



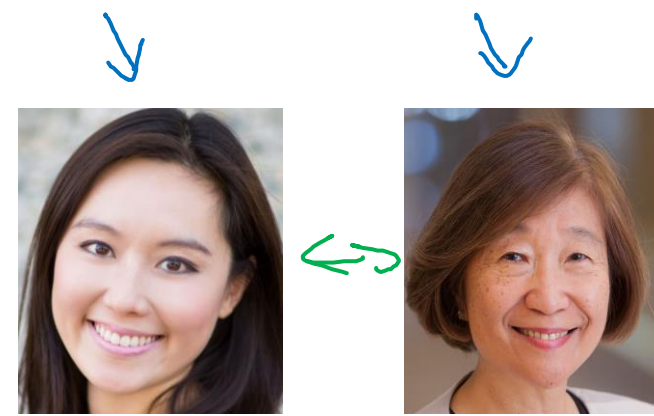
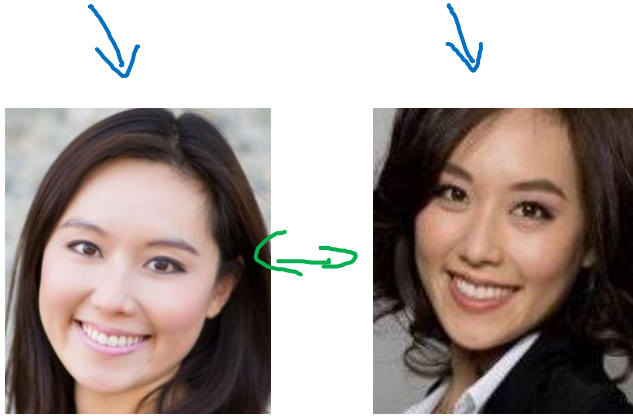
deeplearning.ai

# Face recognition

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## Triplet loss

# Learning Objective



Anchor

Positive

Anchor

Negative

A

$$d(A, P) = 0.5$$

Want:

$$\underbrace{\|f(A) - f(P)\|^2}_{d(A, P)} + \underline{\alpha} \leq \overset{\nearrow 0.2}{\phantom{\alpha}}$$

A

$$d(A, N) = \cancel{0.5} \quad 0.7$$

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

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

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

# Loss function

Given 3 images

$A, P, N$ :

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

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

$A, P$   
↑ ↑

Training set: 10k pictures of 1k persons

# Choosing the triplets A,P,N

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

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

Choose triplets that're "hard" to train on.

$$\frac{d(A, P)}{d(A, P)} + \alpha \leq \frac{d(A, N)}{d(A, N)}$$

↓                      ↑

Face Net  
Deep Face

# Training set using triplet loss

Anchor



⋮



Positive



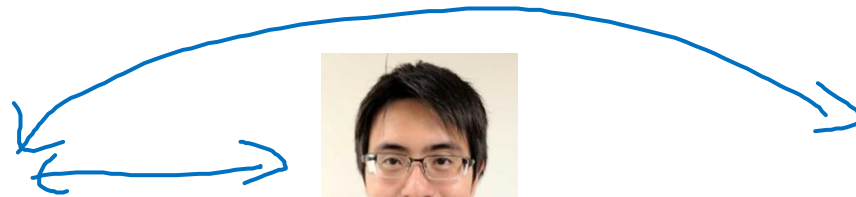
⋮



Negative



⋮



$$d(x^{(i)}, x^{(j)})$$