ELEC4630 Image Processing and Computer Vision

Assignment 4

(Due date: Monday 1/6/2020 at 11pm)

Assignment report should include **coding**, **results**, **images**, and a **verbal description** of how you approached the problem. Some similar solutions can be found on the internet, but you won't learn anything by copying these verbatim, and you may be flagged for integrity issues — none of us want this. However, in this assignment you are encouraged to find internet solutions and modify the code significantly to match your problem. This is fine and ethical as long as you cite your sources appropriately. Also the tutors will help you with the coding. Most importantly, have fun – deep learning is amazing and exciting. I am very pleased to finally offer this to my students.

Ethics: It is considered to be unethical to disclose a person's identity via photos and other means unless you have their full knowing and voluntary consent. For this reason, many recent large face recognition databases are considered to be unethical since faces were harvested off the internet. In this assignment, do not show or use images of faces (including your own) unless you have consent in writing or it is part of a database where I indicate that consent has been obtained. These assignments will be marked but not distributed or made public by the teaching team. Please read the UQ ethics statement.

https://research.uq.edu.au/research-support/ethics-integrity-and-compliance/human-ethics/ethics-application

Figure 1 Australian Smart Gate

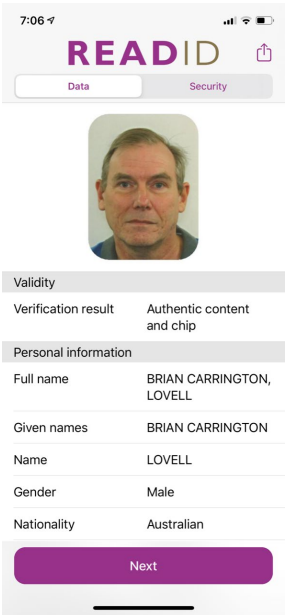

Figure 2 READID Passport Reader

1. In this question I want you to build a bare bones face verification system similar to what is deployed at Australian Airports for border control. Australia is a leader in this area and Brisbane was the first city to deploy this technology at the border in 2007.
    - First, I want you to extract your ID photo from your passport using a mobile phone reader and the app READID available on iPhone and Android Phones. You can use this photo or another in your assignment — I suggest you could use the first photo in the CalTech database as an alternative. This electronic photo extraction from your passport occurs when your passport is scanned.

Photos are generally removed after the matching step. (Why are they removed? Why have the photos in the passport chip instead of a central database?)

- Next take a series of similar selfies to simulate photo capture at the border. Note that in current smartgates, the angle of capture, lighting, pose, expression, wearing of glasses is tightly controlled (Why?).
- Build a deep learning based face verification system to verify your identity using Dlib or other libraries. There is no need to train the systems.
- Plot the ROC curve of your verification system using the Caltech faces as zero-effort imposters (on Blackboard as CalTechfaces.zip). Comment on your results. Would this system be satisfactory for the application of border control? Are the results realistic? Is the database sufficiently large? How could you make the ROC curve results closer to real life results?

(15 marks)

2. Challenge: Develop a method to distinguish cats from dogs. Feel free to use existing source code and enter the competition. Always cite your sources and explain your modifications. Come up with your own architectures and submit an entry to Kaggle. I want UQ top of the leaderboard.
    a. https://www.kaggle.com/c/dogs-vs-cats/overview
    b. https://towardsdatascience.com/image-classifier-cats-vs-dogs-with-convolutional-neural-networks-cnns-and-google-colabs-4e9af21ae7a8

3. 

Figure 3 Cats versus Dogs

(5 marks)

(Total 20 Marks)

Assignment 4 Marking Scheme and Criteria

Q1

- Coding of a solution to Australian border control. Appropriate images, description and explanation of method, issues of implementation, related images and graphs
    - (8 marks)
- Explanation of the requirements of a border control biometric solution regarding privacy efficiency etc. Answers to inline questions.
    - (7 marks)

Q2

- Coding of a solution to perform cat and dog classification. Description and explanation of architectures, performance metrics, appropriate citation of sources.
    - (5 marks)