I had a couple different thoughts when looking for an article. My first thought was the utilization of masks and its affect on predictive powers. This has been studied more in-depth since 2020 due to Covid. In addition to Covid, there are cultures who utilize a partial masking of the face, which could be further explored. After discarding that idea due to the recent prevalence of articles on masking, I thought about colored contacts impact on accuracy. I found one paper where there was a significant decline in accuracy with the inclusion of colored lenses, but that was written nearly a decade ago and more recent materials required purchase. So then I went to something more fun - beauty filters.

<https://data-notes.co/snapchats-filters-how-computer-vision-recognizes-your-face-9907d6904b91>

It turns out the fun filters people can use on Snapchat and other media outlets is largely the result of a Ukranian startup that was acquired by Snapchat in 2015. Their algorithms are largely proprietary but the article has a good synopsis. The first step is to determine all present human faces and output their bounding box (i.e. The rectangle coordinates in the form: X, Y, Width & Height). One of the more common techniques is a combination of Support Vector Machines (which we studied in PDAT 613) and Histogram of Oriented Gradients, aka HOGs. HOGs are new to me but my basic understanding is they remove unnecessary information from the picture. Additional information can be found here:

<https://courses.cs.duke.edu/compsci527/fall15/notes/hog.pdf>

The second step of the algorithm, after determining what area constitutes the face, is to determine facial landmarks (eyes, nose, lips, etc).  You can read more about that here: <https://learnopencv.com/facial-landmark-detection/>

The third step is to create the image. It not only uses the information found in steps 1 and 2, but it also uses an aggregated human face called the Active Shape Model - which is the artificial creation of an average human face.

The fourth and final step is to make the changes that the filter activates (adding dog ears, face swapping, etc).

There is quite a lot to unpack and we can go into a variety of directions. Regarding our class, and the video discussing racial/gender bias with facial recognition, it is clear that step 3's use of the Active Shape Model can lead to recognition issues. If the Active Shape Model draws from a library that is predominantly white men, then of course there will be issues with those on the other end of the spectrum.

Another issue that arises is the trigger that activates the filter. Some filters activate when the mouth is opened. This is determined by the computer by location a relatively darker area in the lower middle of the face than the surrounding areas. Of course those with very dark skin, or dark facial hair, might not have enough differences to actually hit the threshold to trigger the filter.

Given the information provided in the videos, where 10 digitial footprints are used to predict default, and 3 pieces of information can unravel someone's identity, I am concerned about what is being collected and analyzed with regards to filters. Are men and women who use anti-aging filters subject to more ads and age-related news in an effort to get them to buy more product? Is somebody trying to predict future behavior based off their usage of the chicken nugget face filter? (LOL, I don't have snapchat so I tried to find some fun filters). Furthermore, while Snapchat may be utilizing the HOG to focus on the face, the discarded remnants of an image can then be thrown into another database where further information can be analyzed.