CHAPTER V
CONCLUSION

5.1 Conclusion

Based on the results gained from the various tests done, the following conclusions can be made for each of the algorithms:

1. CNN has the most average speed and accuracy performance out of the four algorithms (0.037 seconds/image and 22.73% FRR, 0% FAR). It also performed well in both the dataset tests and the real life tests; CNN has the least tendencies to detect a false positive.
2. HOG was the fastest algorithm during the dataset tests (0.011 seconds), and has average accuracy (27.27% FRR, and 0% FAR) but performed poorly when tested against the real life images matching only a few faces compares to the other algorithms; this could be due to the fact that the HOG algorithm (from the Dlib library specifically) can't handle complex background, and small faces well. The algorithm also requires the images to be in grayscale; making it colorblind, and unsuitable for cases that are color sensitive.
3. DNN is the slowest algorithm out of the four, requiring 0.119 seconds to process an image. But the accuracy is the best out of the other four algorithms (11.69% FRR and 2.6% FAR). There is however one thing to keep in mind when using DNN for face recognition, the DNN algorithm (with the model used) requires the input image to be resized into a square first before anything else. So you will need to resize any non-square

image into a square first; parse it through the DNN, and then resize the output image back into its original resolutions.

4. HAAR cascades face detection algorithm is in third place when it comes to speed (0.053 seconds), but works extremely well for frontal faces in images (both for the dataset tests as well as the real life tests). However, HAAR has the highest FRR due to the fact that HAAR works poorly against faces that are blocked (partially, or half), or pose invariant (34.42% FRR and 0.65% FAR).

There is no clear winner when it comes to “the best” algorithm to use, developers will have to pick on what the value most in the algorithm; speed or accuracy; as well as what types of faces will the algorithm be faced with, for example the placement of the camera. HOG and HAAR would work best for cameras that are placed at eye level, where the faces will always be in frontal view with minimal pose variant, while DNN and CNN HOG is viable for cameras that are placed in higher, or lower angles like CCTV cameras. HOG is the fastest, but suffers in terms of accuracy in general, while the face recognition algorithms using DNN and CNN are more versatile in detecting faces that are more obscured and pose variant (but requires more high quality images, and processing time). The face recognition algorithm using HAAR cascades while is the third quickest (losing only to HOG and CNN) handles low quality images very well, but very pose dependent.

5.2. Suggestions

A few suggestions that the writers would like to make for future students/researchers that are looking to continue or expand upon the research done in this thesis. The first would be to use a larger dataset when doing the tests; the dataset chosen doesn't consider the different faces from varying races and ages enough. Secondly, to use videos instead of still images when trying to determine what is the best face recognition algorithm to use in real life cases. Thirdly, to use a better and faster machine to run the algorithms; so we could see whether the hardware affects the performance of the algorithms. And finally, New technologies are always being developed; there will always be a chance that a new face recognition algorithm has been developed and released to the public; if so it would be interesting to take a look at what the performance of said algorithm would be as well.