ELEC4630 Image Processing and Computer Vision
Assignment 3
(Due date: Friday 26/5/2023 at 4pm)
Revision 1

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. You may also use generative AI technologies such as ChatGPT. In this case, you must declare what you used and how you used them. Also, the tutors will help you with the coding. Most importantly, have fun.

1. Create a personal blog on GitHub to document your progress and what you have learned about AI from the fastai course. Use Github Pages to create your free blog. Here are the instructions https://www.fast.ai/posts/2020-01-16-fast_template.html. Please provide a link to your blog site and some sample posts to show you have created your own personal blog site. Here is my own example blog based on this template.

   https://lovellbrian.github.io

   (5 marks)

2. Write a Jupyter notebook to classify 10 different classes of animal of your choice. Use Duck Duck Go to scrape sample images off the Web based on the fast.ai course example on birds. Design an appropriate multiclass loss function or describe which one was used. Analyse your data and results using tools such as t-SNE and Confusion matrices. Report on metrics such as classification accuracy and explain the methods used.

   00-is-it-a-bird-creating-a-model-from-your-own-data.ipynb

   (10 marks)

3. The quality of AI-generated images has rapidly increased, leading to concerns of authenticity and trustworthiness. Treat this problem as a mini research project as the best answer is not known. You will have to research the topic to find good solutions. Make sure you clarify which work is yours and which is from others.

   CIFAKE is a dataset that contains 60,000 synthetically generated images and 60,000 real images (collected from CIFAR-10). Can computer vision techniques be used to detect when an image is real or has been generated by AI?

   Design a deep learning model to classify images into either fake or real. Evaluate the performance of your model and analyze the impact of varying hyperparameters and architecture choices on model accuracy and training time. This dataset was released in 2023, so we really don't know how well we can perform on this task. You should try several different approaches and see how well you can do. Cite all sources and papers you have read to complete the assignment. See if you can win Kaggle for UQ! (I really mean this!)

https://www.kaggle.com/datasets/birdy654/cifake-real-and-ai-generated-synthetic-images

   (15 marks)
   (Total 30 Marks)

Assignment 3 Marking Scheme and Criteria

Rather than completing your assignment in Word (yuk). It is preferable if you write a Jupyter notebook for each question to explain what you have done. You can print the notebooks in PDF as explained on my fastai blog and also in the announcements.

Q1

- Setting up your Personal Blog on GitHub. Site setup and working. More than 3 blog posts visible.
    - (2 marks)
- Quality of posts and attractiveness of site. Usage of fonts, links, images, pdf files, tables etc.
    - (3 marks)

Q2

- Classify 10 different animals. Appropriate modification of the source code and working solution.
    - (5 marks)
- Good explanations, graphs, and images. Good analysis and explanation of t-SNE and Confusion matrices.
    - (5 marks)

Q3

- This question is treated as a Research Problem. It should be documented as a Jupyter notebook and converted to pdf. Marking of this question will be somewhat harder than Q1 and Q2, so this is where you should put in the effort to get good overall results. I really want one of you to win the Kaggle competition.
- Classify real vs fake images. Appropriate discussion and approach. Implementation and evaluation of several methods and architectures. Notebook coding quality, ease of reading text.
    - (10 marks)
- Explanation justifying different architecture choices, Evaluation of the work of others. Recent literature search analysis. List of references. Quality of citations.
    - (5 marks)