

FACE DETECTION



Human face detection



Face detection process



Face detection framework

- For each window:



- Features?
- Classifier?

Haar features



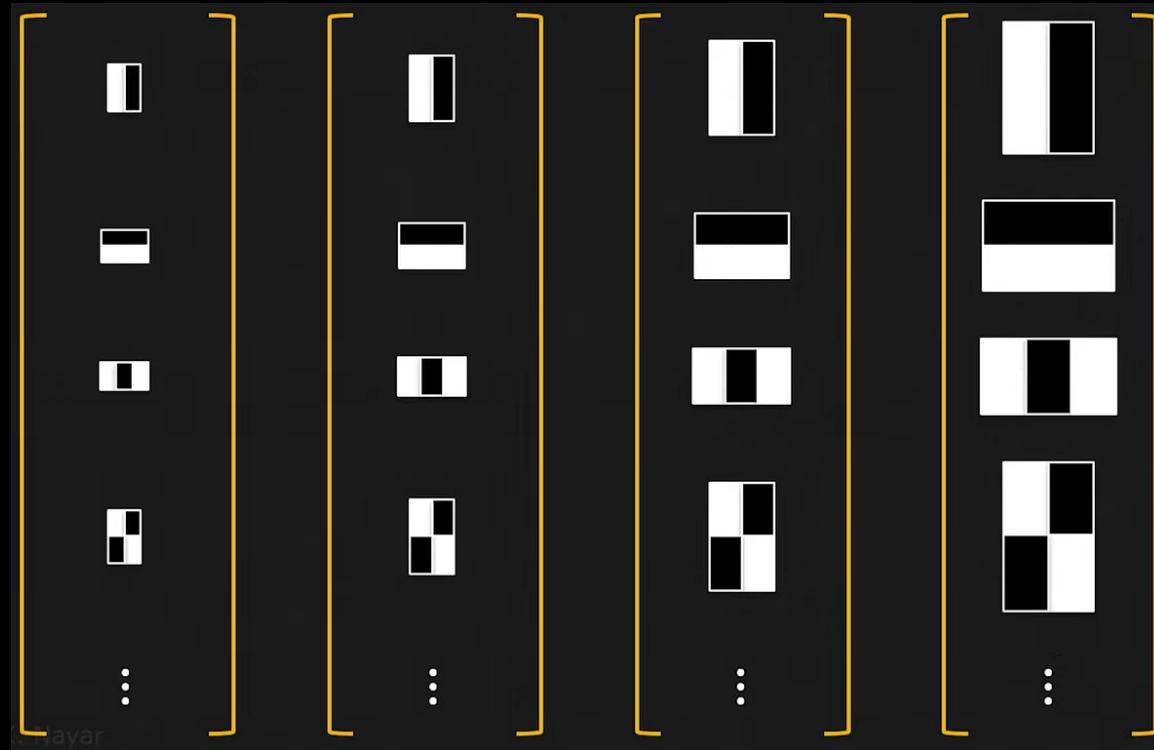
Haar Filters

$$\otimes \begin{bmatrix} H_A \\ H_B \\ H_C \\ H_D \\ \vdots \end{bmatrix} =$$

Haar Features

$$\begin{bmatrix} V_A[i,j] \\ V_B[i,j] \\ V_C[i,j] \\ V_D[i,j] \\ \vdots \end{bmatrix}$$

Detecting faces of different size

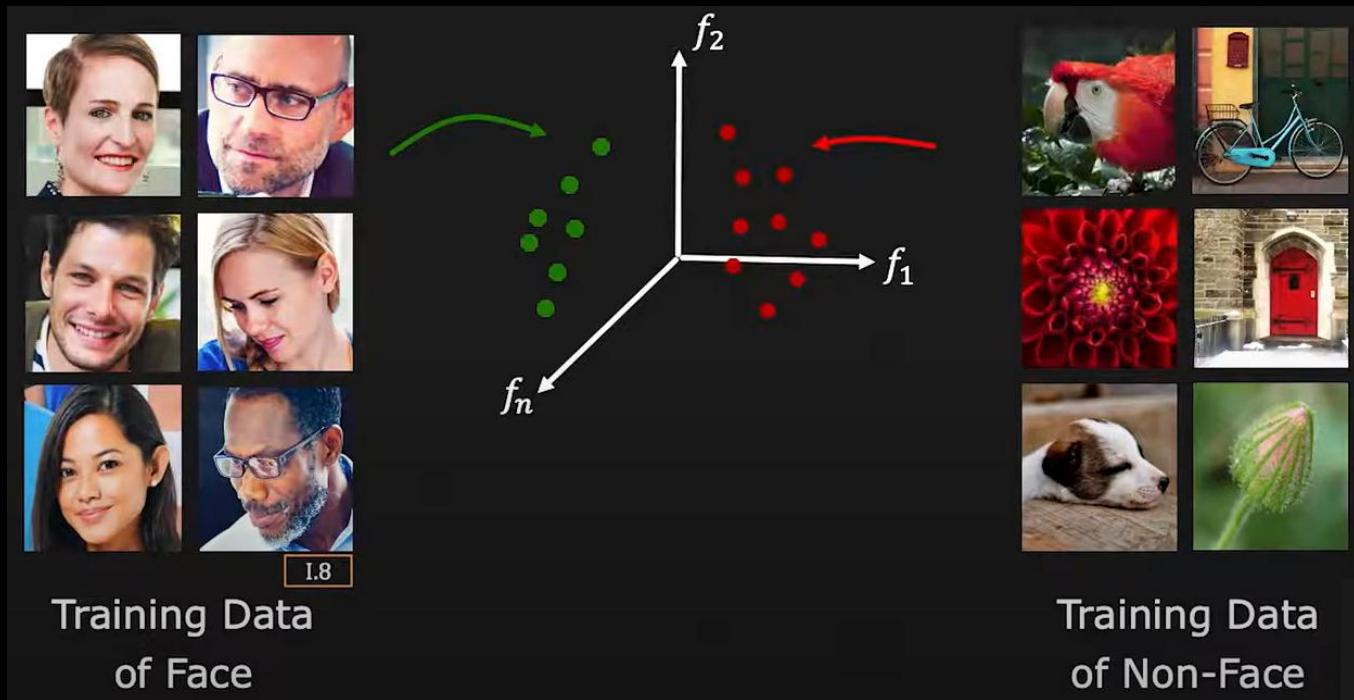


Classifier for face detection



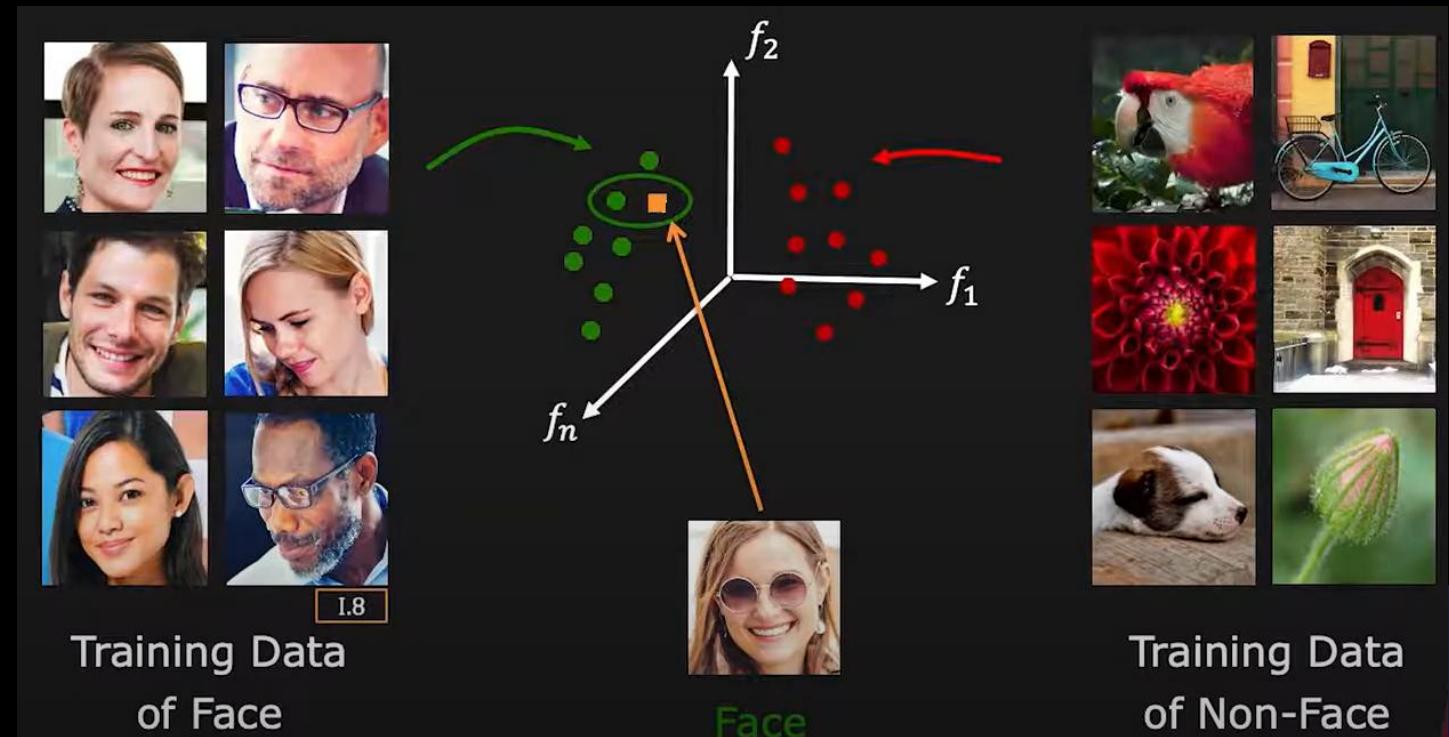
Feature Space

- Haar features f (a vector) at a pixel is a point in an n-D space, $f \in \mathbb{R}^n$



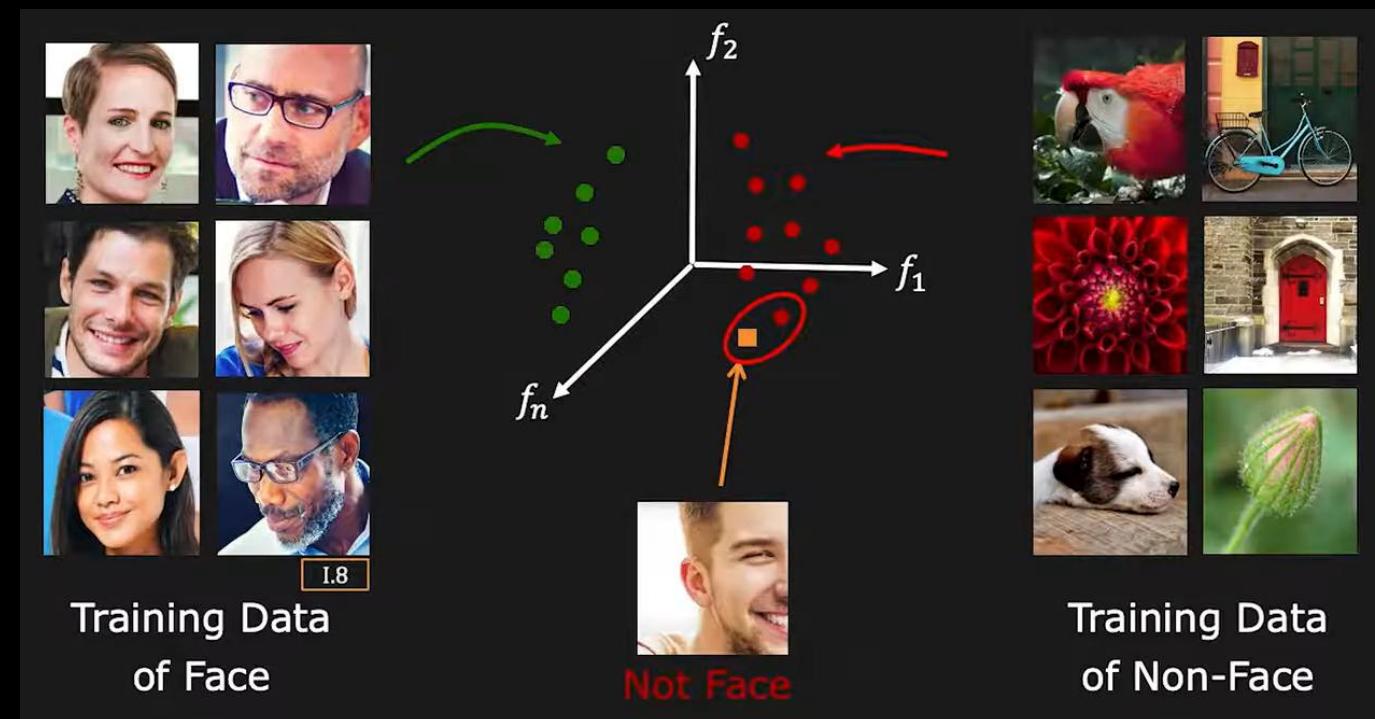
Nearest Neighbour Classifier

- Find the nearest training sample and assign the label



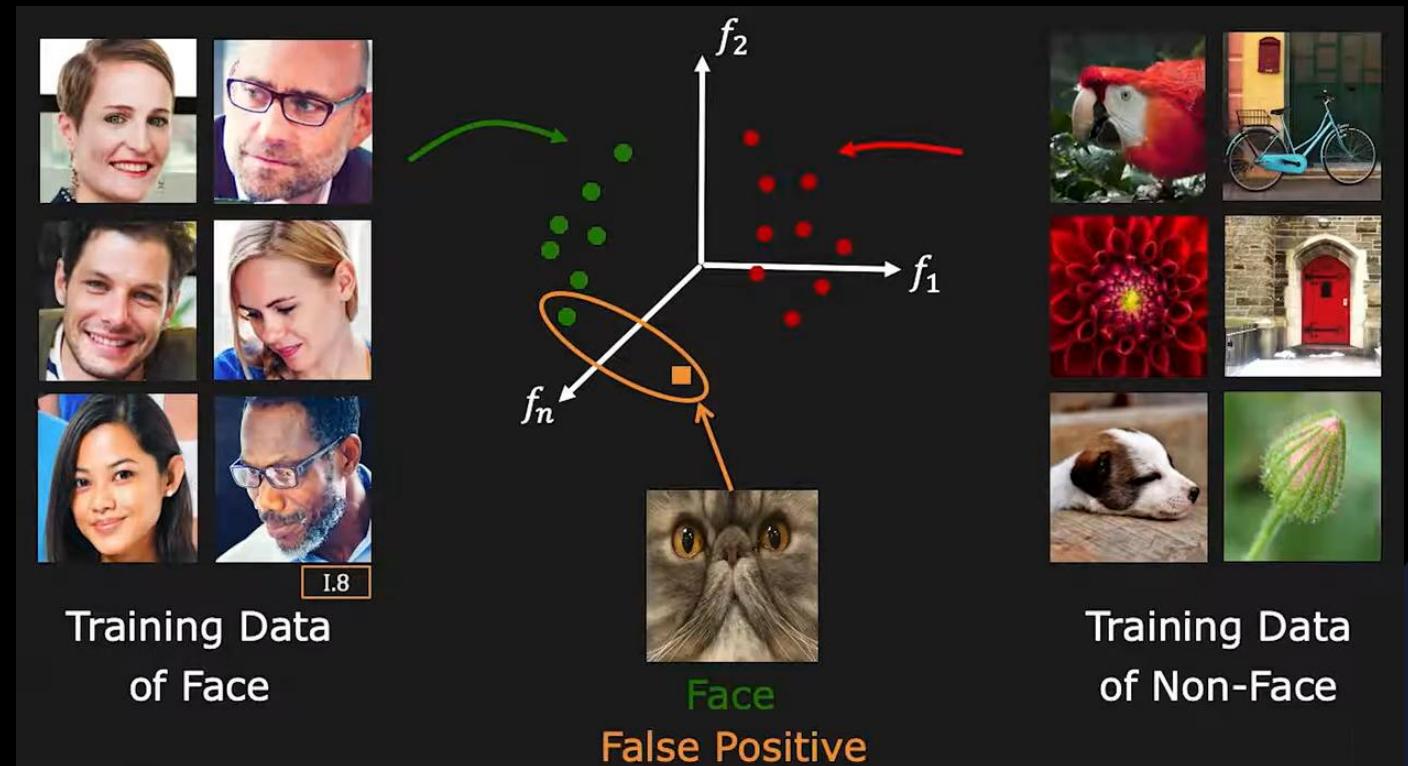
Nearest Neighbour Classifier

- Find the nearest training sample and assign the label



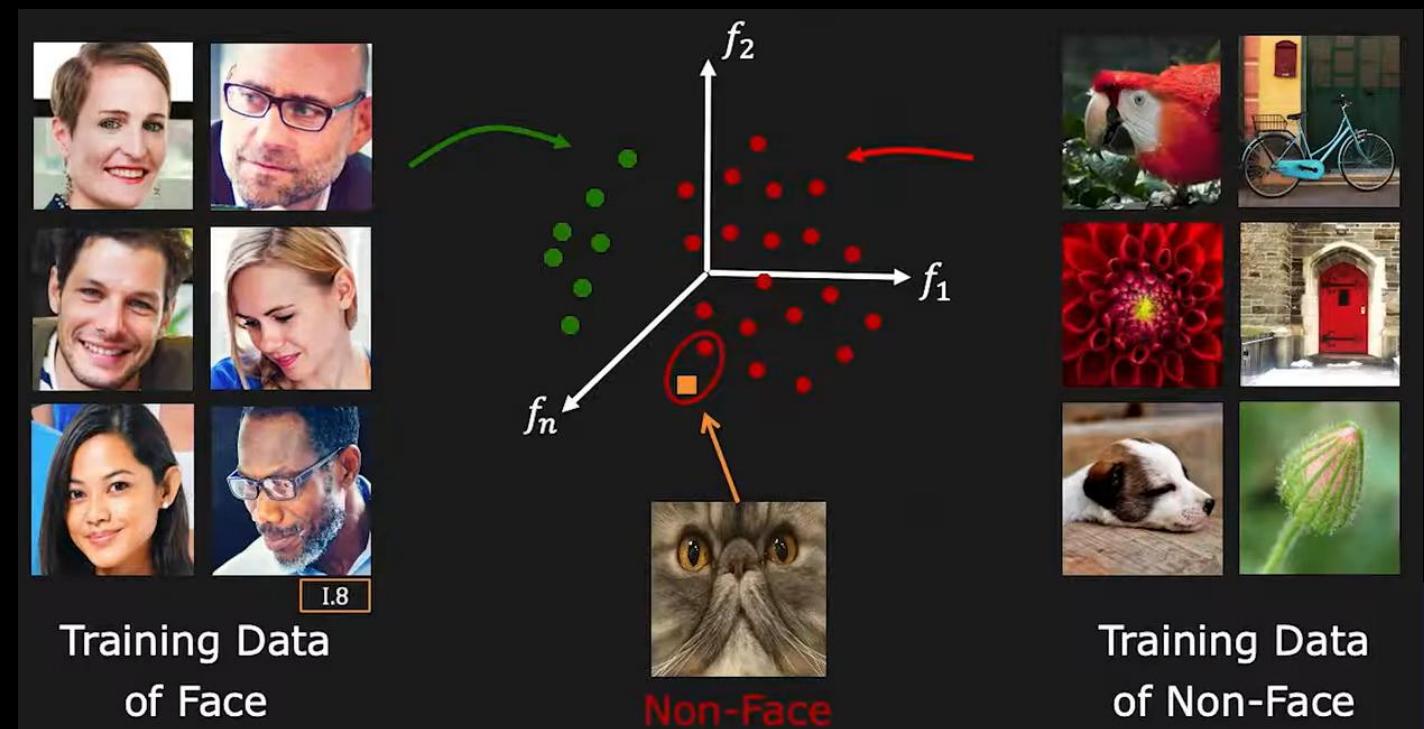
Nearest Neighbour Classifier

- Find the nearest training sample and assign the label

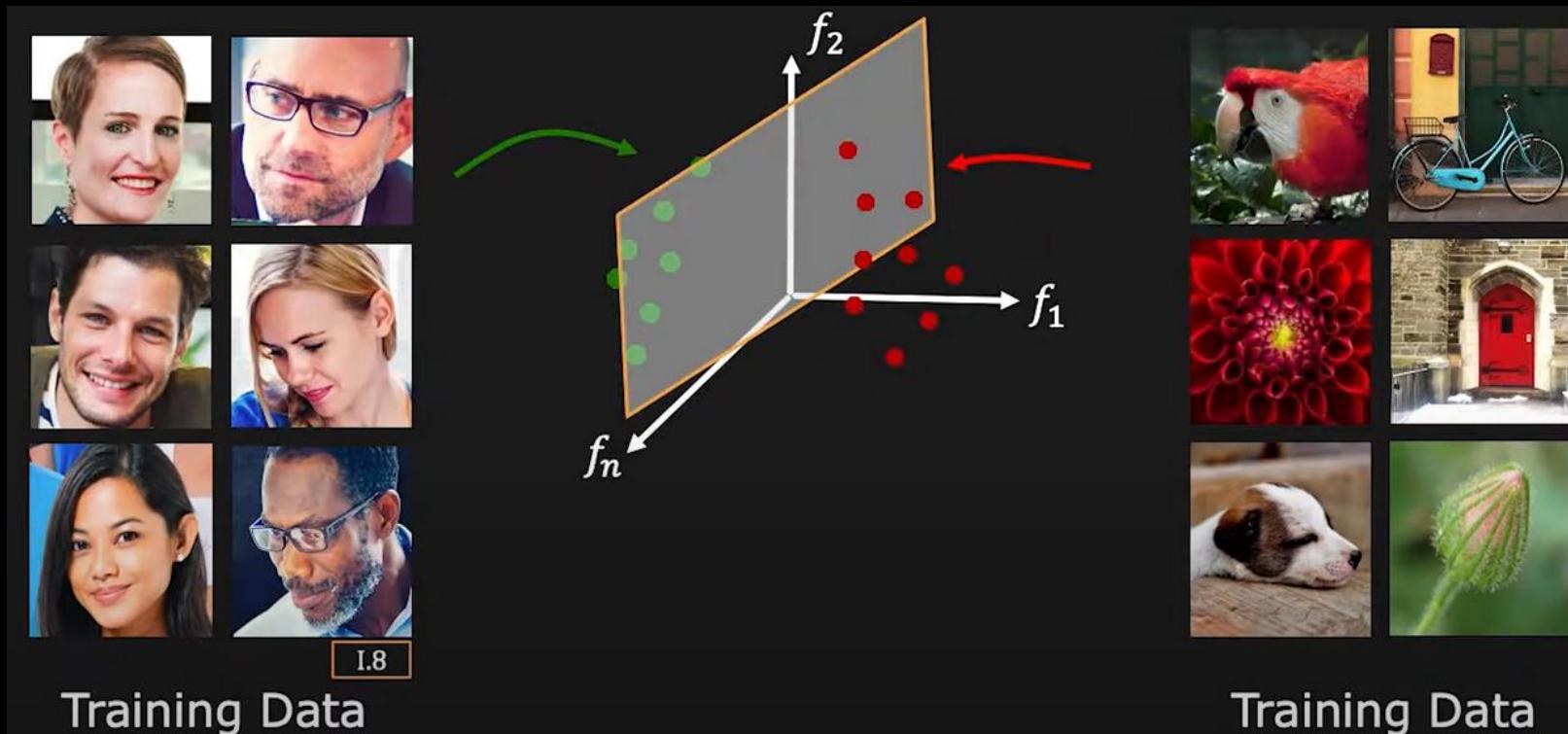


Nearest Neighbour Classifier

- Large training set
- Robust NN classifier
- Slower the NN classifier

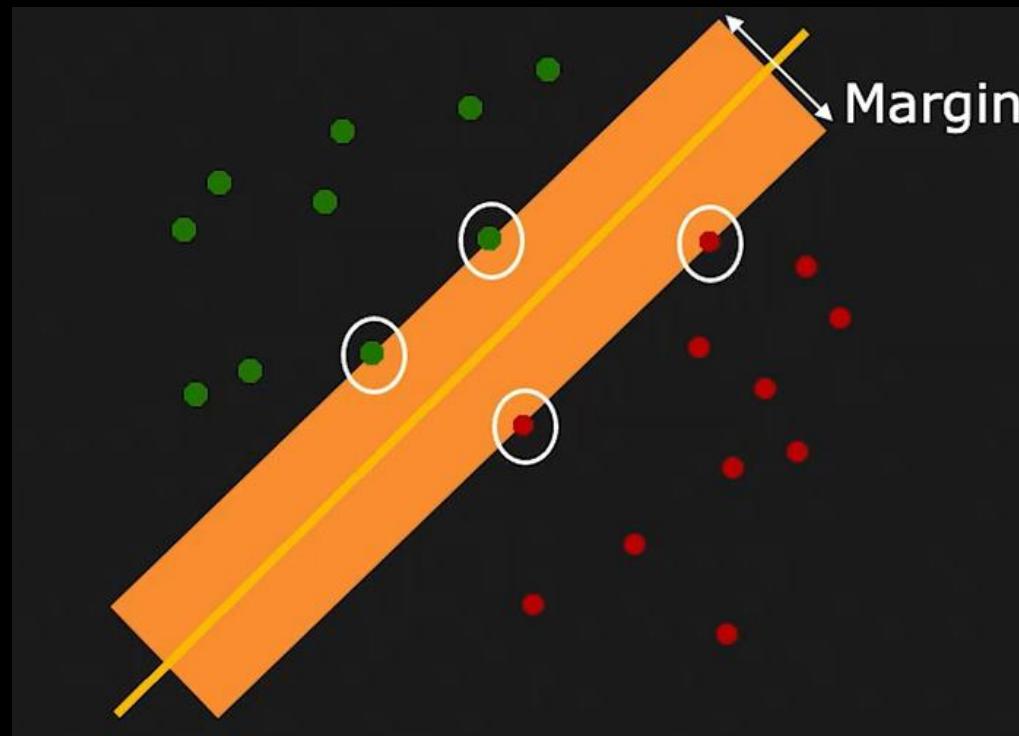


Decision boundary

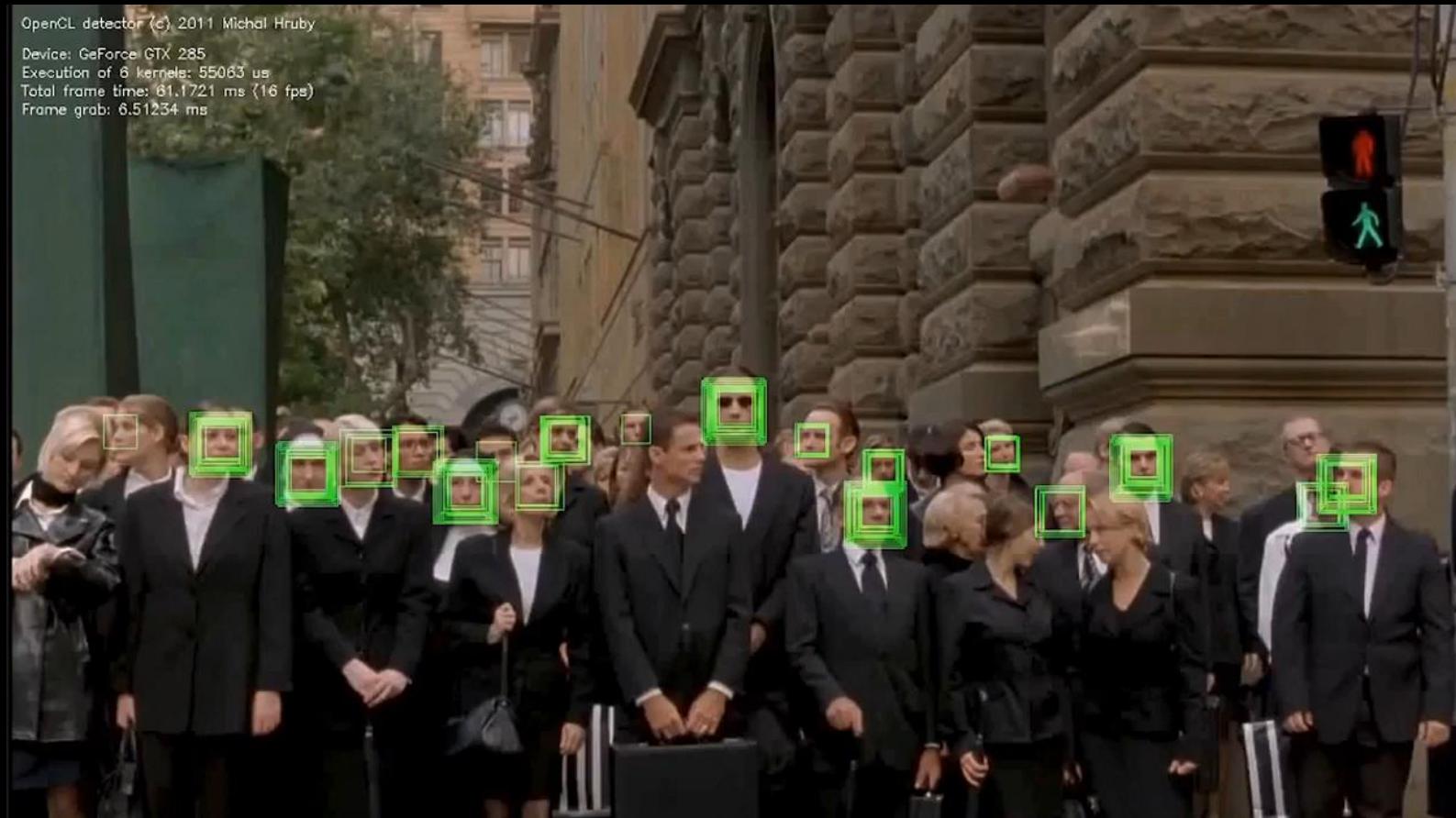


Support Vector Machine (SVM)

Support Vectors: Closest
data samples to the
boundary



Results





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Thank You!



Food for thought!

1. When you take a photo with your mobile phone, what do you think is actually stored inside the phone — a picture or numbers?
 2. Why can we easily recognize a friend's face in a photo, but a computer cannot do this naturally like humans?
 3. What do you think happens to an image when we zoom in too much and it looks blurred or blocky?
 4. How do apps automatically improve brightness or contrast of a photo without asking us?
 5. Do you think a computer can “understand” an image the same way humans do? Why or why not?
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