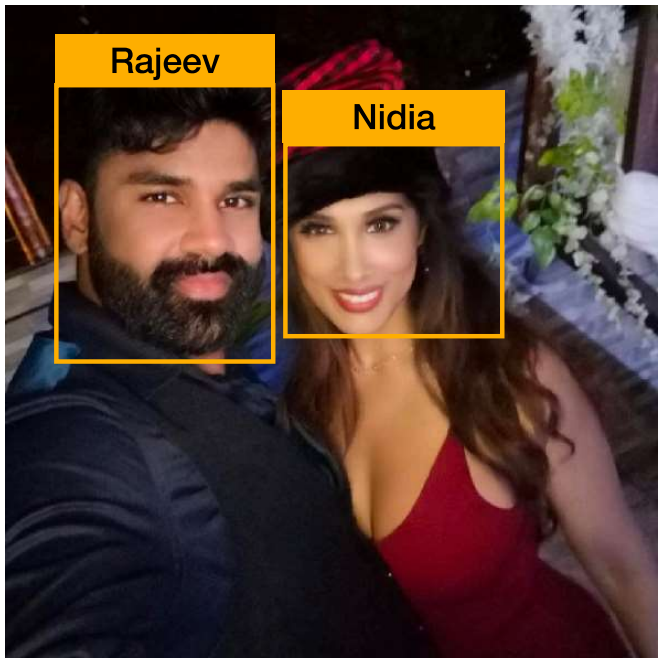
What is Facial Recognition?

- The ability to automatically attach an individual's identity to a face
- It's a task that human abilities are absolutely brilliant, and even some animals, dogs, crows, sheep can do it!
- Can machines do it?



Facial Recognition the Early Days

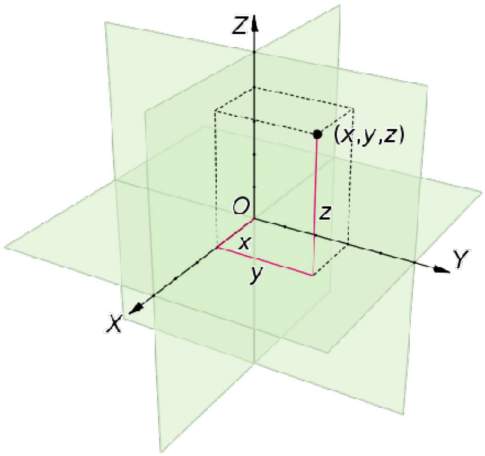
- **OpenCV** has 3 facial recognition libraries, all of which operate similarly.
- They take a dataset of labelled faces, and compute features to represent the images. Their classifiers then utilise these features to classify.
- **Eigenfaces (1987)** - createEigenFaceRecognizer()
- **Fisherfaces (1997)** - createFisherFaceRecognizer()
- **Local Binary Patterns Histograms (1996)**- createLBPHFaceRecognizer()

Facial Recognition using Deep Learning

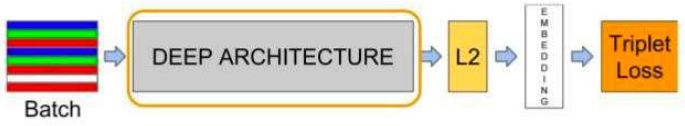
- Siamese Networks can be used for Facial Recognition.
- Let’s take a look at two popular Deep Learning Facial Recognition Networks:
  - VGGFace
  - FaceNet

A look at FaceNet

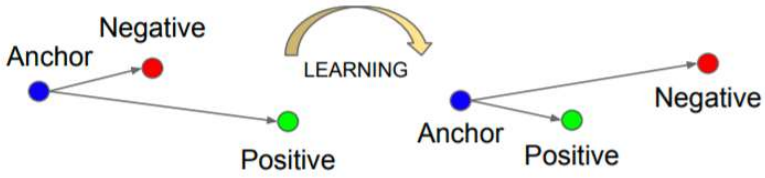
- FaceNet was first introduced by Google in 2015
- It transforms a face into a 128 dimension Euclidian space embedding
- Uses the triplet loss function



3 Dim in euclidian space



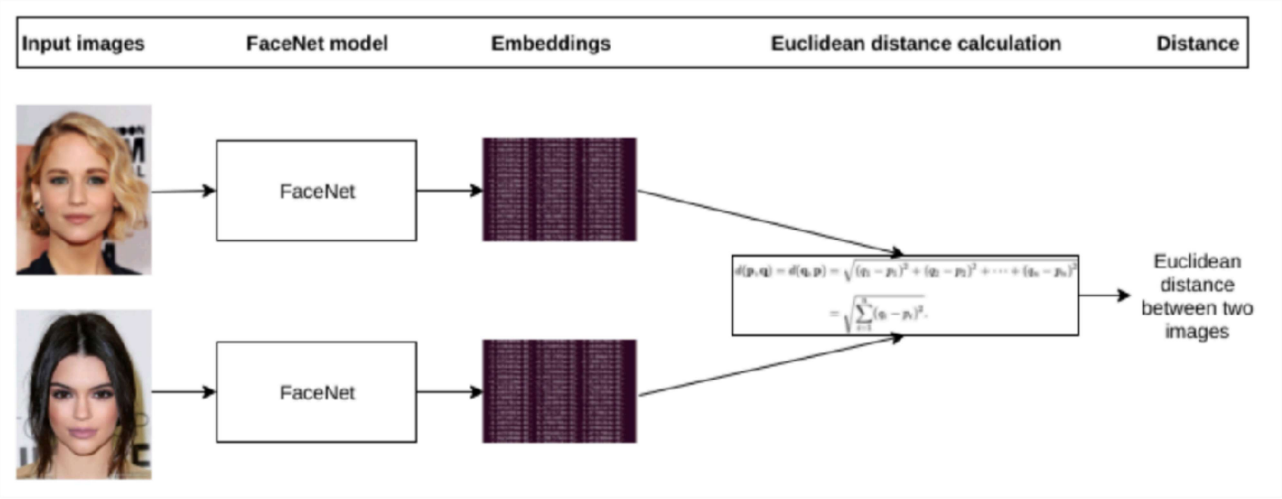
FaceNet Basic Architecture



Triplet Loss Training

https://arxiv.org/pdf/1503.03832.pdf

A look at FaceNet



One shot learning using FaceNet

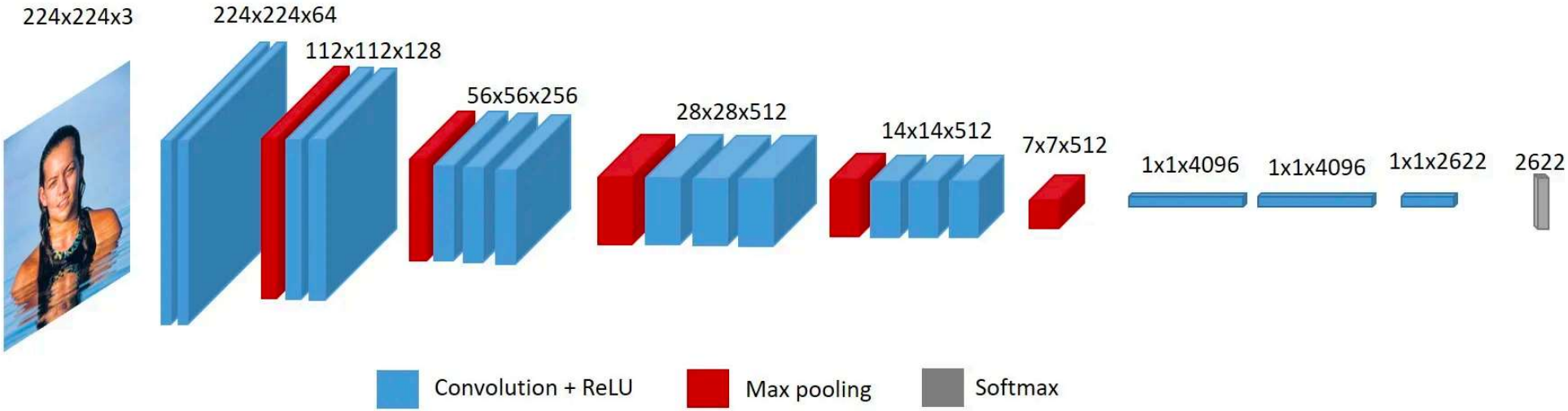
A look at VGGFace

- VGGFace was introduced by Oxford University Researchers Omkar M. Parkhi, Andrea Vedaldi and Andrew Zisserman in their paper titled ‘Deep Face Recognition) in 2015
- They used Triplet Loss and an embedding vector of 2,622 or 1,024 (depending on the configuration) with input image size being 224 x 224

Figure 1: Example images from our dataset for six identities.

https://www.robots.ox.ac.uk/~vgg/publications/2015/Parkhi15/parkhi15.pdf

A look at VGGFace



Dataset	Identities	Images
LFW	5,749	13,233
WDRef [4]	2,995	99,773
CelebFaces [25]	10,177	202,599

Dataset	Identities	Images
Ours	2,622	2.6M
FaceBook [29]	4,030	4.4M
Google [17]	8M	200M

Table 1: **Dataset comparisons:** Our dataset has the largest collection of face images outside industrial datasets by Goole, Facebook, or Baidu, which are not publicly available.

VGGFace Performance

No.	Method	Images	Networks	Acc.
1	Fisher Vector Faces [21]	-	-	93.10
2	DeepFace [29]	4M	3	97.35
3	Fusion [30]	500M	5	98.37
4	DeepID-2,3		200	99.47
5	FaceNet [17]	200M	1	98.87
6	FaceNet [17] + Alignment	200M	1	99.63
7	Ours	2.6M	1	98.95

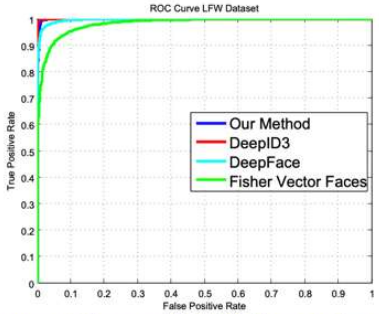
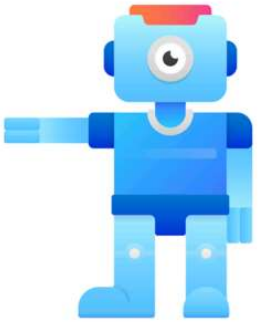


Table 5: **LFW unrestricted setting.** Left: we achieve comparable results to the state of the art whilst requiring less data (than DeepFace and FaceNet) and using a simpler network architecture (than DeepID-2,3). Note, DeepID3 results are for the test set with label errors corrected – which has not been done by any other method. Right: ROC curves.

LFW - Labelled Faces in the Wild

No.	Method	Images	Networks	100%- EER	Acc.
1	Video Fisher Vector Faces [15]	-	-	87.7	83.8
2	DeepFace [29]	4M	1	91.4	91.4
3	DeepID-2,2+,3		200	-	93.2
4	FaceNet [17] + Alignment	200M	1	-	95.1
5	Ours ($K = 100$)	2.6M	1	92.8	91.6
6	Ours ($K = 100$) + Embedding learning	2.6M	1	97.4	97.3

Table 6: **Results on the Youtube Faces Dataset, unrestricted setting**. The value of K indicates the number of faces used to represent each video.



MODER
COMPUTER
VISION

BY RAJEEV RATAN

Next...

Face Similarity, Recognition, VGG Face and FaceNet