Murdoch University
Information Technology

ICT304 Tutorial 2

Due: Teaching Week 5– Submit the tutorial to your tutor during your tutorial session in week 5. External students will need to upload the answers to LMS and an interview session may be arranged by your tutor.

Note:

- You must provide answers and discussions in a PowerPoint file, which must be self-explanatory. You may be asked by your lecturer/tutor to present your answers during your tutorial session.
- You need to provide references to the sources used to answer your questions. Visit the library website to learn how to do proper referencing. See https://www.murdoch.edu.au/library/support/referencing-guides
- If the question requires you to describe the installation steps, the code, or the program, you may also need to demonstrate them to your lecturer/tutor.
- **You are discouraged from using AI tools like ChatGPT to answer your questions, and if you use such tools, you must declare or reference the part that you use them. See https://libguides.murdoch.edu.au/APA/generativeAI for information on how to make reference to it.**

Tutorials:

1) What are the different types of data representation in Machine Learning?

2) Provide at least three common ways of scaling your data for Machine Learning techniques. Explain clearly how these scaling methods can be used. Highlight any advantages and disadvantages of these scaling methods, and illustrate with examples.

3) What are pre-trained networks for image processing and text processing? List and explain at least 2 for each (i.e. 2 for image processing and 2 for text processing). Use these to explain the concept of embeddings.

4) Using a pre-trained network that you have found from question 3, develop an object detection module such that it can be used later in a security system. The security system can be used to detect if there are any hazardous objects in an image.

   Take care of the following when providing the answers to this question.

   a) Using a ML learning or system engineering development cycle to explain the steps in developing the prototype.
   b) Provide the steps of installing the environment and packages for setting up such an object detection module. The steps have to be clear enough for someone to set up the development environment and train the model.
   c) Provide steps in training, validating, and testing your object detection sub-system.

d) Describe any pre-processing required and explain why they are necessary. If none is required, explain why pre-processing is not required.
e) List the type of objects that your system can detect.
f) What is the performance metric used to assess the capability of your developed sub-system?
g) How do you evaluate your sub-system?
h) Provide a video capturing the functions of your sub-system. And illustrate how a user can use the module.

5) Provide answers for the following.

a) Explain what class imbalance problem is and describe at least two approaches on how this can be handled. Is there any sampling method you will use to develop the ML system if the data has such problem?

b) Explain how data augmentation can be used and describe how this can use to enhance the ML development.

c) How do you deal with missing data problems.

6) Discuss the progress of your assignment with your tutor.