



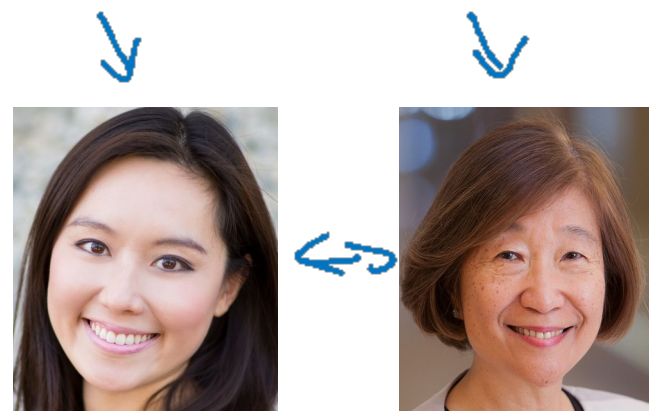
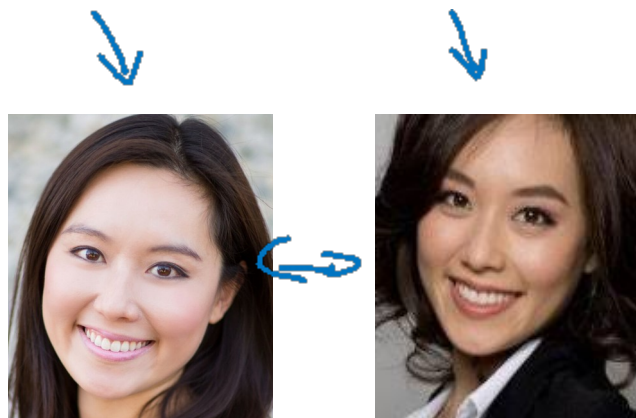
**deeplearning.ai**

# Face recognition

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## Triplet loss

# Learning Objective



Anchor

Positive

Anchor

Negative

A  $d(A, P) = 0.5$

A  $d(A, N) = 0.5 \rightarrow 0.7$

Want:  $\underbrace{\|f(A) - f(P)\|^2}_{d(A, P)} + \alpha \leq$

$\underbrace{\|f(A) - f(N)\|^2}_{d(A, N)}$

$$\underbrace{\|f(A) - f(P)\|^2}_0 - \underbrace{\|f(A) - f(N)\|^2}_0 + \alpha \leq 0$$

margin

$f(\text{img}) = \vec{0}$

# Loss function

Given 3 images  $A, P, N$ :

$$\underline{L(A, P, N)} = \max \left( \underbrace{\|f(A) - f(P)\|^2 - \|f(A) - f(N)\|^2 + \alpha}_{> 0}, 0 \right)$$

$$J = \sum_{i=1}^m L(A^{(i)}, P^{(i)}, N^{(i)})$$

$A, P$   
 $\uparrow \quad \uparrow$

Training set: 10k pictures of 1k persons

# Choosing the triplets A,P,N

During training, if  $A, P, N$  are chosen randomly, is  $d(A, P) + \alpha \leq d(A, N)$  easily satisfied.

$$\|f(A) - f(P)\|^2 + \alpha \leq \|f(A) - f(W)\|^2$$

# Choose triplets that're “hard” to train on.

$$\frac{Q(A, P) + \frac{1}{n}}{Q(A, P)} \leq \frac{Q(A, N)}{Q(A, N)}$$

Face Net  
Deep Face

# Training set using triplet loss

Anchor



⋮



Positive



⋮



Negative



⋮



$$J$$
$$d(x^{(a)}, x^{(p)})$$