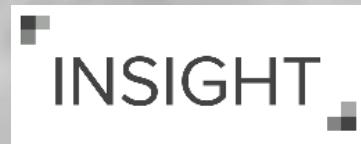




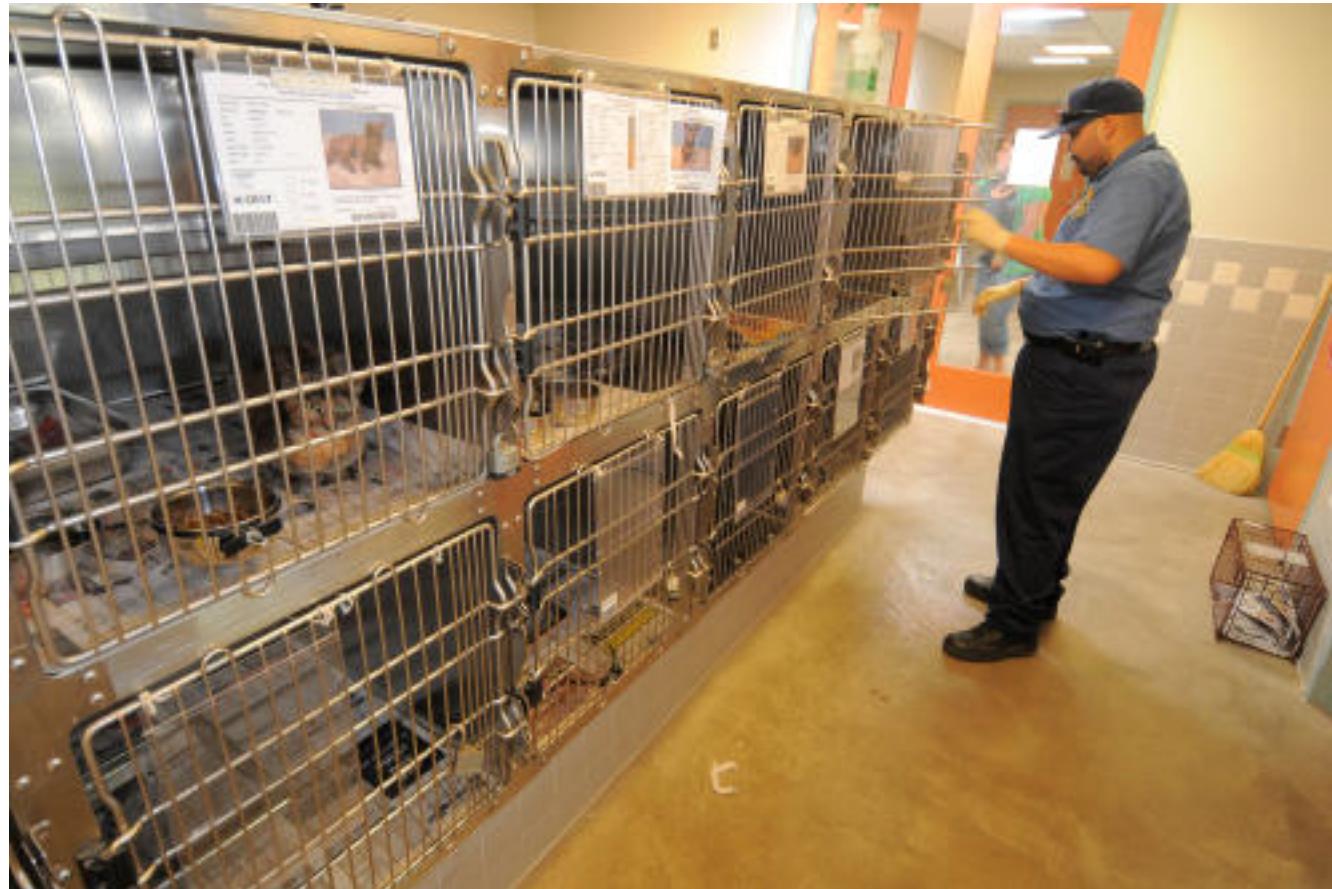
kittyTwin

Find a feline friend that looks just like you!

Katie Amrine



“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



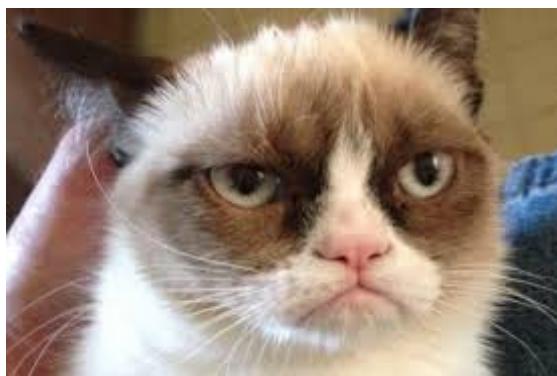
Cats with more
Petfinder.com
activity get adopted
~ 3x faster than cats
with less activity



Cats with more
Petfinder.com
activity get adopted
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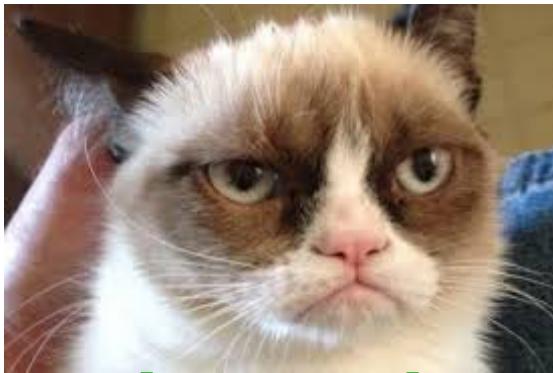


Want to match this picture:

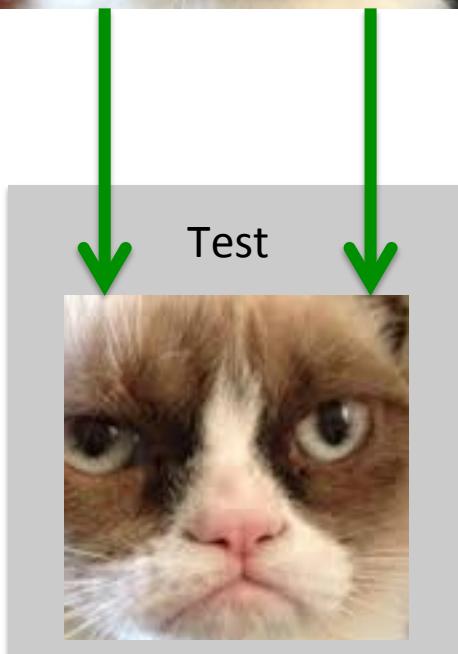


Eigenspace

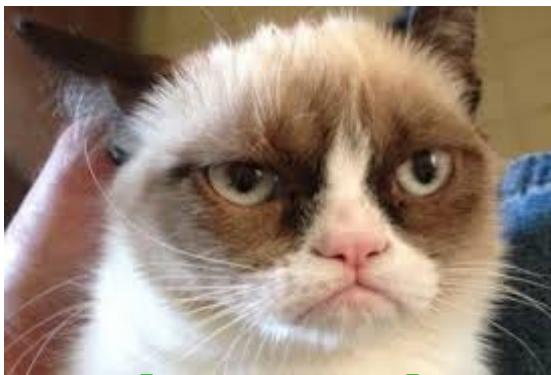
Want to match this picture:



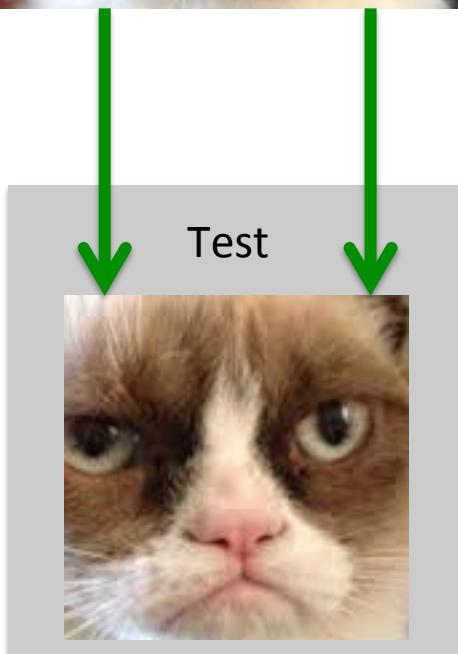
Eigenspace



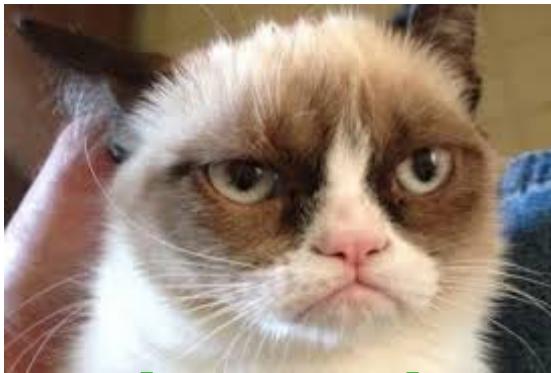
Want to match this picture:



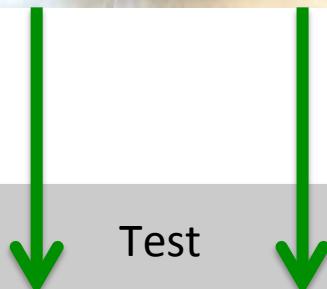
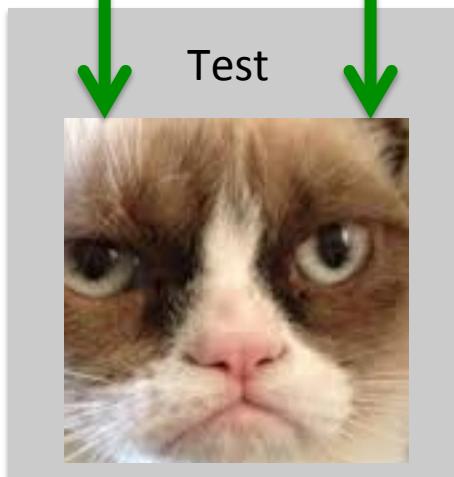
Eigenspace



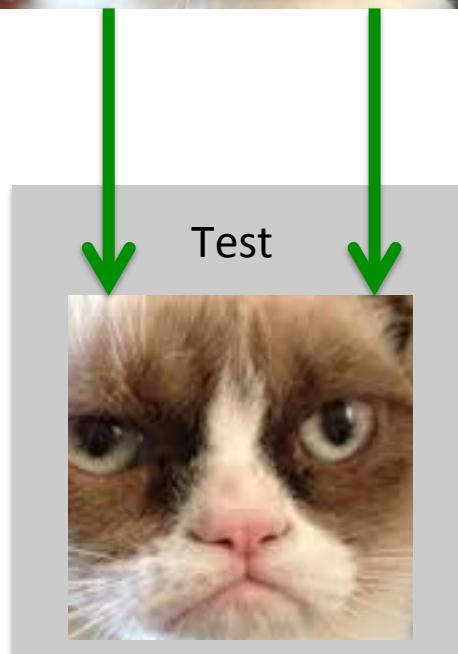
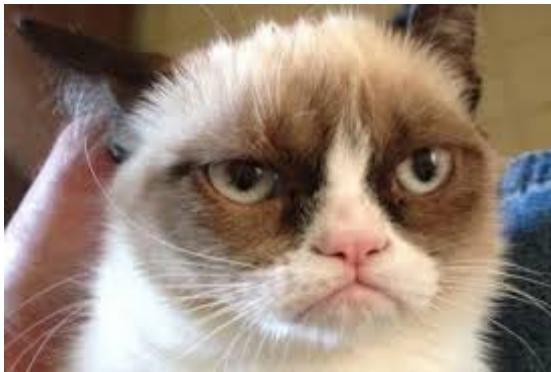
Want to match this picture:



Eigenspace



Want to match this picture:

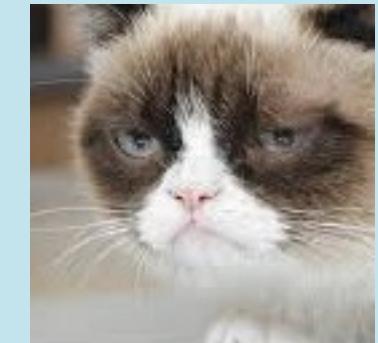
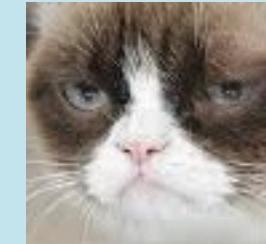


Eigenspace

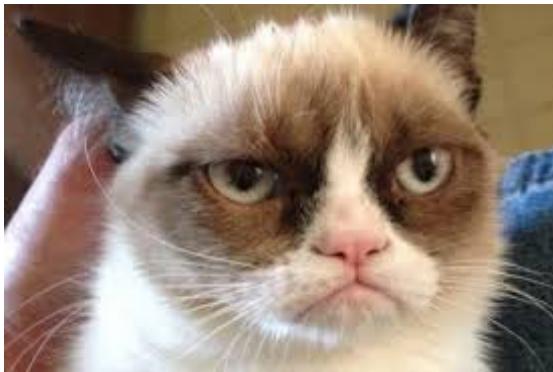
Train 1



Train 2



Want to match this picture:

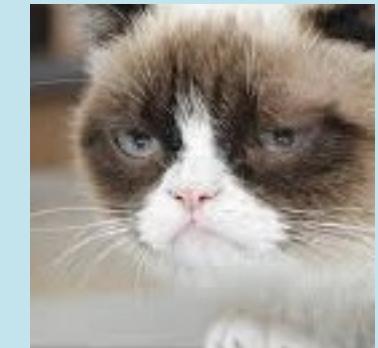
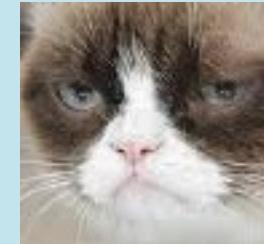


Eigenspace

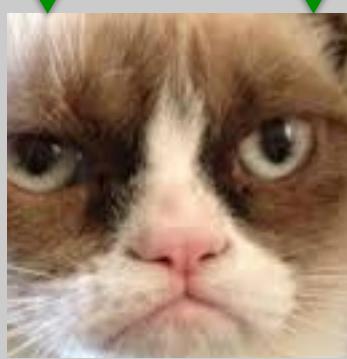
Train 1



Train 2



Test

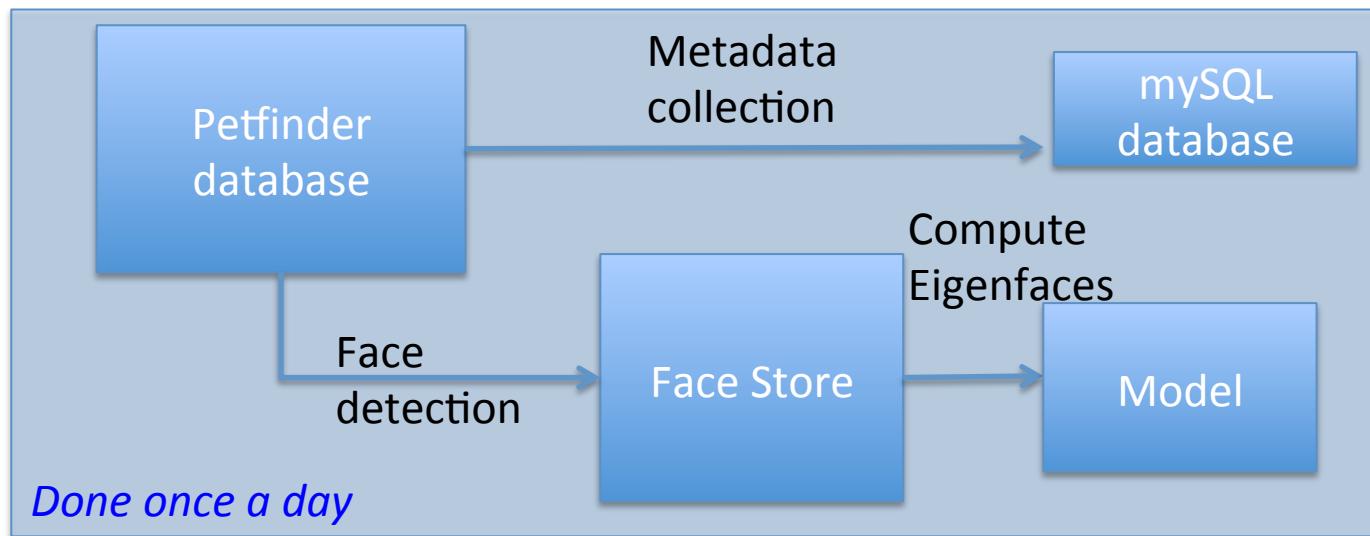


Grumpycat !!!!



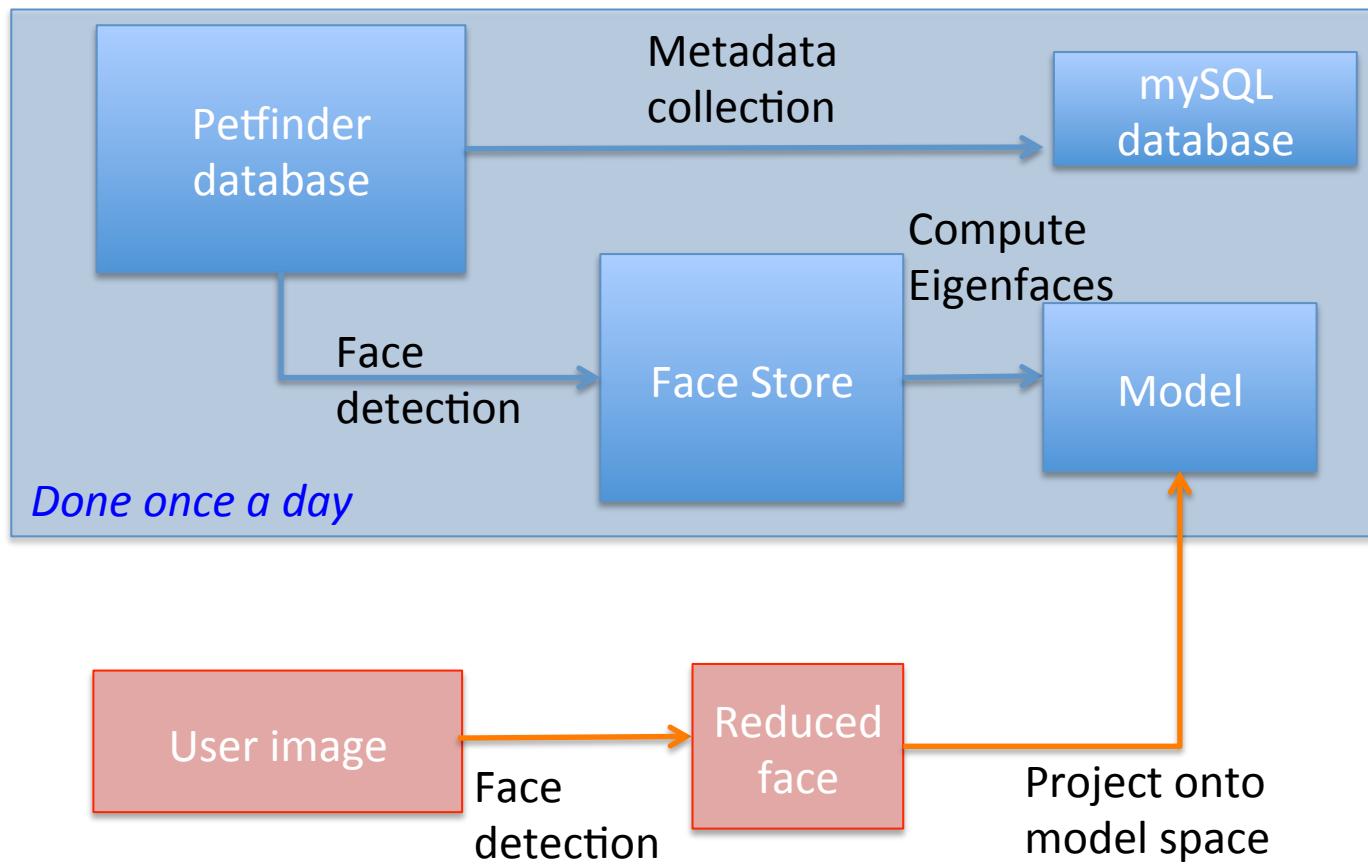
Algorithm (Eigenfaces Method)

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



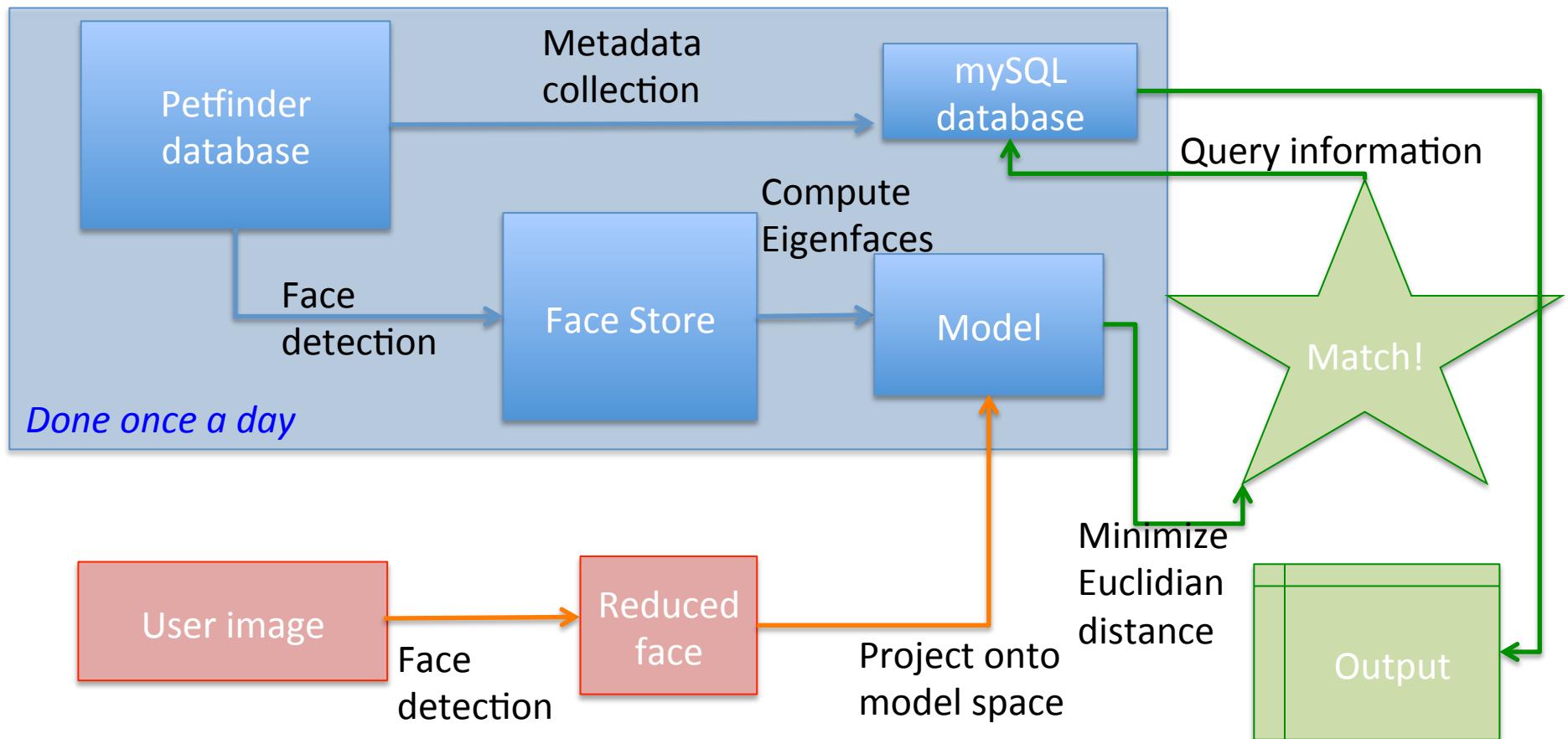
Algorithm (Eigenfaces Method)

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



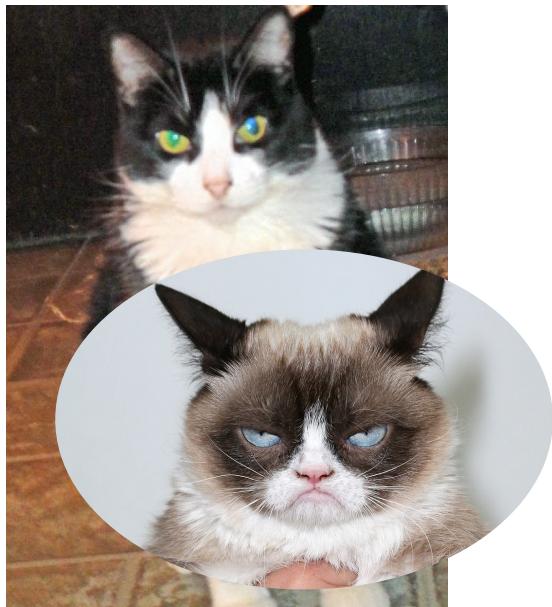
Algorithm (Eigenfaces Method)

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





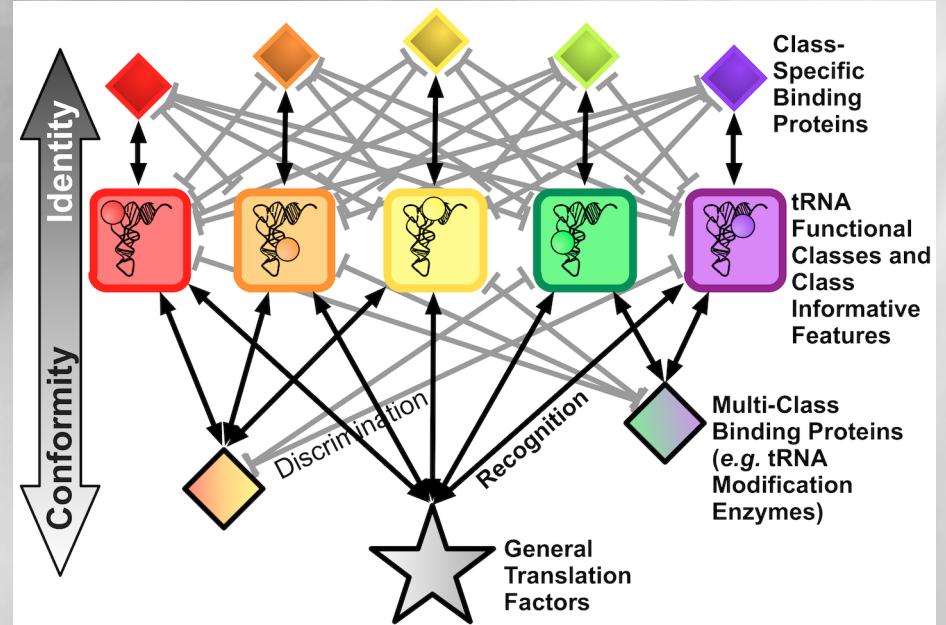
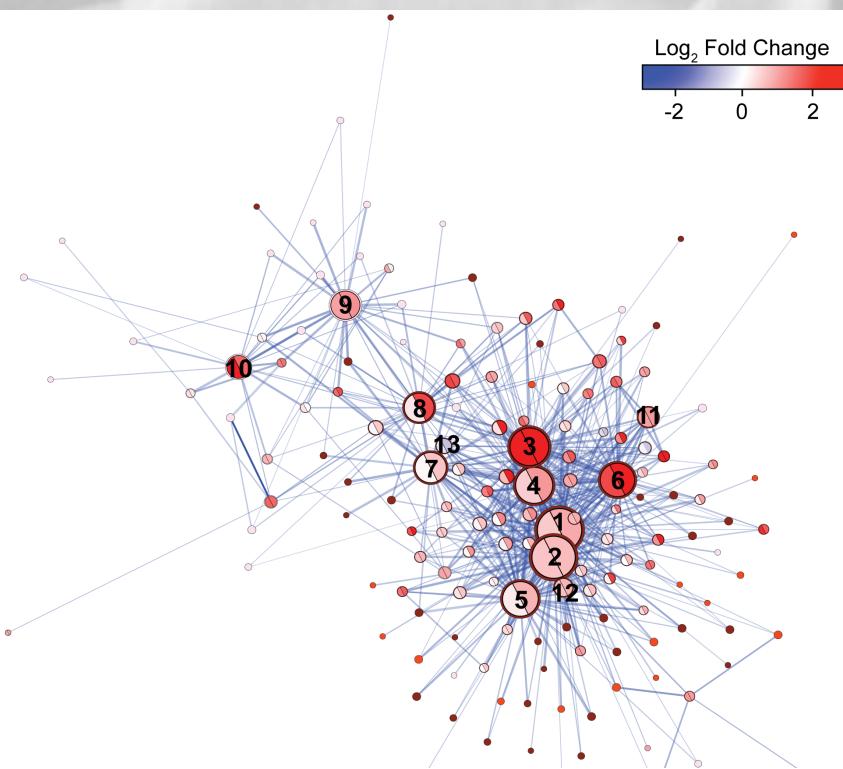
ADOPT ME!!!!!!



4/5

Katie Amrine

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



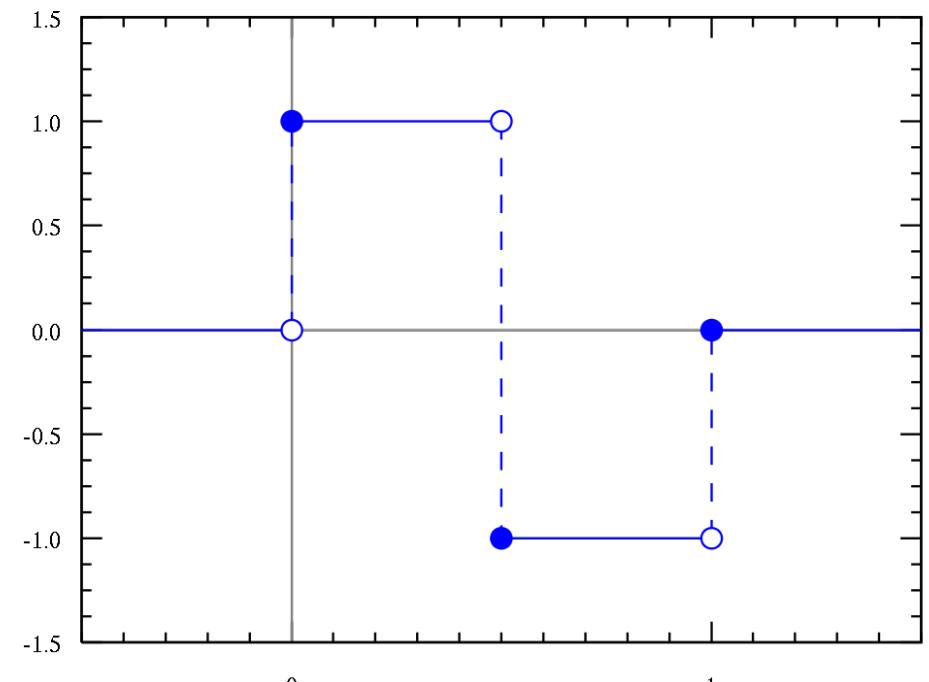
More detail...

Machine Learning: Feature Detection

Haar Cascades

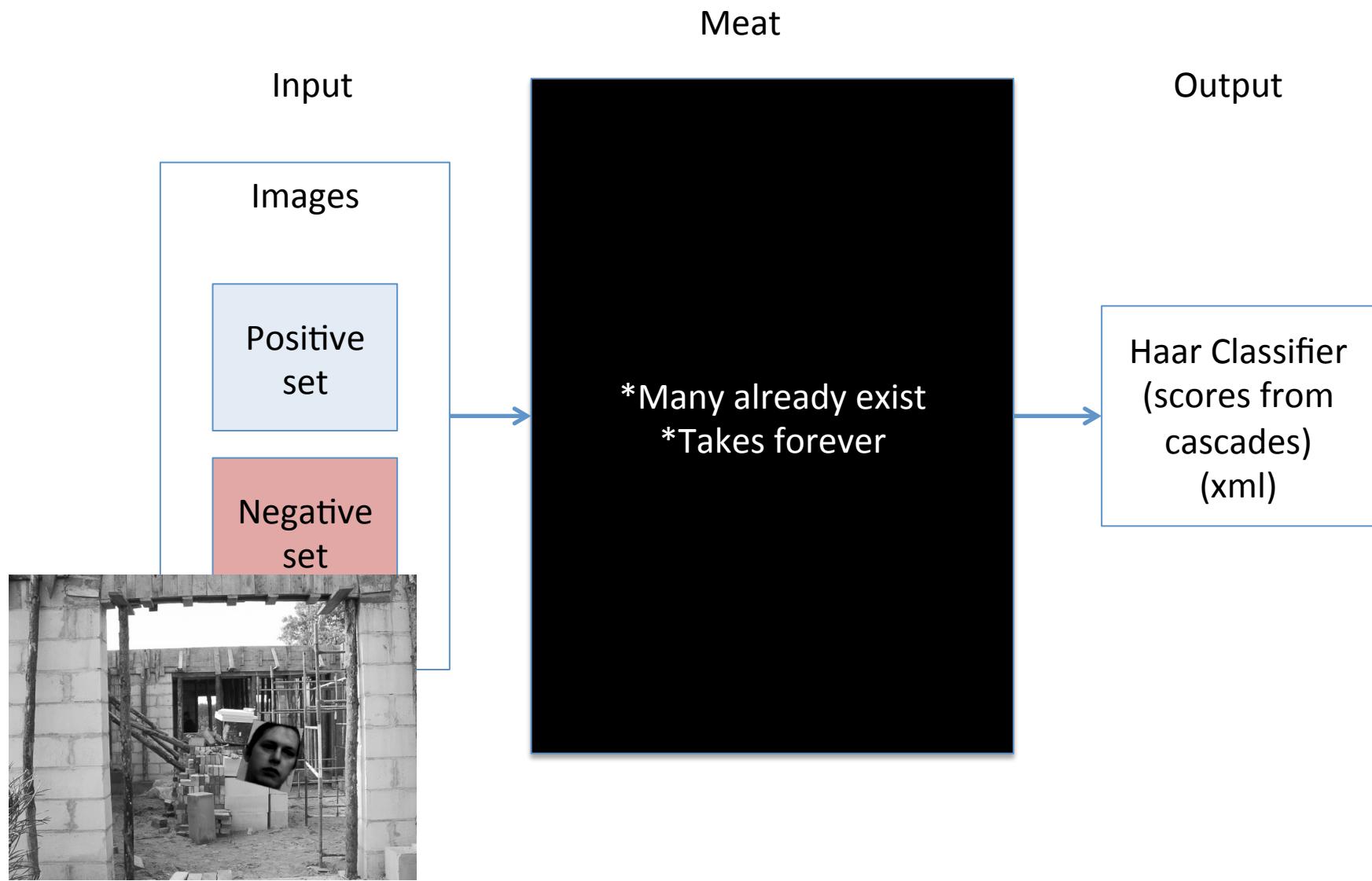


Wikipedia.org



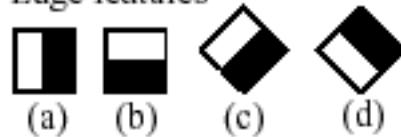
Haar wavelet

Training

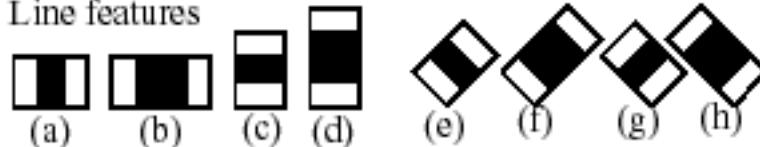


Detecting Haar-like Features

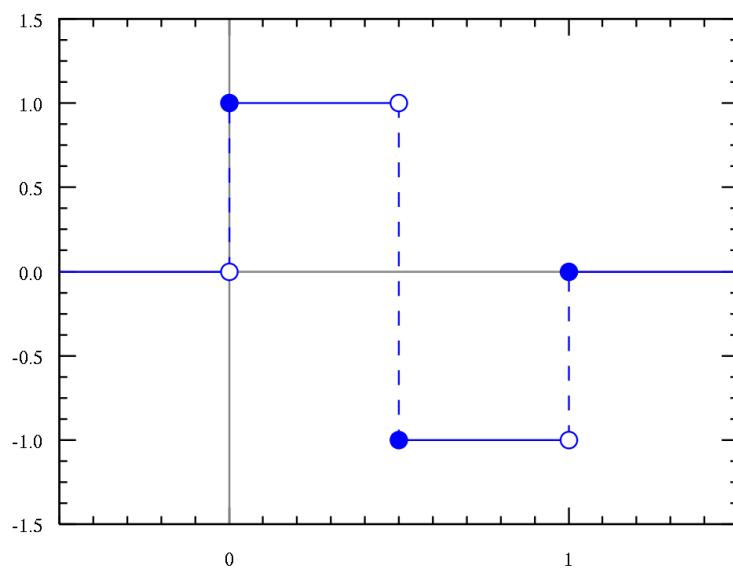
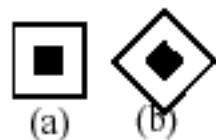
1. Edge features



2. Line features



3. Center-surround features



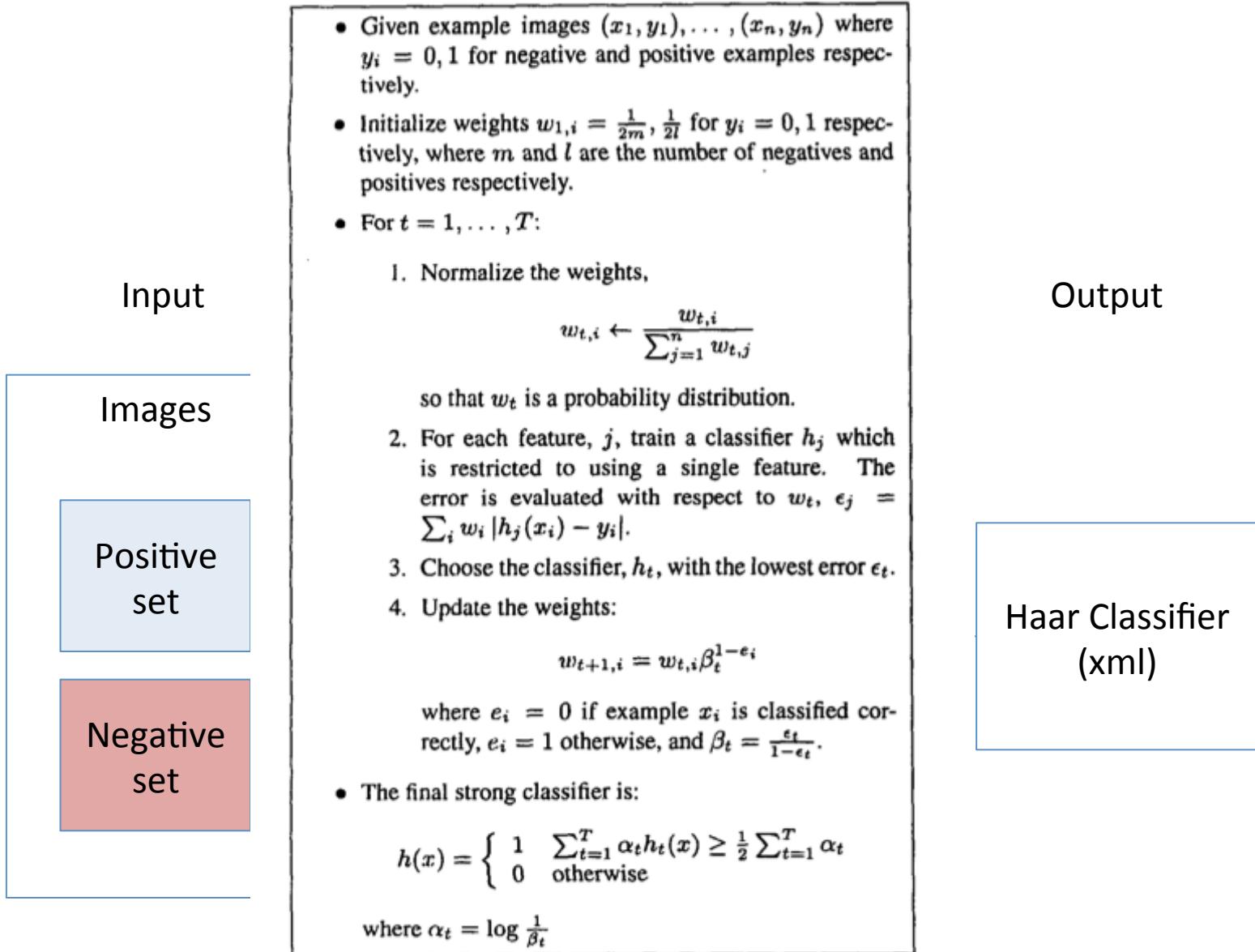


Figure 3: The AdaBoost algorithm for classifier learning. Each round of boosting selects one feature from the 180,000 potential features.

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

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

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

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

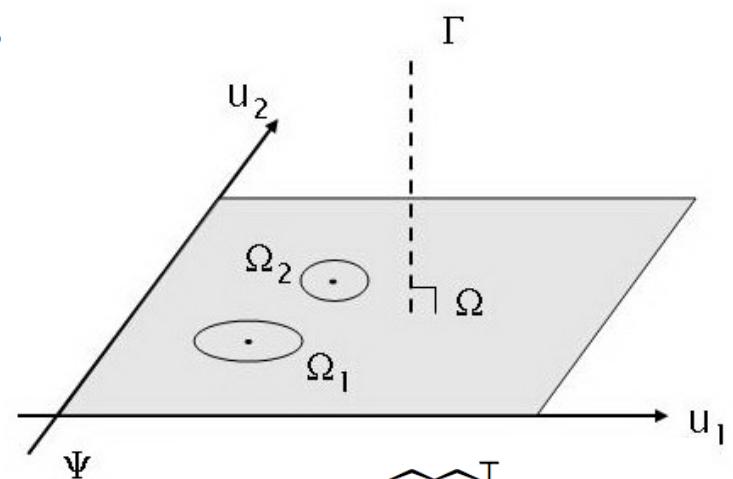
$$\mathbf{C} = \frac{1}{M} \sum_{i=1}^M \Phi_i \Phi_i^\top = \mathbf{A} \mathbf{A}^\top,$$



To match up new eigenface with closest neighbor

*minimize euclidian distance

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



$$\delta = \|(I - \widehat{\mathbf{U}} \widehat{\mathbf{U}}^\top)(\Gamma - \Psi)\|$$