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Glasses for Everyone

While face classification is something that is relatively simple with today's algorithms, it's applications are only becoming more and more important. I propose an extension to the face classification problem, which will focus mainly on the eyes of a person's face; I call the project "Glasses for Everyone." The goal of the project is given an image of a face, I'd like to place an image of glasses (type of glasses are TBD) on the person's eyes. While seemingly simple at first, this problem is actually quite interesting when considering different scenarios: how do I account for the scale of the face? The image of the glasses should be able to scale with the size of the face it's being applied to. What about when the face is rotated? If the face is facing a certain direction? The glasses should be properly distorted to match this perspective. Additionally, the image may not contain a picture of a face at all.

My current approach is to first tackle the problem of whether or not there is a face in the given image; this can easily be done using an out-of-box neural net solution that is trained to recognize different human faces. Images into the training set should be distorted and rotated to prevent the net from overfitting on upright faces that are directly looking at the camera. I am considering other solutions, however, because I believe that a neural net may be computationally expensive to determine whether or not a face is present in the image. Training images will be obtained from a database of face images, which are plentiful online.

Once a face is detected, I will likely use a mechanism similar to to the Haar-like rectangle features described by Viola & Jones to detect the eyes of the face. The challenge is to detect eyes in multiple orientations, so many Haar-like rectangles might be iterated over the image in

multiple directions. Alternatively, it may be possible to deduce the orientation of the eyes using gradient approximations computed by only horizontal and vertical Haar-like rectangles.

From this point, I will need to use different calculations to figure out the correct scaling, position, and distortion of the image of the glasses to properly fit on the face. Scaling measurements can come from measuring the distance between the detected eyes and position by the location of them, but distortion calculations have yet to be realized.

For related topics in the course, I will primarily be looking at sources referenced in the lectures on “Intro to Recognition” and “Classification.” While the Haar-like rectangles were the first thing to stand out to me, I realize they might not be the best technique for my application, and I will continue to do research to figure out the correct direction to head in.

The target outcome for the project is a system where an image can be provided, and the output will be the same image of the face with a pair of glasses over the eyes. The difference between this application and something like a Snapchat filter is that ideally, this algorithm will be more robust to face rotation and distortion. But more importantly, this algorithm will classify eyes rather than faces. One potential roadblock that may occur is because my algorithm will be focused only on eyes, it may be more difficult to determine the orientation of the face. For example, if there are two images of a face: one right-side up and another upside down, then using only measurements of the eyes, how do I know which image is right-side up? Additionally, I currently have no direction for figuring out how to distort an image of the glasses to match the angle of the provided face. I will likely be able to deliver a project that can rotate glasses, but distortion of the glasses may an extra component that might not be completed if significant roadblocks are encountered.