FACENET

A Unified Embedding for Face Recognition and Clustering

PRESENTED BY:

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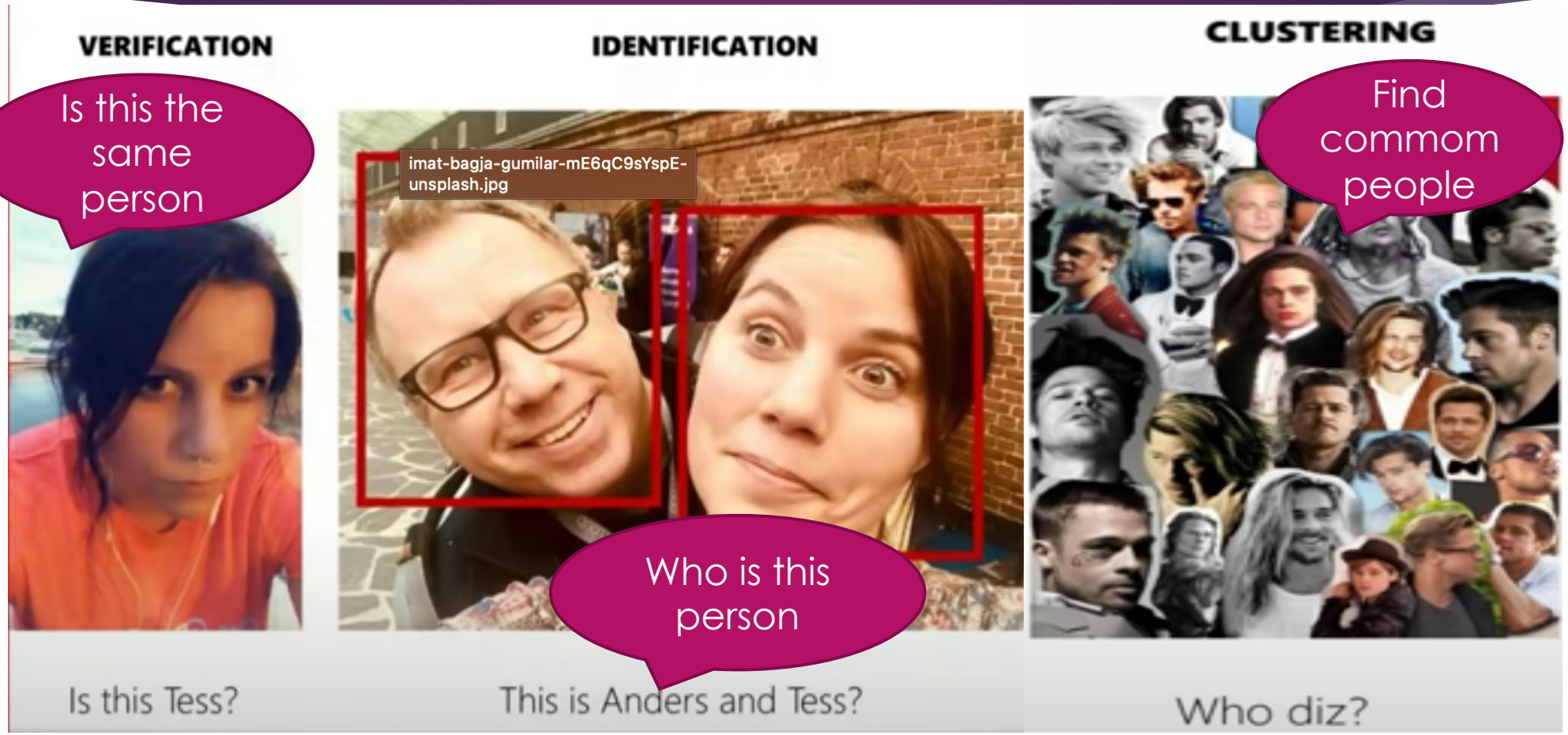
Idea of the paper ?

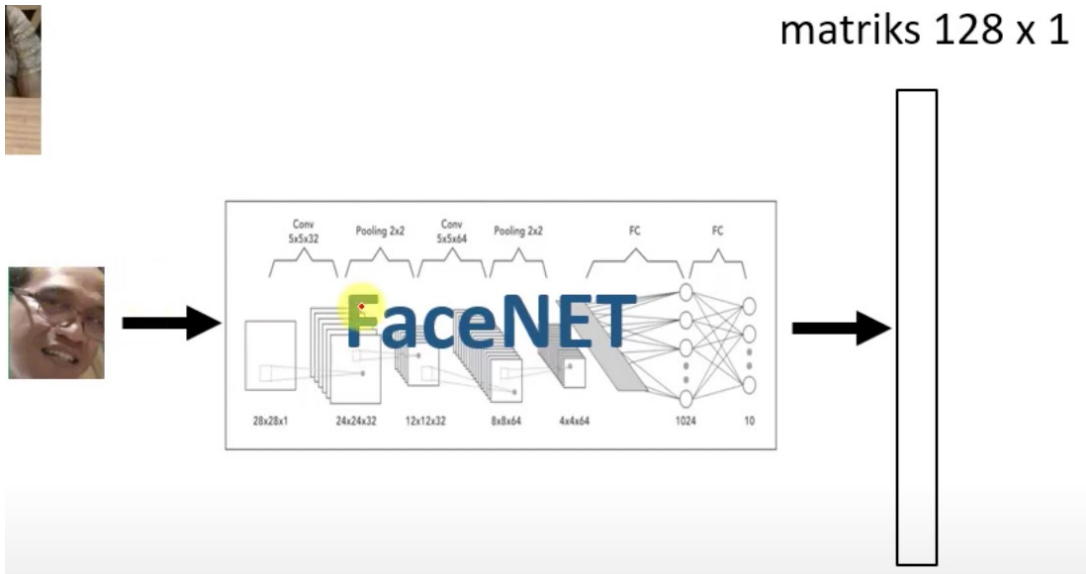


Idea of the paper ?

- FaceNet is based on learning an **Euclidean embedding** per image using a deep convolutional network
- It uses a method called ‘one-shot training’, so we don’t need to train the network with many photos(i.e We only need one picture for every person)

Idea of the paper ?

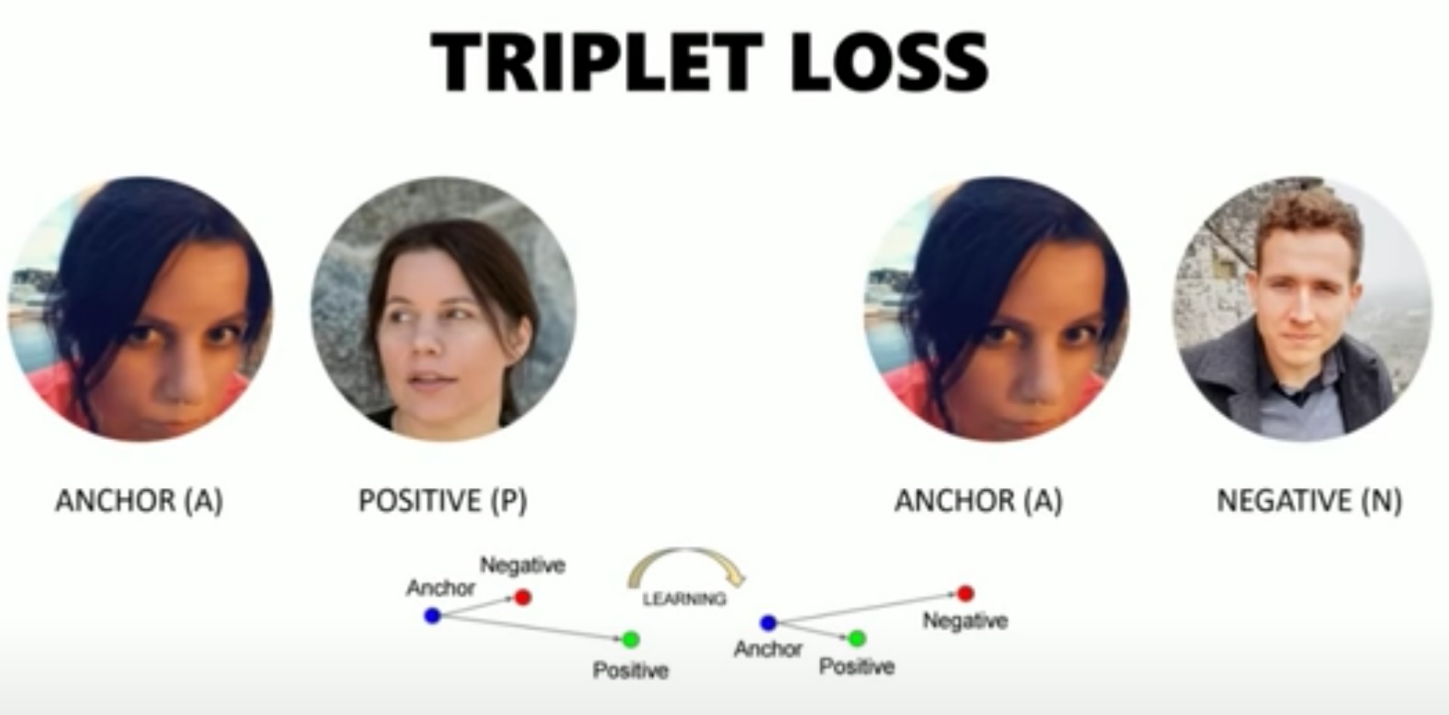
- The input to FaceNet is a '**face**' with a size of 160*160
- Facenet is trained to give an output of 128 nodes (numbers)
- The 128 numbers contain the **features** of the face
- So to every given input (face) corresponds a specific set of 128 numbers
- If we input the faces of the **same person** in different positions then the numbers *will be* ***similar***



Idea of the paper ?

- The input picture can contain more than 1 face or also no face at all
- So another machine learning procedure is used to know the location of eventual faces in the picture → **CNN**

TRIPLET LOSS & TRIPLET SELECTION



TRIPLET LOSS & TRIPLET SELECTION

$$\|f(x_i^a) - f(x_i^p)\|_2^2 + \alpha < \|f(x_i^a) - f(x_i^n)\|_2^2 \,,$$

$$\forall \, (f(x_i^a), f(x_i^p), f(x_i^n)) \in \mathcal{T} \,.$$

- For an image x_i^a (anchor) of a specific person is closer to all other images x_i^p (positive) of the same person than it is to any image x_i^n (negative) of any other person.

TRIPLET LOSS & TRIPLET SELECTION

$$Loss = \sum_{i=1}^{N} \left[\| f_i^a - f_i^p \|_2^2 - \| f_i^a - f_i^n \|_2^2 + \alpha \right]_+$$

TRIPLET LOSS & TRIPLET SELECTION

- Generating all possible triplets would result in many triplets that are easily satisfied
- These triplets would **not contribute to the training** and result in **slower convergence**
- **SOLUTION → select hard triplets**

TRIPLET LOSS & TRIPLET SELECTION

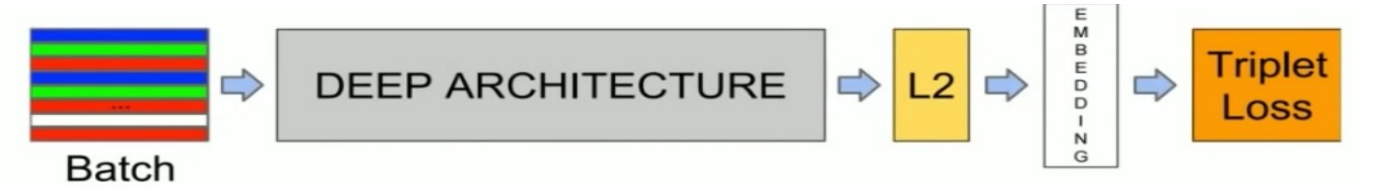
We need triplets that violate the equation to ensure fast convergance

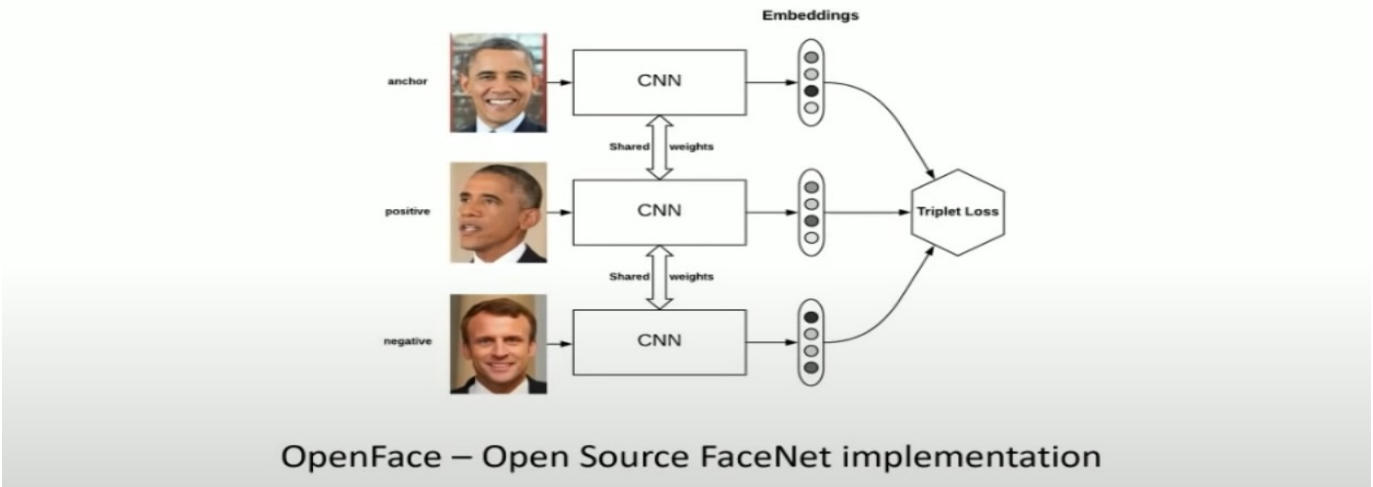
$$\|f(a) - f(p)\| - \|f(a) - f(n)\| + \alpha \leq 0$$

find P where argmax($\|f(a) - f(p)\|$)

find N where argmin($\|f(a) - f(n)\|$)

MODEL ARCHITECTURE





OpenFace – Open Source FaceNet implementation

MODULES/CONCEPTS

- Three main concepts
  - Verifictaion
  - Identification
  - Clustering