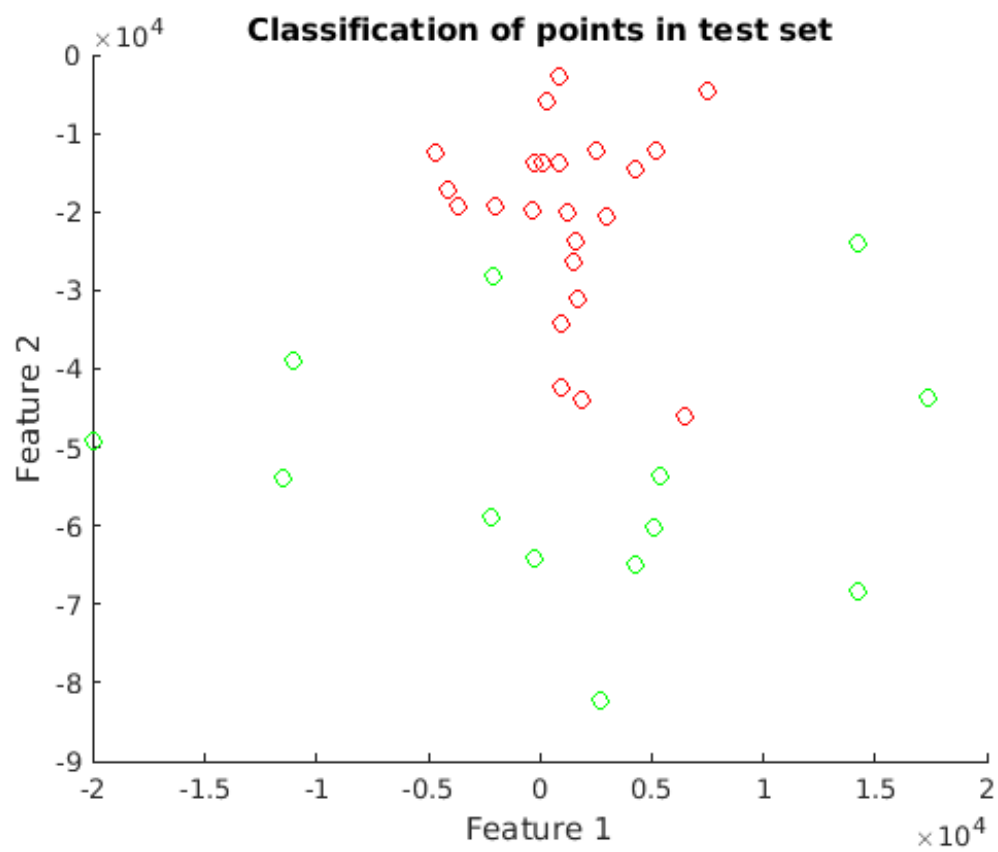


Figure 7: Highlighted faces & non-faces (test set)



Figure 8: Highlighted faces & non-faces (test set)

# Appendices

## A Annex

Some text in the annex.