



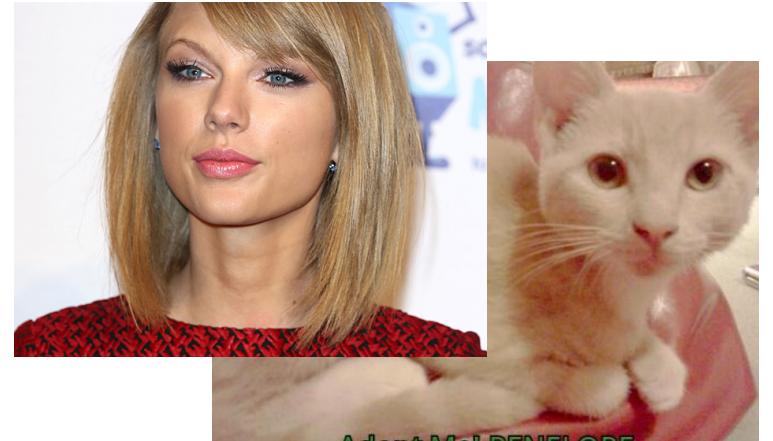
kittyTwin

Find a feline friend that looks just like you!

Katie Amrine



■ INSIGHT ■



“Of the cats entering shelters, approximately 37% are adopted, 41% are euthanized, and less than 5% of cats who came in as strays are returned to their owners.” -ASPCA



Cats with more
Petfinder.com
activity get adopted
~ **3x** faster than cats
with less activity



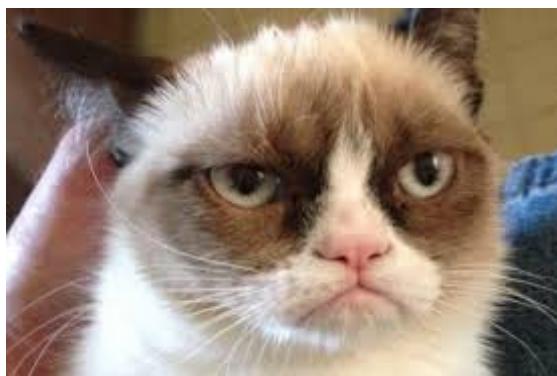
Petfinder™

Home of 307,951 adoptable pets from 12,103
adoption groups.

Cats with more
Petfinder.com
activity get adopted
~ 3x faster than cats
with less activity

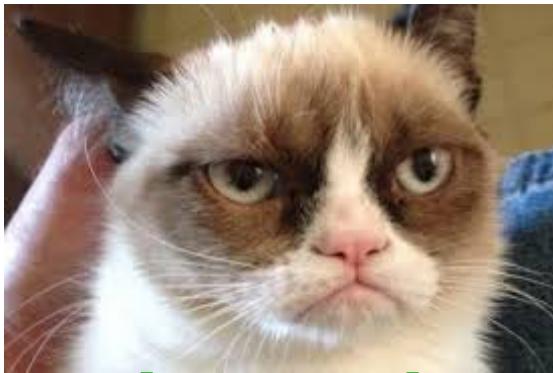


Want to match this picture:

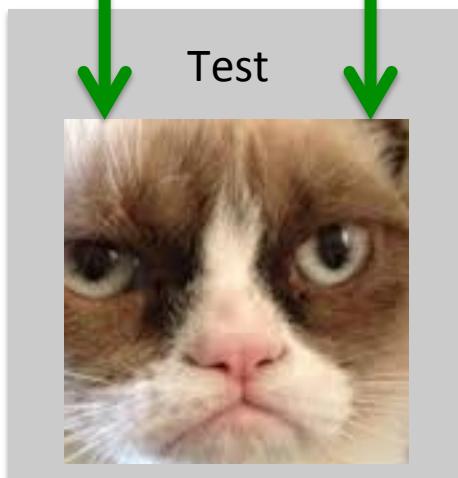


Eigenspace

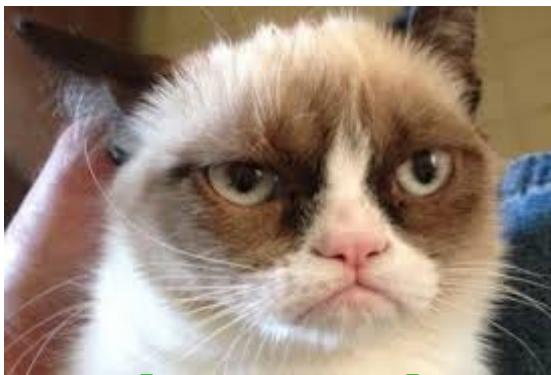
Want to match this picture:



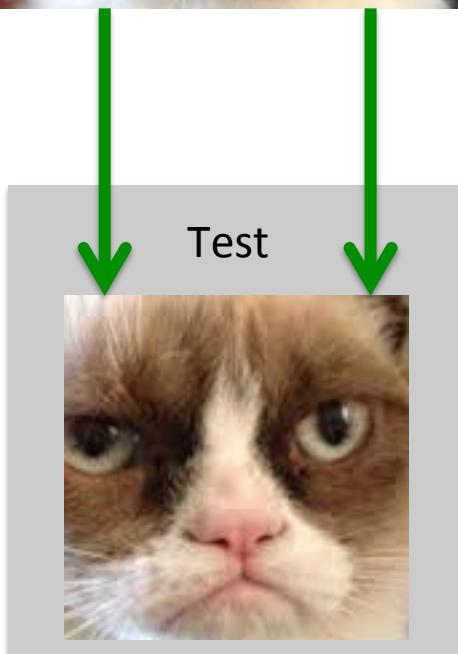
Eigenspace



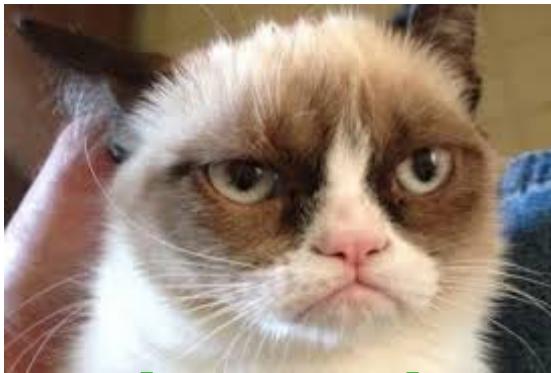
Want to match this picture:



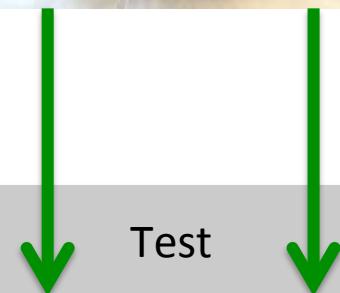
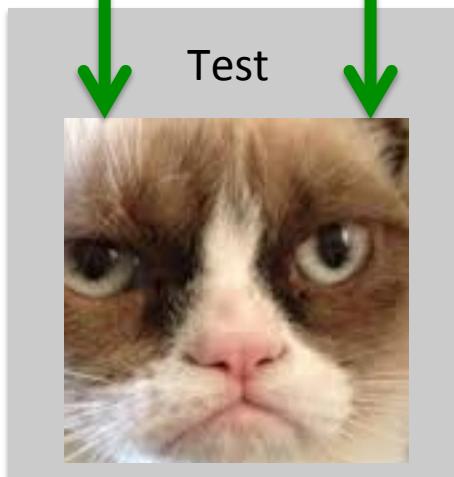
Eigenspace



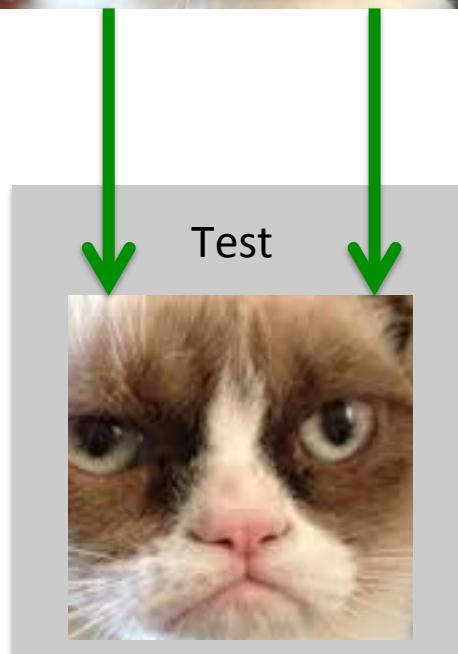
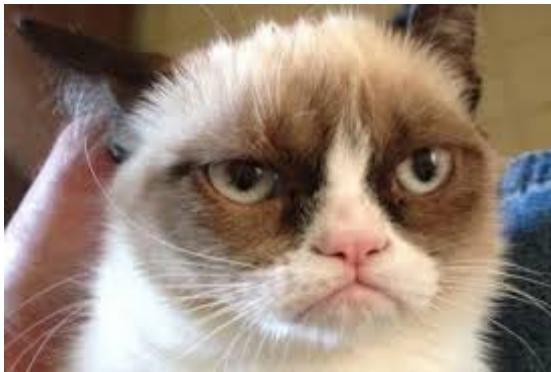
Want to match this picture:



Eigenspace



Want to match this picture:

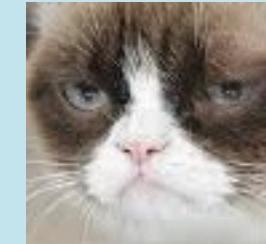


Eigenspace

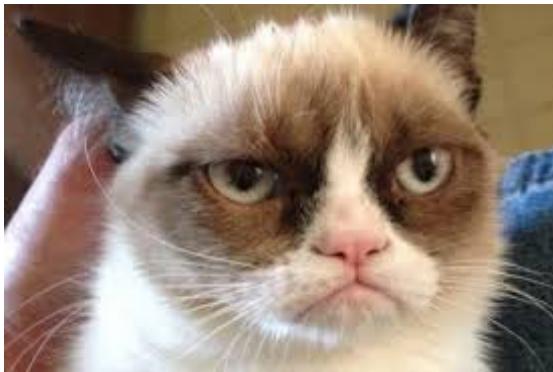
Train 1



Train 2



Want to match this picture:

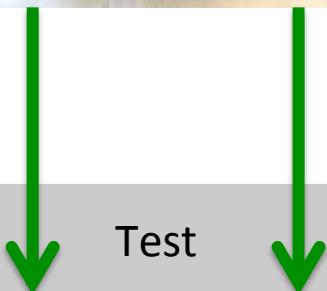
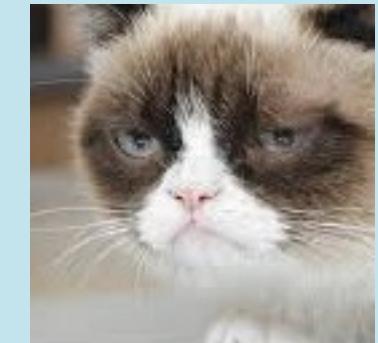
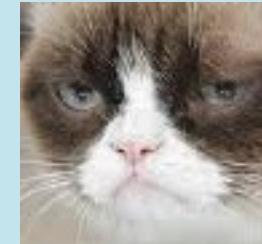


Eigenspace

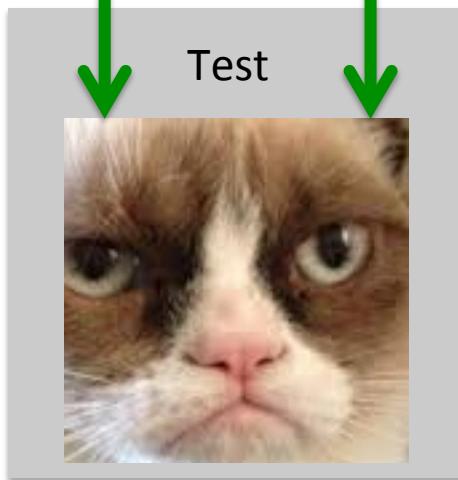
Train 1



Train 2



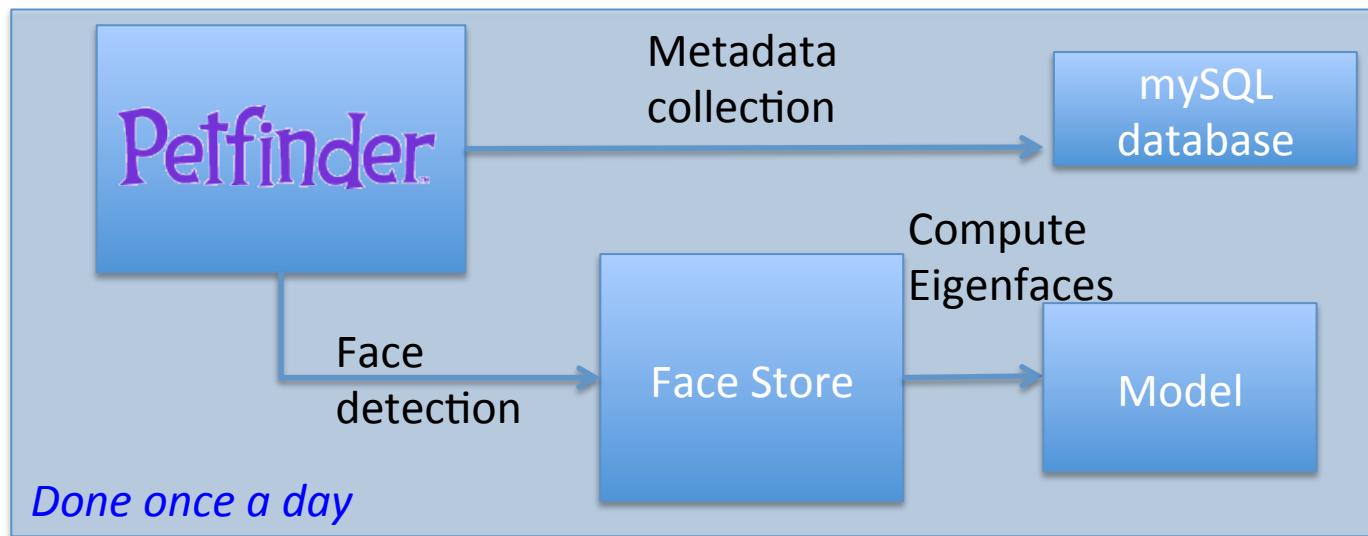
Test



Grumpycat !!!!

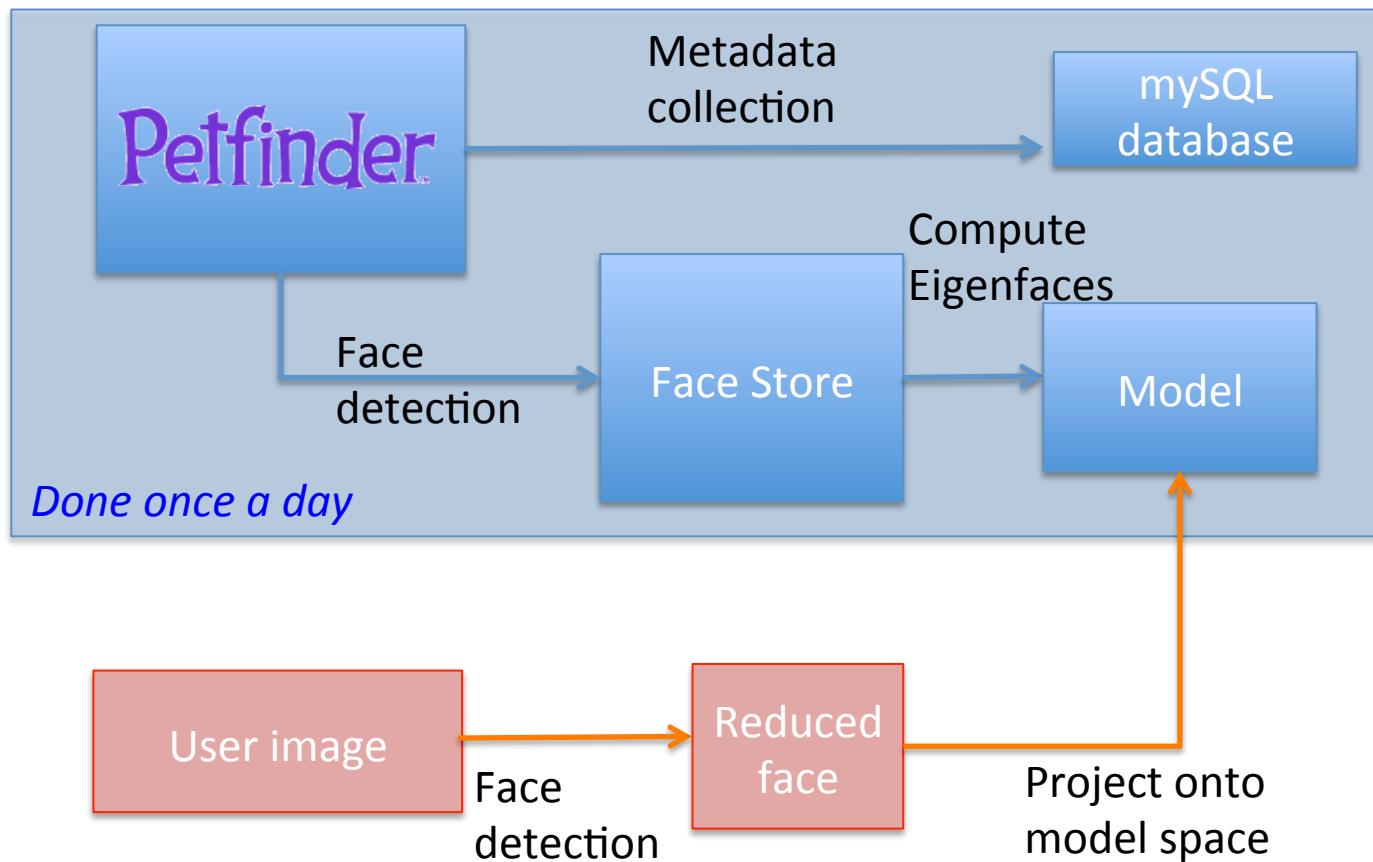
Algorithm (Eigenfaces Method)

Pull out most distinguishing features from each image
and projects onto PCA subspace along with test image



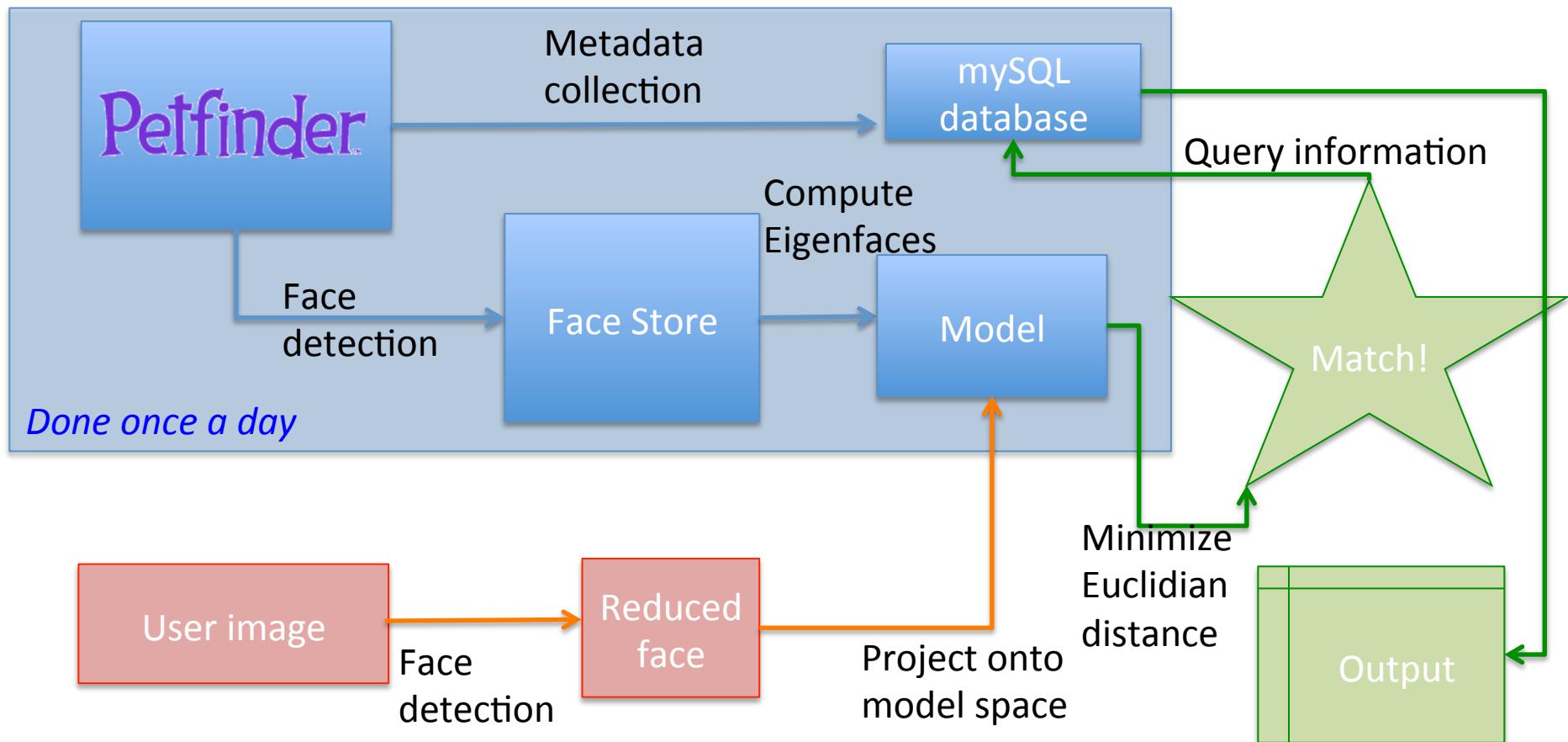
Algorithm (Eigenfaces Method)

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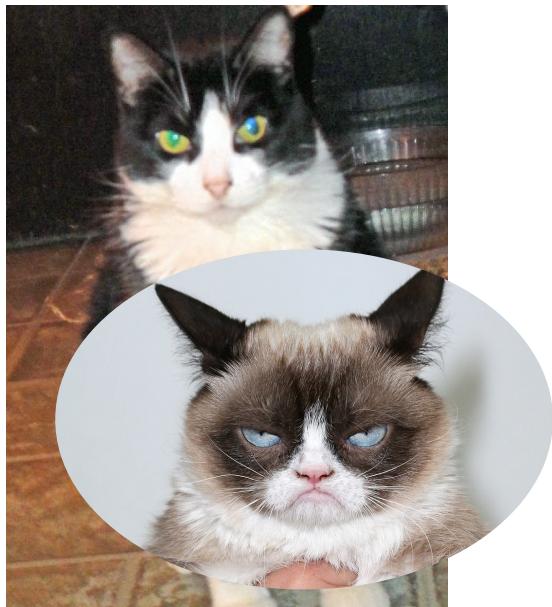
Algorithm (Eigenfaces Method)

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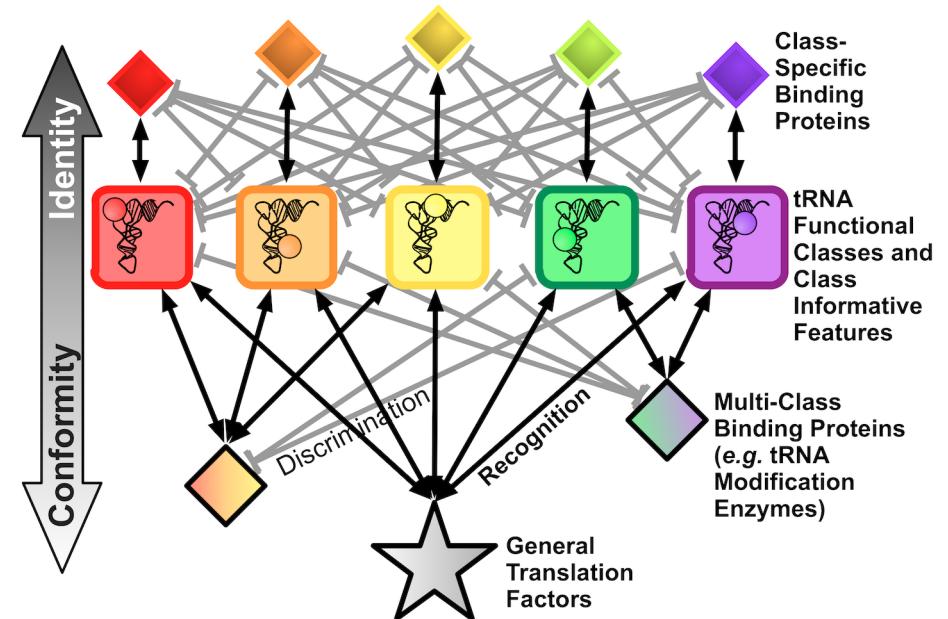
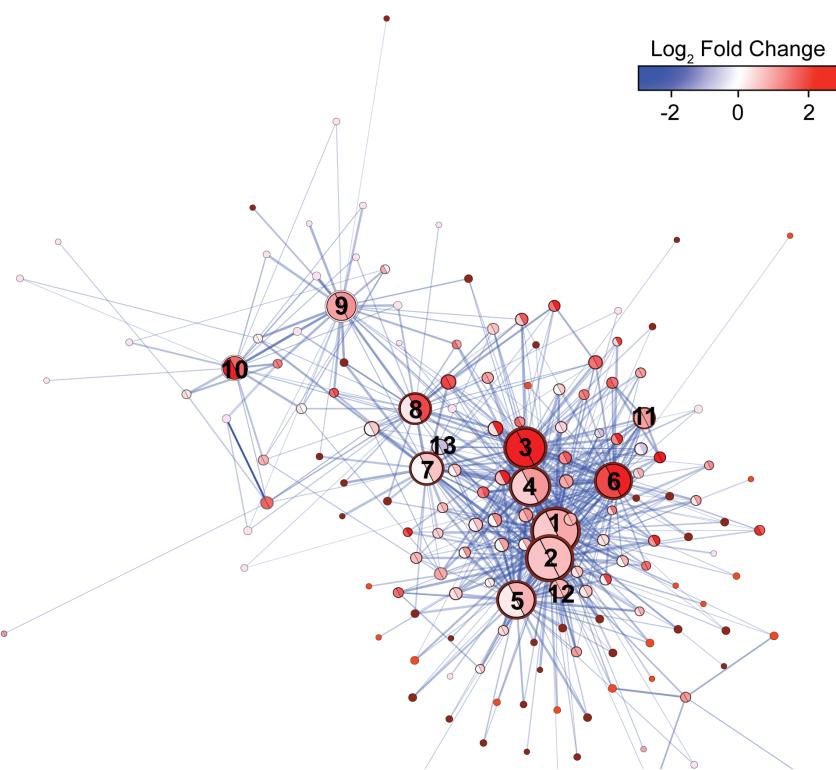
ADOPT ME!!!!!!



4/5

Katie Amrine

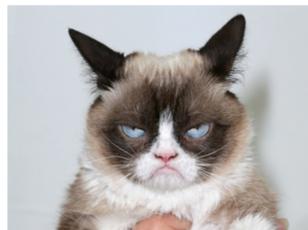
PhD – Quantitative &
Systems Biology, UC Merced
Postdoc – Department of
Viticulture & Enology, UC
Davis





kittyTwin

Find my kittyTwin!



Upload a frontal face image to start!

No file chosen

kittyTwin works on one human face at a time. If an image is submitted with
more than one face, the clearer/larger face will be processed.
kittyTwin will only match cats listed for adoption on Petfinder.com
and is updated once a day with new listings. kittyTwin is an independent,
entertainment-based site unaffiliated with Petfinder.com. Support your
local animal shelter!



kittyTwin

Find my kittyTwin!



Finding your kittyTwin now. This may take a moment...

Upload a frontal face image to start!

john.jpg

kittyTwin works on one human face at a time. If an image is submitted with
more than one face, the clearer/larger face will be processed.

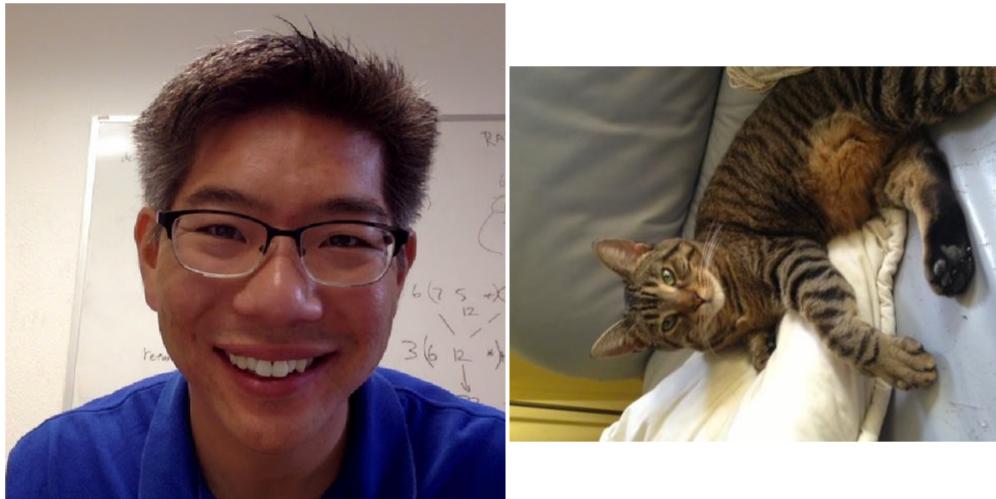
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and is updated once a day with new listings. kittyTwin is an independent,
entertainment-based site unaffiliated with Petfinder.com. Support your
local animal shelter!

kittyTwin.me Amrine_Insight_demo.pdf

www.kittytwin.me/output/IBD4JVJ1PY81.jpg

kittyTwin

We found a match!



Your kittyTwin is...

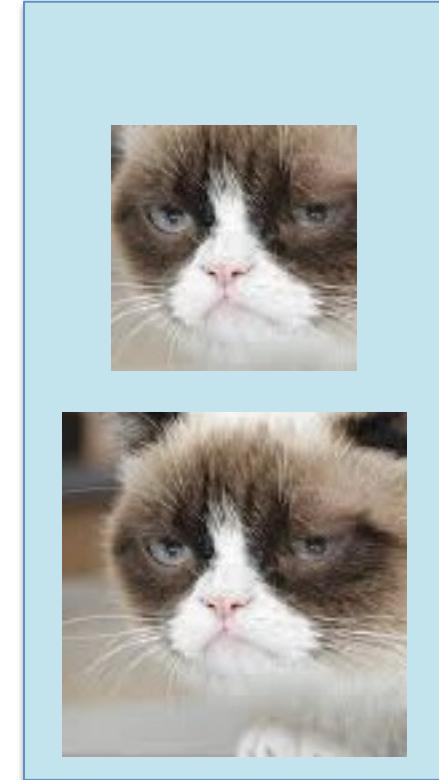
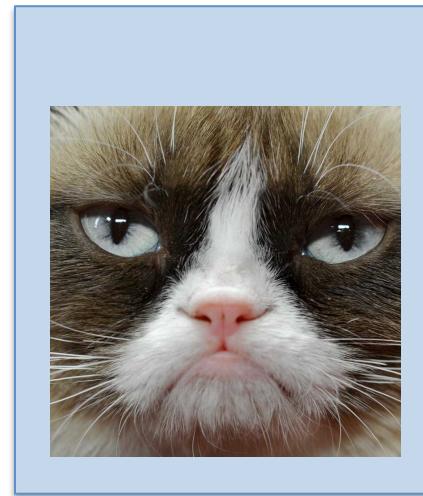
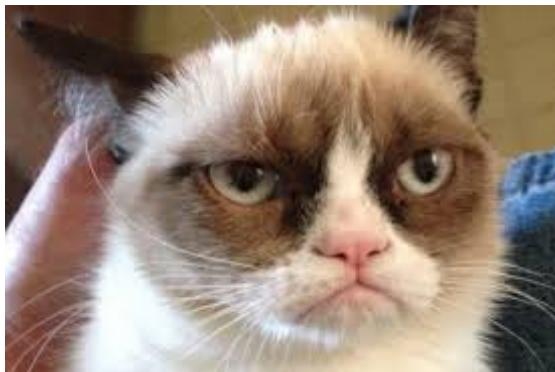
LouLou!!

LouLou is at your local shelter in Los Angeles

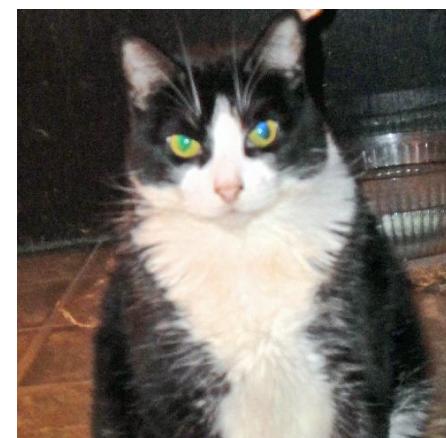
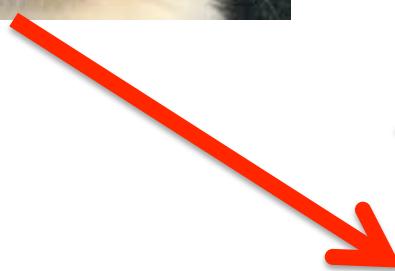
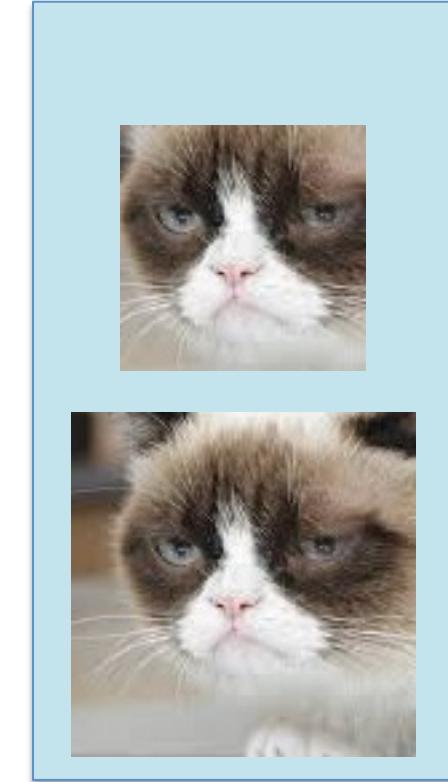
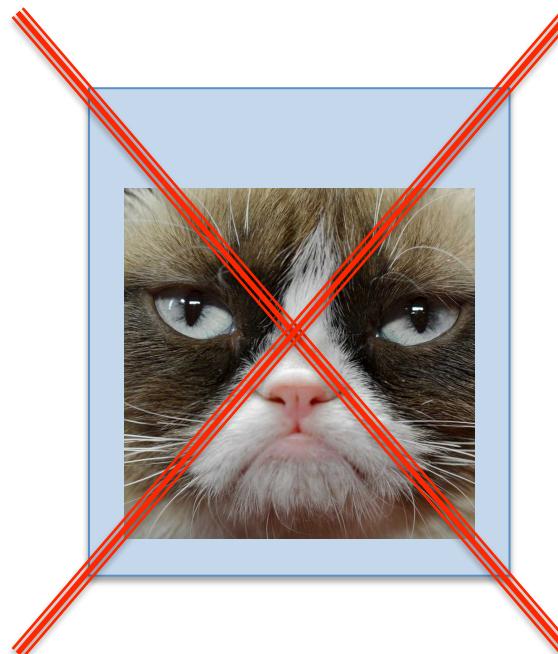
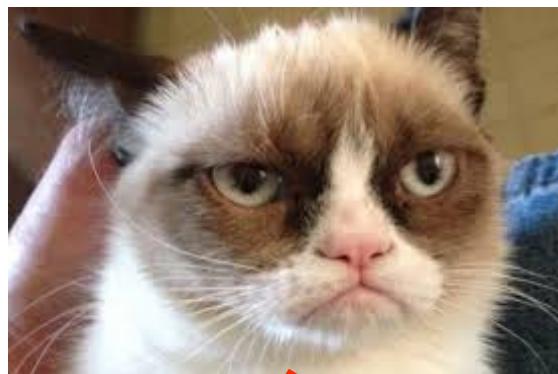
[click here](#) for more information

click [here](#) to search with another face

Angle matters most...



Angle matters most...



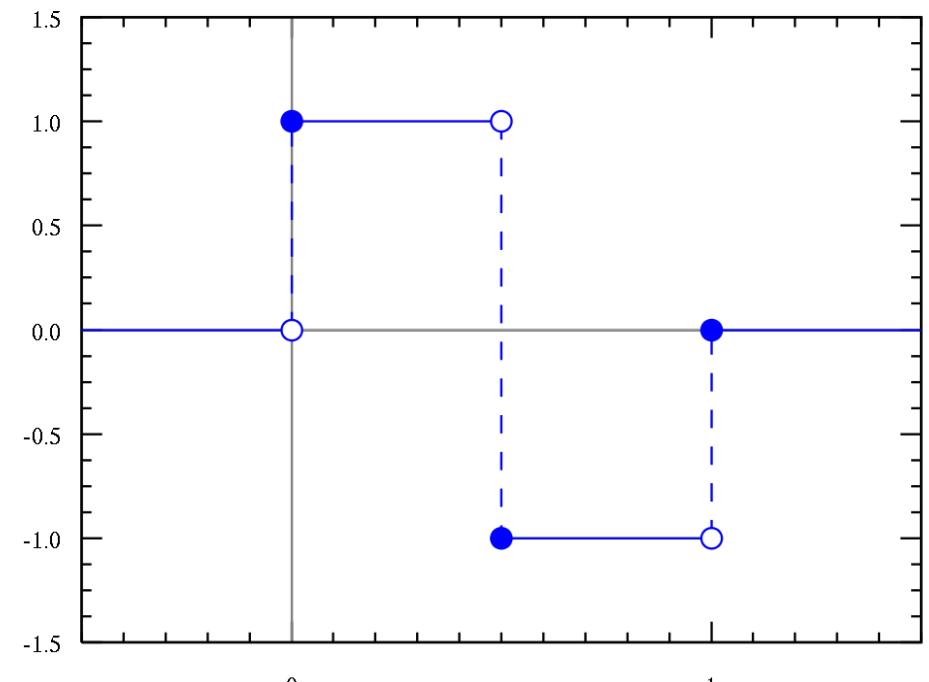
More detail...

Machine Learning: Feature Detection

Haar Cascades

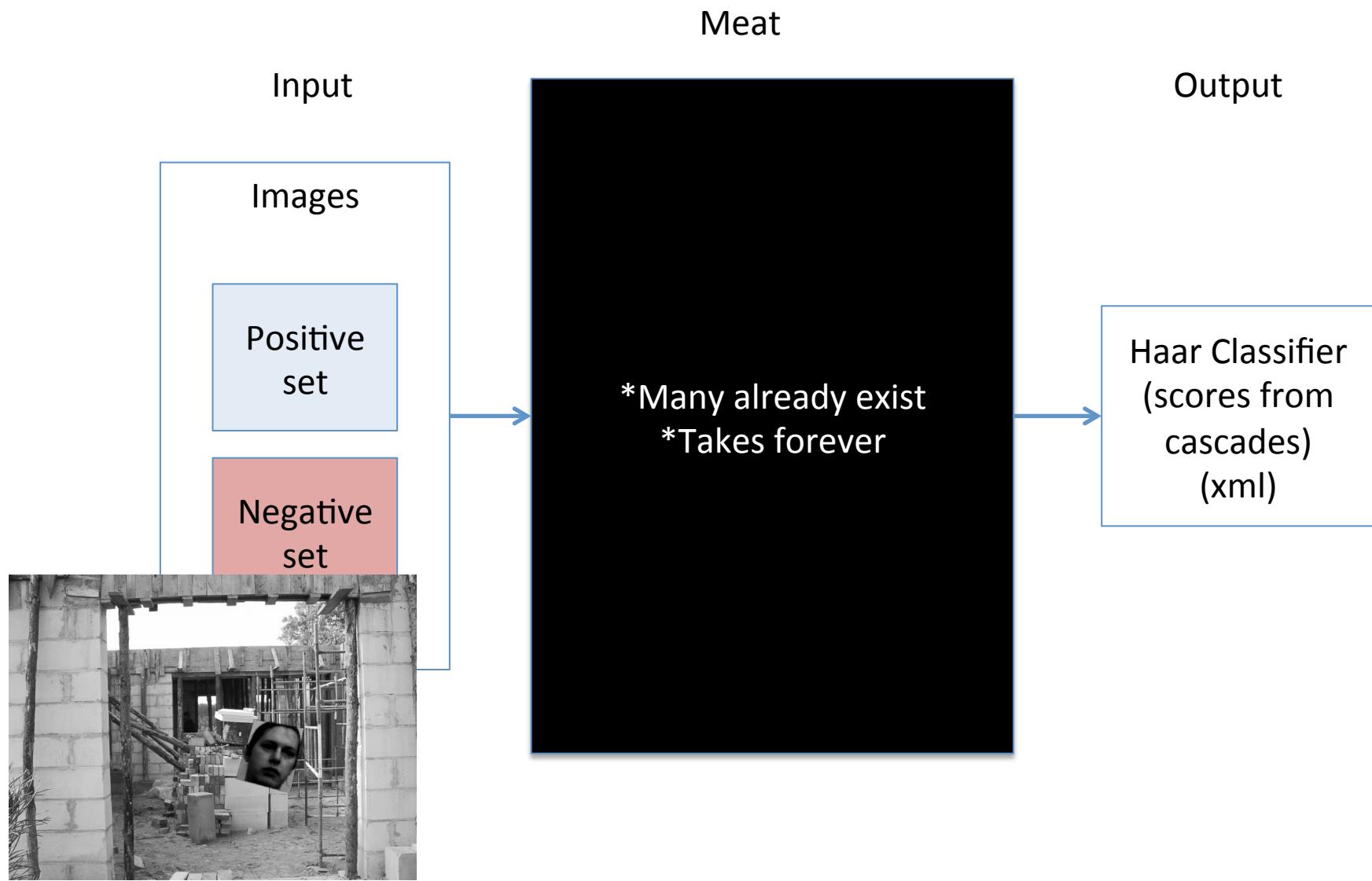


Wikipedia.org



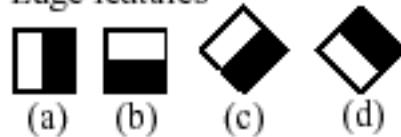
Haar wavelet

Training

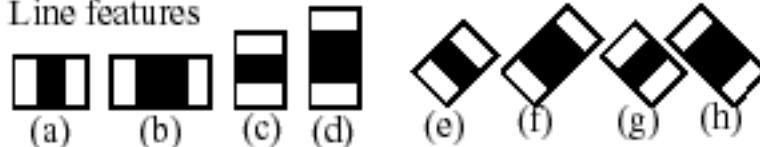


Detecting Haar-like Features

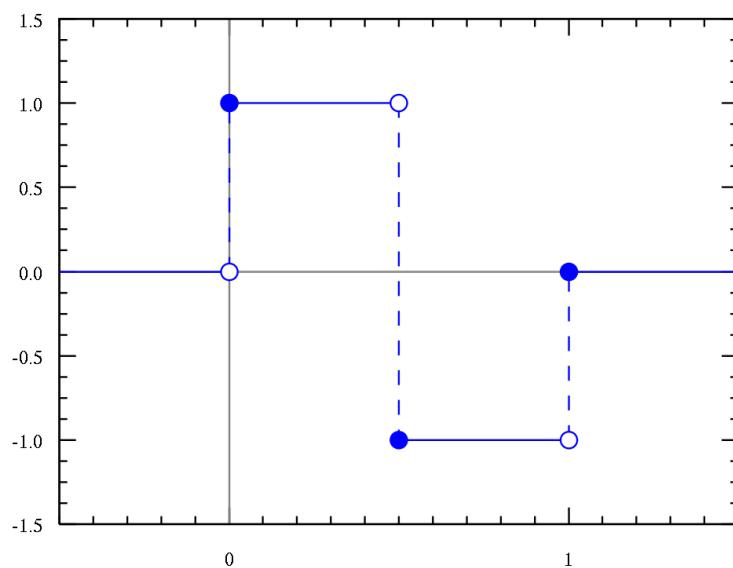
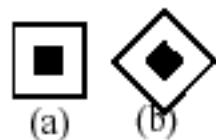
1. Edge features



2. Line features



3. Center-surround features



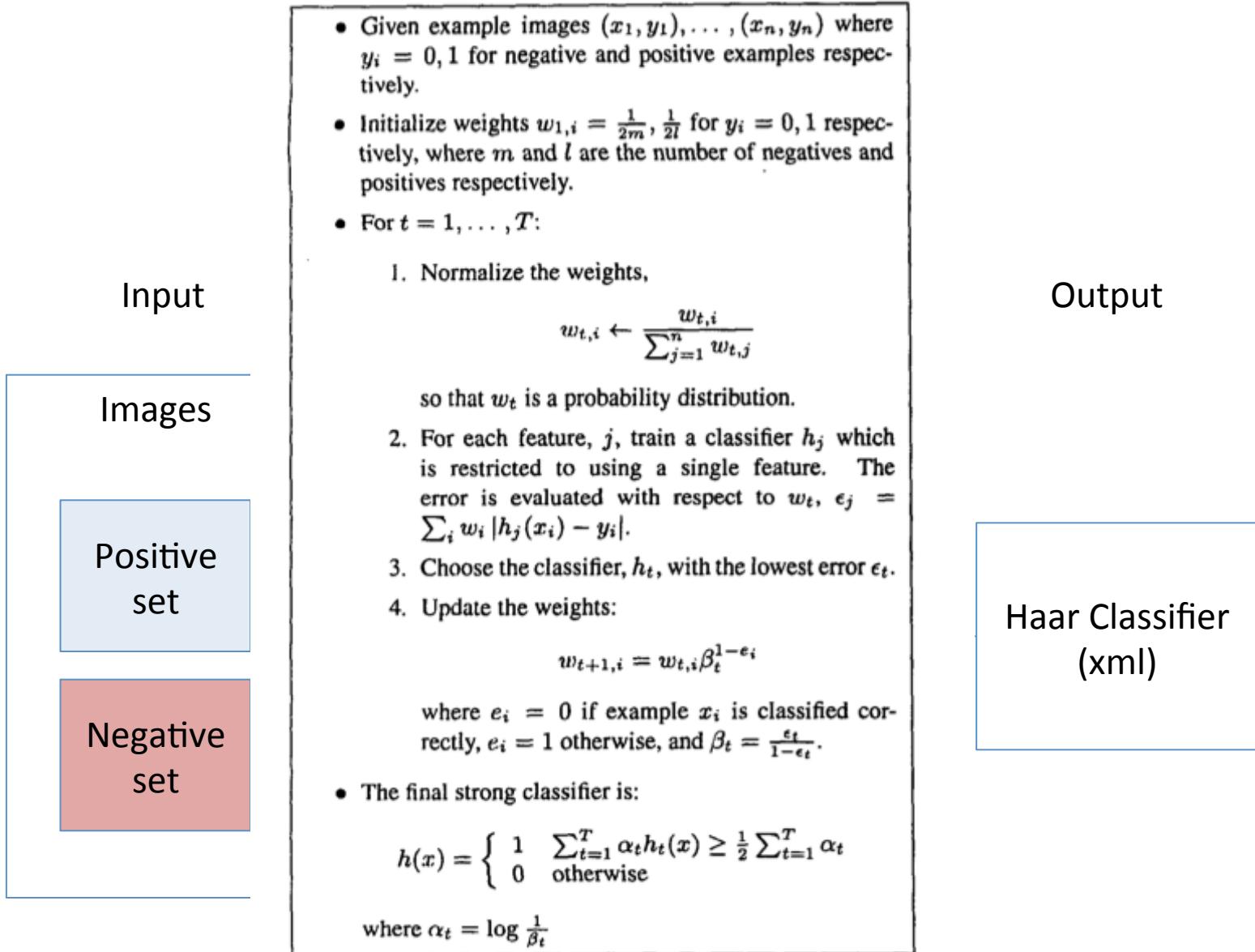
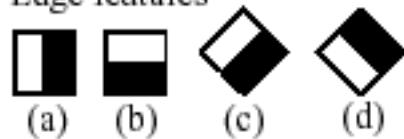


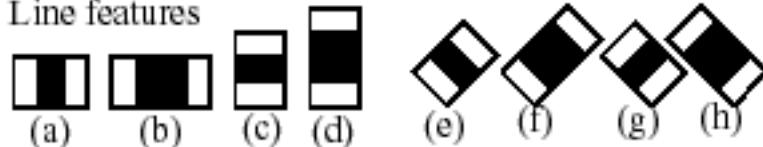
Figure 3: The AdaBoost algorithm for classifier learning. Each round of boosting selects one feature from the 180,000 potential features.

Detecting Haar-like Features

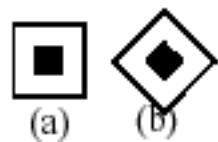
1. Edge features



2. Line features



3. Center-surround features



You can find code to do this at :

<http://www.janeriksolem.net/2009/01/pca-for-images-using-python.html>

Scoring images (Eigenfaces)

Eigenface – extraction of features by principal component analysis (PCA)

*Images need to line up
(so run facial detection first)

*transform images into a set
of vectors

*compute the ‘average face’
and save the difference for
each image

*compute a covariance
matrix

*from here you can compute
eigenvectors and
eigenvalues, and rank them

$$\{\Gamma_1, \Gamma_2, \dots, \Gamma_M\}.$$

$$\Psi = \frac{1}{M} \sum_{i=1}^M \Gamma_i$$

$$\Phi_i = \Gamma_i - \Psi$$

$$\mathbf{C} = \frac{1}{M} \sum_{i=1}^M \Phi_i \Phi_i^\top = \mathbf{A} \mathbf{A}^\top,$$



To match up new eigenface with closest neighbor

*minimize euclidian distance

$$\Omega = \widehat{\mathbf{U}}^\top (\Gamma - \Psi)$$

