



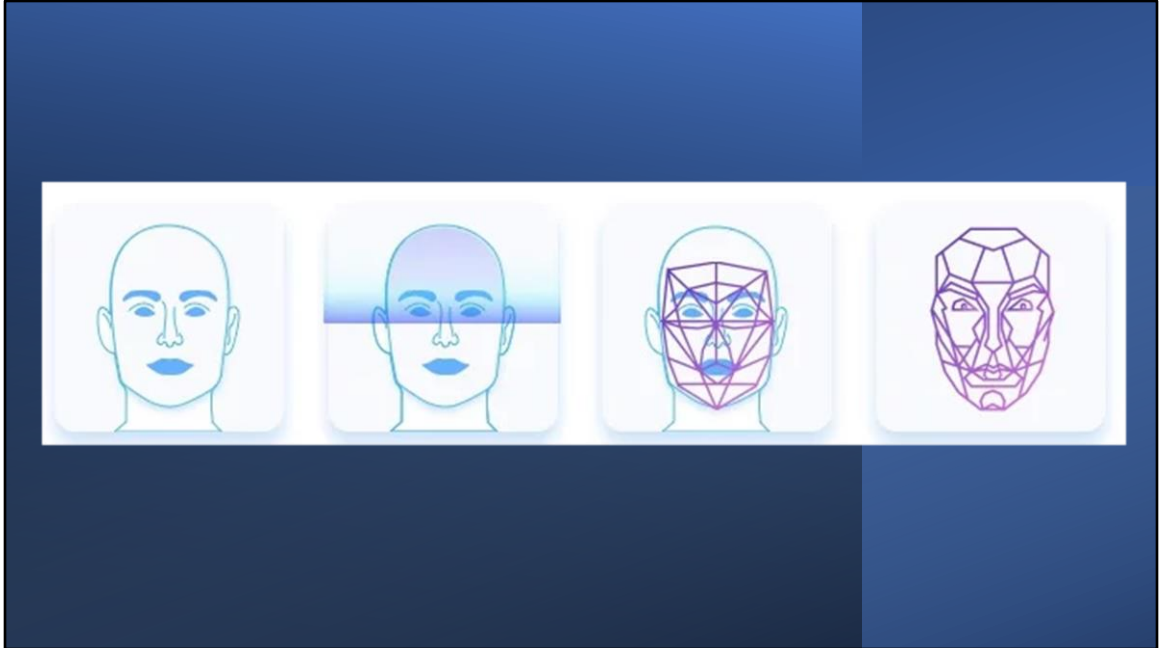
Facebook's Face Recognition



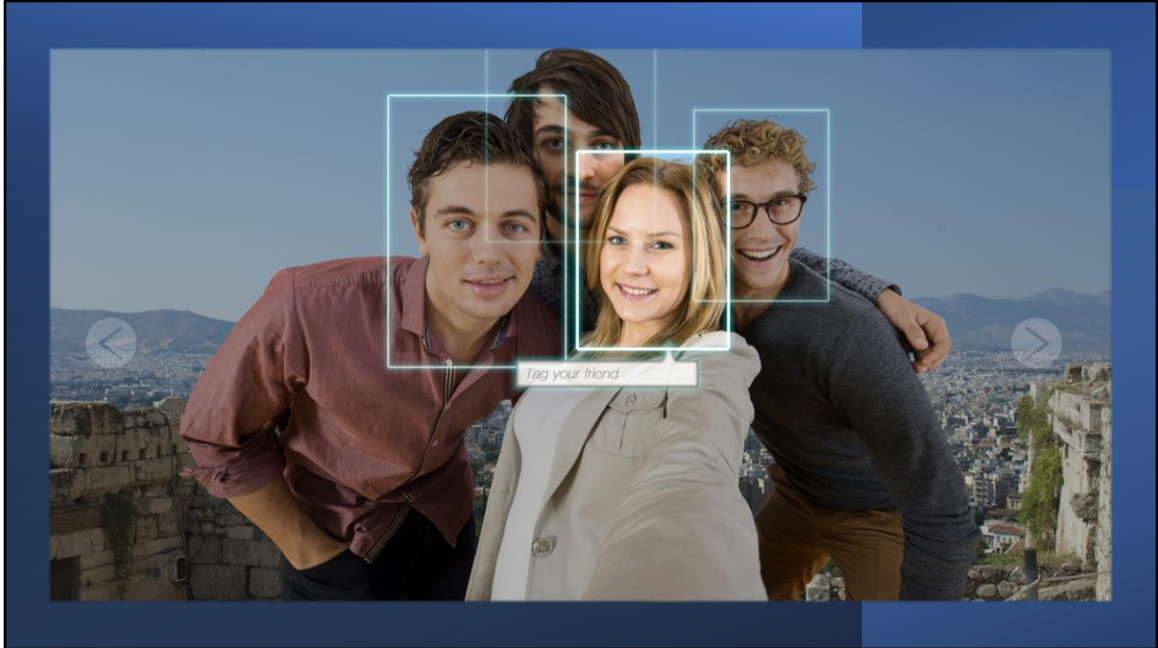
In 2014 Facebook announced their face-matching software. A standard “**Label Faces in the Wild (LFW)**” dataset was used to measure the accuracy of the software.



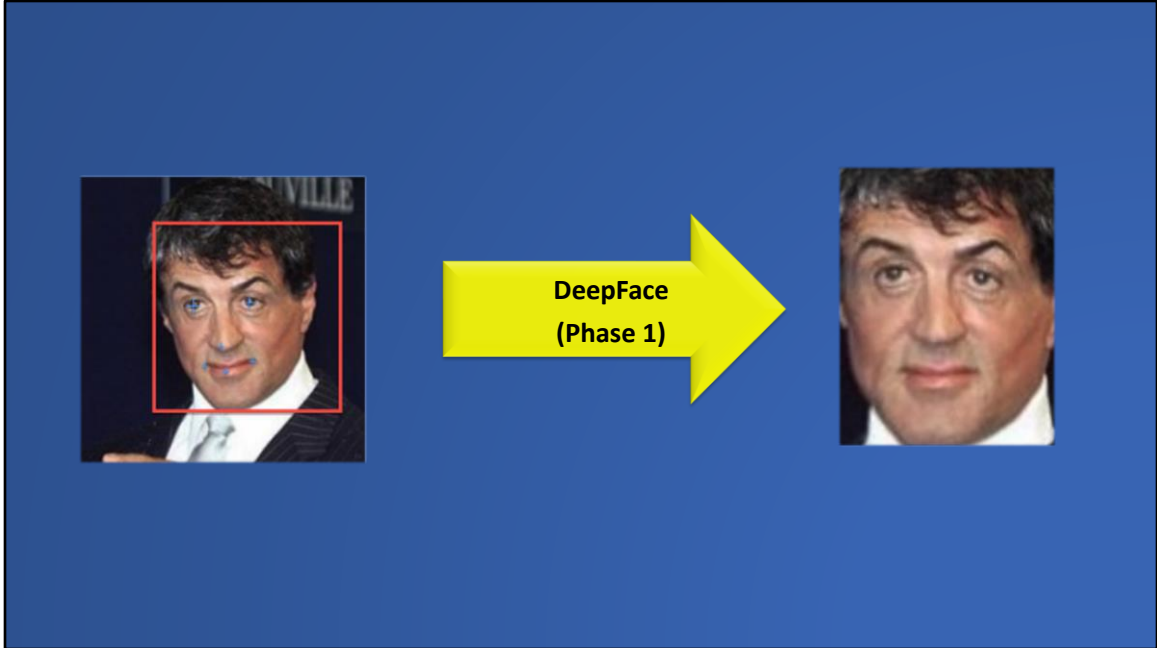
A human will get it right **97.53%** of the time and the software can score **97.25%** on the same challenge, regardless of variations in lighting or whether the person in the picture is directly facing the camera. That was a significant advance over previous face-matching software, and it demonstrated the power of deep learning.



When a Facebook user with either **“tag suggestions”** or **“face recognition”** turned on is tagged in a photo, the social network’s machine systems analyze the pixels of the face in the image, creating what’s called a **“template”**. Facebook describe the template as a **“string of numbers”**, but each user is assigned a template that’s unique to them.



When new photos are uploaded, Facebook compares faces present in the image to template of relevant users and suggests a tag if there's a match.

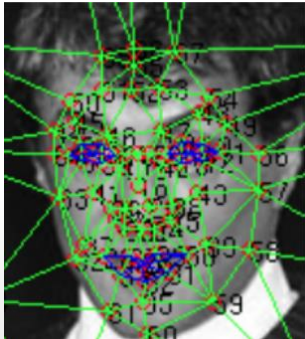


Facebook’s **“DeepFace”** algorithm first aligns a face using a 3D model of an “average” forward-looking face so that the person in the picture faces forward.

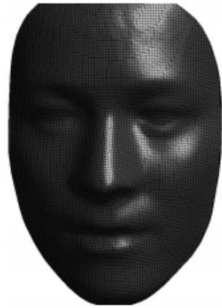


6-fiducial points

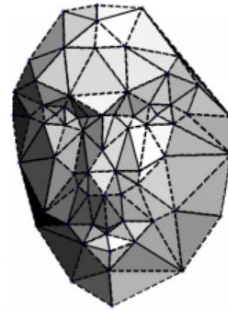
Given an input image, it identifies the face using **six fiducial points**: 2 eyes, tip of the nose and 3 points on the lips. These feature points are used to detect faces in the image and crop it to show the face.



67 fiducial points with Delaunay triangulation

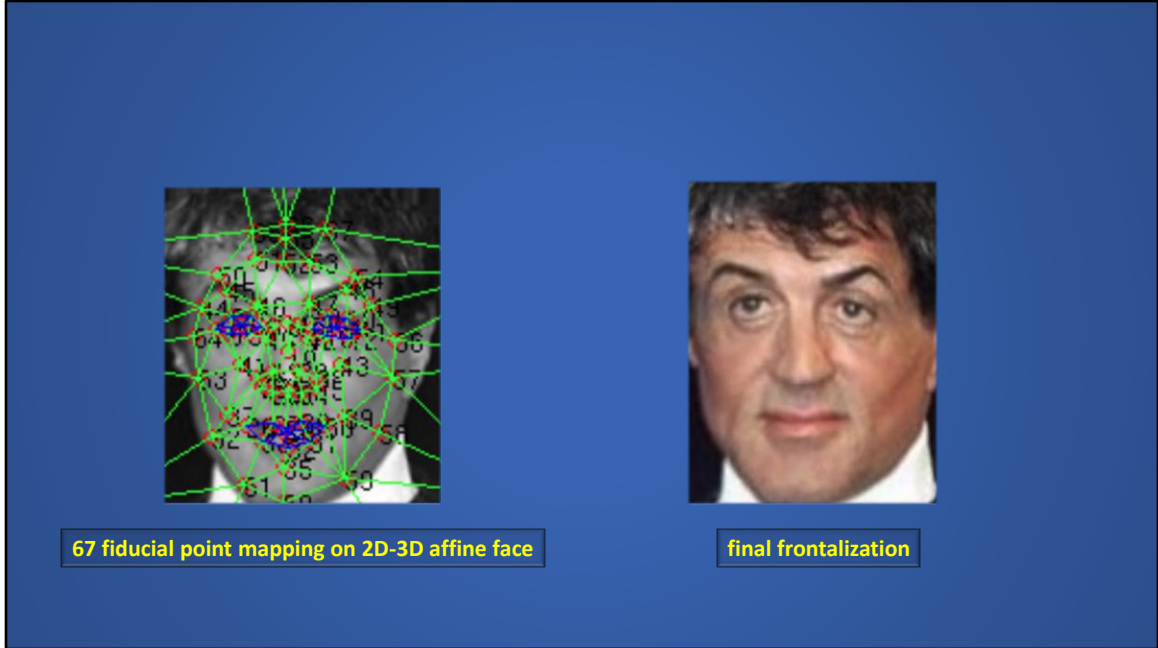


3D shape generated from the align 2D-crop image



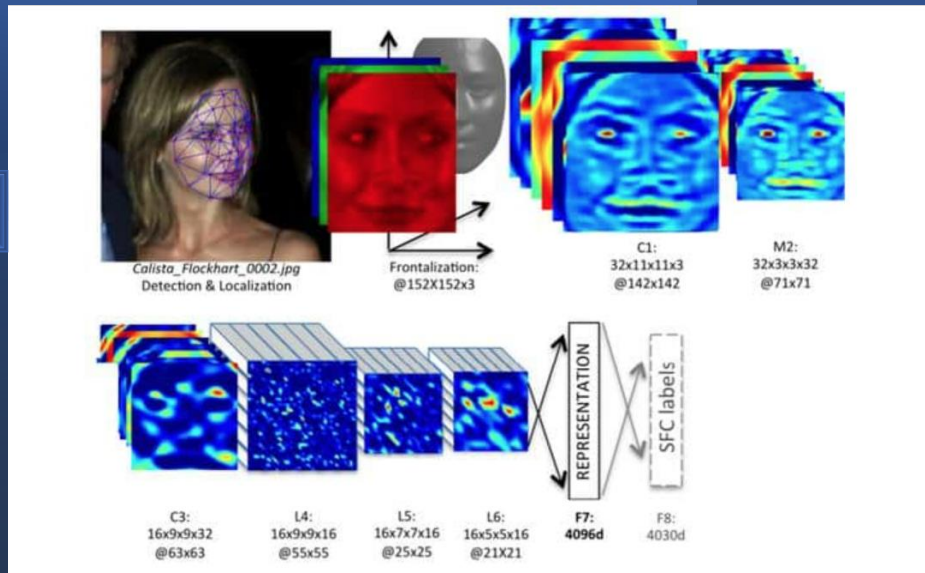
Visibility map of 2D shape in 3D (darker triangles are less visible as compared to light triangles)

Then it applies 67 fiducial point map to generate a 3D model using a generic 2D to 3D model generator and establishes a relation between 2D and 3D.



The final stage is a frontalization of alignment.

DeepFace (Phase 2)

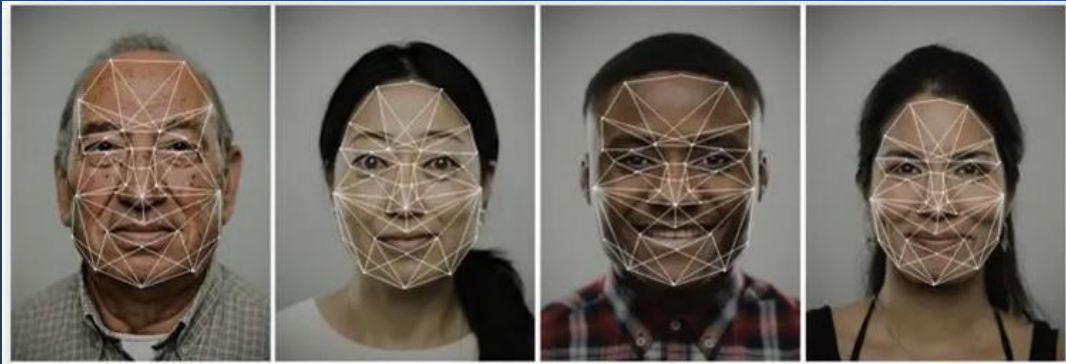


- Then it uses the deep learning to find a numerical description of the forward-looking face.
- So, if DeepFace comes up with a description that matches some user “template”, it assumes that the face on the image is that user’s face.
- There are nine layers of simple simulated neurons, with more than 120 million connections between them. To train this network, Facebook’s researches used a tiny slice of date Facebook users’ images. It was nearly 4.4 million images of 4030 people, each person having 800 to 1200 face images.



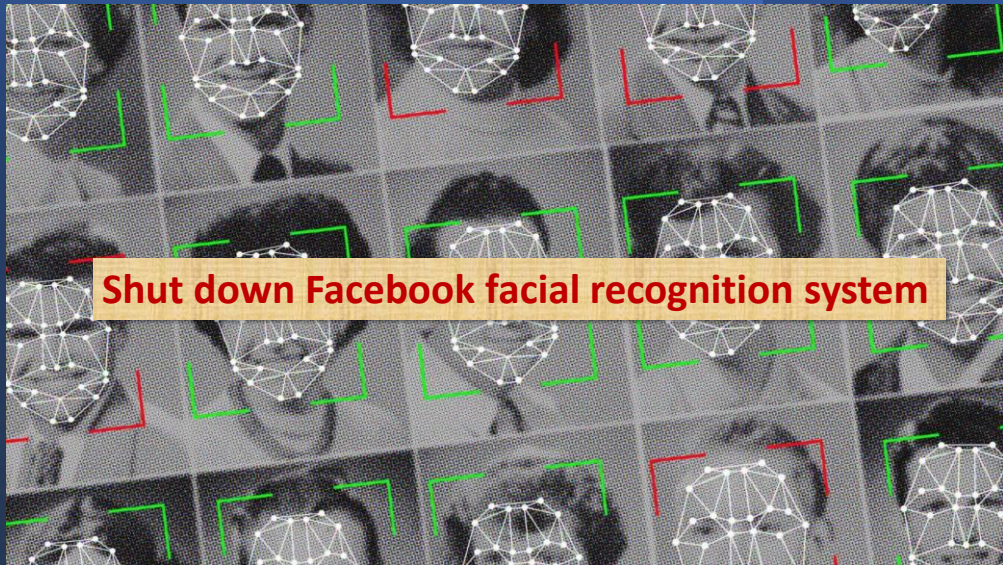
Technology allows social media companies to create their digital profiles

- Because of Facebook's wide access to images of individuals, their facial recognition software can perform comparatively better than other software with much smaller datasets. However, there was a lot of negative response to the technology.
- People were concerned about privacy aspect and that the technology allows social media companies to create their digital profiles. Some European governments required Facebook to delete facial-recognition data.



The accuracy was much lower when the algorithms are used to women, black individuals, and young people, because algorithms are primarily trained with white men.

Another problem was that accuracy was much lower when the algorithms are used to women, black individuals, and young people, because algorithms are primarily trained with white men. The systems falsely identify black and Asian faces and was considered racist. Facebook even announced that it is building teams that will look into racism in its algorithms.



As a result of growing privacy concerns, Facebook announced that it plans to shut down Facebook facial recognition system. By December 2021 they planned to delete more than one billion facial recognition templates. However, it will not eliminate DeepFace completely. They are still going to use the technology in their future projects.