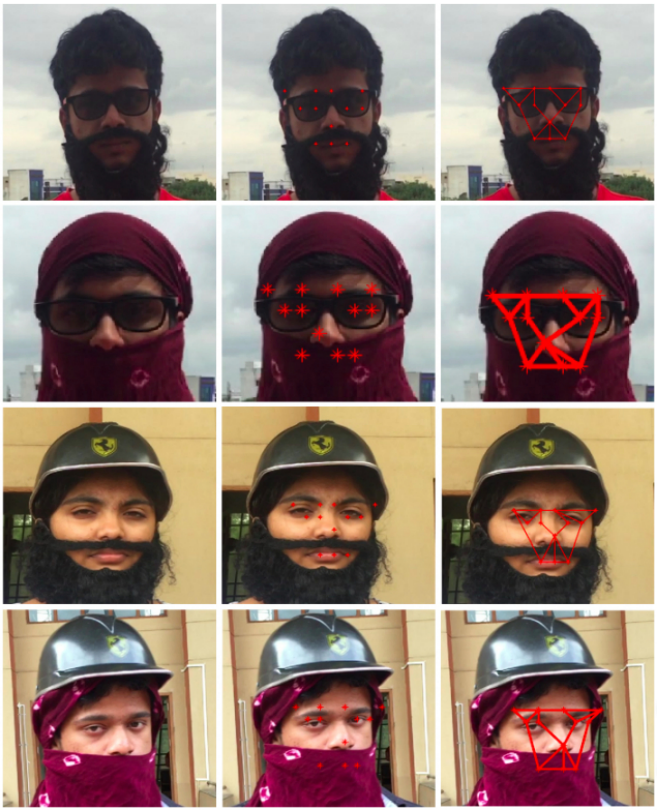
# Meeting the disguised face challenge via deep convolutional network

9 September 2017, by Nancy Owano



Credit: arXiv:1708.09317 [cs.CV]

(Tech Xplore)—Catch me if you can. Fearless criminals on the run from the law grab their hats, fake beards and dark glasses to shake off cameras and detectives. Old ploy. New technology advances, though, are making them think twice about their efforts.

Facial recognition technology is in the news this month with work done by Amarjot Singh (Department of Engineering, University of Cambridge) and his colleagues: Devendra Patil and G. Meghana Reddy (National Institute of Technology, India) and S.N. Omkar (Indian Institute of Science).

They presented a framework to identify people who wear disguises. They (1) introduced their framework to detect 14 facial key-points (2) and then used those to perform disguised face identification."

"We analyzed numerous images and videos of crimes, as well as protests, all over the world to see which parts of the face are usually covered by individuals to disguise themselves," project leader Amarjot Singh told *Seeker*.

Their paper is titled "Disguised Face Identification (DFI) with Facial KeyPoints using Spatial Fusion Convolutional Network" and it is on arXiv. The paper will appear next month at the International Conference on Computer Vision Workshop) in Venice.

Matt Reynolds, *New Scientist*, wrote that the team worked with photos of people wearing hats, glasses, scarves and fake beards. The algorithm looked at an image subset to learn how the disguised faces corresponded with the undisguised faces.

The authors wrote, "Each proposed dataset (Simple and Complex) is formed of 2000 images recorded with male and female subjects aged from 18 years to 30 years. The dataset of disguised faces was collected in 8 different backgrounds, 25 subjects and 10 different disguises."

("The system only needs to be able to see a fraction of facial key points – most of which are around the eyes and mouth – to be able to guess where the other points are likely to be," said Reynolds.)

The authors stated that the framework was shown "to outperform the state-of-the-art methods on key-point detection and face disguise classification."

To carry out their work, they turned to a deep

convolutional network.

Jen Viegas in *Seeker*: "'Deep convolutional networks are software creations organized into interconnected layers, much like the visual cortex, the part of the brain that processes visual information,' Singh explained."

The networks learned from datasets. Viegas wrote that their system "reads the batches of photos of disguised individuals and learns to predict the target facial key-points."

Viegas in *Seeker* and Reynolds in *New Scientist* noted the system's limitations thus far.

"The fewer facial key points it can see, the worse the software is at recognising a person in a photo. It's also thrown off by busy backgrounds, so can only identify a person wearing a cap, glasses and scarf 43 per cent of the time if they're standing in front of a complicated background," Reynolds wrote.

Viegas said that Singh acknowledged how the precision decreased in the presence of a complex background having images with uneven lighting conditions.

In the bigger picture, "anti-surveillance tricks are keeping pace with improvements," said Simon. This is a type of technology challenge where everyone can just stay tuned.

James Vincent in *The Verge*: "Wearing a rigid mask that covers the whole face, for example, would give current facial recognition systems nothing to go on. And other researchers have developed patterned glasses that are specially designed to trick and confuse AI facial recognition systems."

**More information:** Disguised Face Identification (DFI) with Facial KeyPoints using Spatial Fusion Convolutional Network, arXiv:1708.09317 [cs.CV] arxiv.org/abs/1708.09317

**Abstract**
Disguised face identification (DFI) is an extremely challenging problem due to the numerous variations that can be introduced using different disguises. This paper introduces a deep learning framework to first detect 14 facial key-points which are then utilized to perform disguised face identification. Since the training of deep learning architectures relies on large annotated datasets, two annotated facial key-points datasets are introduced. The effectiveness of the facial keypoint detection framework is presented for each keypoint. The superiority of the key-point detection framework is also demonstrated by a comparison with other deep networks. The effectiveness of classification performance is also demonstrated by comparison with the state-of-the-art face disguise classification methods.

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