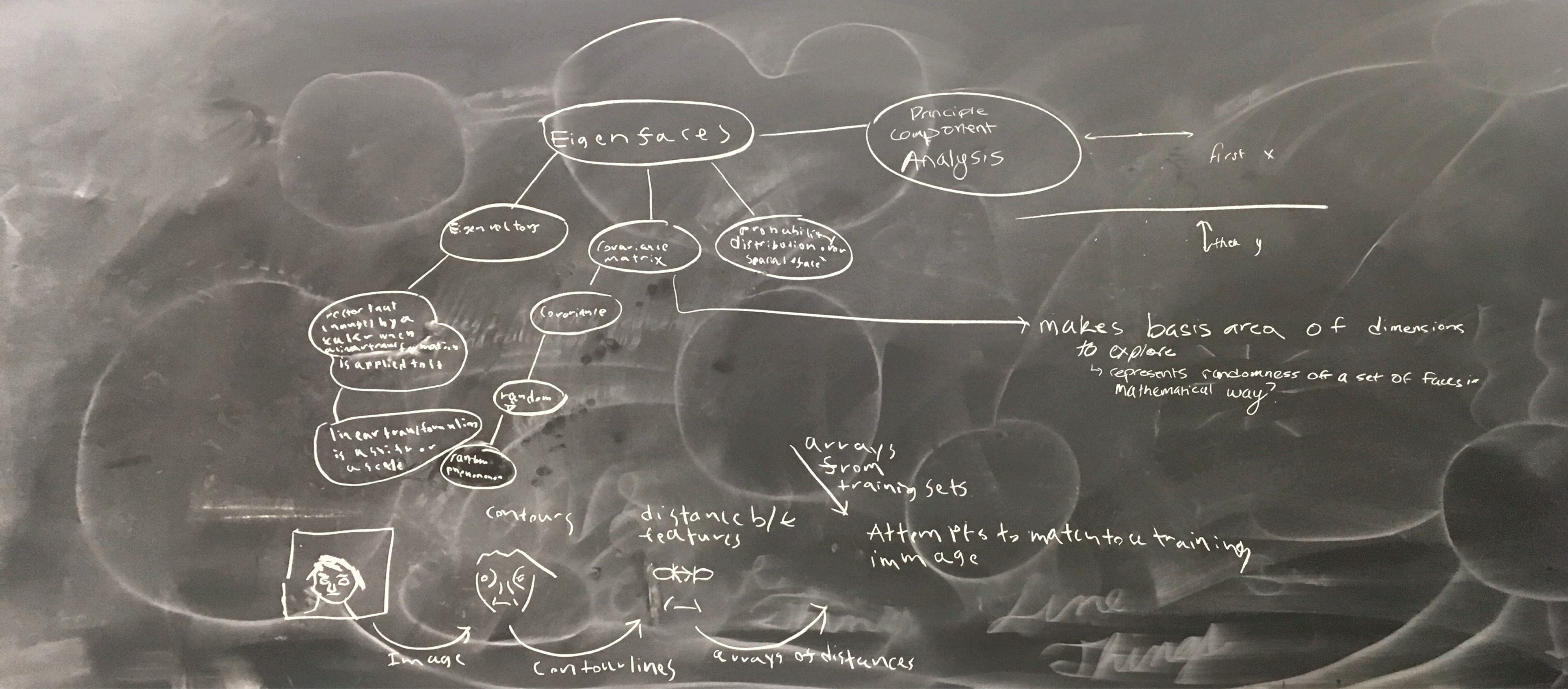

Eigenfaces
Principle component Analysis
first x
then y
Eigenvectors
Covariance matrix
probability distribution over spatial space
vector that changes by a scaler when a linear transformation is applied to it
Covariance
random
linear transformation is a stretch or a scale
random phenomenon
makes basis area of dimensions to explore
represents randomness of a set of faces in mathematical way?
arrays from training sets
contours
distance b/t features
Attempts to match to a training immage
Image
Contour lines
arrays of distances

Vectors

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} \quad \begin{bmatrix} \text{orange} \\ \text{grapefruit} \\ \text{apple} \end{bmatrix} \quad \begin{bmatrix} 120 \\ 250 \\ 80 \end{bmatrix}$$

$$\begin{bmatrix} \text{orange} & \text{grapefruit} & \text{apple} \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \text{total fruits}$$

$$\begin{bmatrix} 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \text{total citrus}$$

$$\begin{bmatrix} 120 & 250 & 100 \end{bmatrix} \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \text{total weight}$$

$$G = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 \\ 3 & -1 \\ 0 & 4 \end{bmatrix} \begin{bmatrix} -2 \\ 1 \end{bmatrix}$$

$3 \times \boxed{2 \quad 2} \times 1$

3×1

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$2 \times \boxed{3 \quad 3} \times 1$

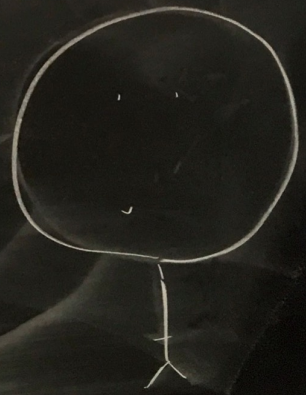
2×1

$$\Downarrow$$

$$1\begin{bmatrix} 1 \\ 1 \end{bmatrix} + 2\begin{bmatrix} 1 \\ 1 \end{bmatrix} + 3\begin{bmatrix} 1 \\ 0 \end{bmatrix} =$$

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix} + \begin{bmatrix} 2 \\ 2 \end{bmatrix} + \begin{bmatrix} 3 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 6 \\ 3 \end{bmatrix}$$



5

a) $v = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ =

b) a- $\begin{bmatrix} 1/\sqrt{2} & -1/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1/\sqrt{2} \\ 1/\sqrt{2} \end{bmatrix}$

c)

d) $b = \begin{bmatrix} \cos(30) & -\sin 30 \\ \sin(30) & \cos 30 \end{bmatrix} \cdot V = \begin{bmatrix} \cos(30) - \sin(30)\,0 \\ \sin(30) + \cos(30)\,0 \end{bmatrix} = \begin{bmatrix} \cos(30) \\ \sin(30) \end{bmatrix}$

e) |v| 30

f) $\begin{bmatrix} \cos\theta \\ \sin\theta \end{bmatrix}$

g) |v| θ $\Rightarrow \begin{bmatrix} \cos(\theta) & -\sin(\theta) \\ \sin(\theta) & \cos(\theta) \end{bmatrix}$ rotates vectors

H) $\begin{bmatrix} 1 \\ 1 \end{bmatrix} = \vec{w}$

I) $S = RW$

$S = \begin{bmatrix} \cos\theta - \sin\theta \\ \sin\theta + \cos\theta \end{bmatrix}$

J) θ