# AINT515 and AINT515Z
# Coursework

## Assignment Brief

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| Assignment Title: | Artificial Vision and Deep Learning Coursework |
| Submission Deadlines: | 2nd May 2024, 16:00 |
| Submission: | Online (DLE) |
| Contribution to Module Grade: | 50% |
| Individual/Group Assignment: | Individual |
| Module: | AINT515 and AINT515Z |
| Module Leader: | Dr Dena Bazazian |

## Requirements

This assignment consists of 2 sections, you need to write up a technical report to cover both sections. A short sample of the writing of a report can be found in DLE/AINT515/Module Information.

### Section 1:

For the first section, you are required to recognize the droplets from a video using computer vision algorithms that is taken by a high-speed camera during the droplet 3D printing process.
Find below for the detailed tasks of the topic you need to follow, indicative effort in brackets:

1. You will need to recognize the inner droplet (25%).
2. You will need to recognize the outer wrap (25%).
3. You will need to count for all the successfully formed droplets (25%).
4. You will need to do centre of mass/blob detection (25%).

### Section 2:

The second section is related to NN (Neural Network) tasks, designing a Convolutional Neural Network (CNN) architecture trained by the CIFAR-10 dataset, to classify the CIFAR-10 test images with higher accuracy than the network in Practical 9. The changes that you can apply to improve the performance of the network can be as below but are not limited to them.

1. Different optimisers, different learning rates and a different number of epochs to check the performance of the model.
2. Different designs of convolution layers and activation functions, then

modify the architecture to improve the performance of the model by adding different layers and changing the hyperparameters.
3. Explore the classes which are defined as wrong classes according to the confusion matrix and find how you can build the model to have a better prediction of these classes.
4. Apply data augmentation techniques to see if the training can improve.
5. Check the performance with and without batch normalisation or drop-out.

You will need to write a technical report for this with the following items:

1. demonstration of its theoretical contents, math, etc. (25%);
2. analysis in what situation, the system has the best recognition performance by adjusting the parameters (25%);
3. compare your designing with the one in Practical 9 (Implementing a CNN trained by the CIFAR-10), and write down the critical analysis for it (25%);
4. the architecture should be designed with convolutional layers, you need to assure the model accuracy is over 80% and the successful recognition rate is 80% at the least (25%).

## Marking Criteria

Your technical report will be marked based on the following criteria and weights:

1. Video/demonstration (submitted with your report) [15 marks]
2. Writing: description of the methods you used, theory on code implementation, use of English, Figures and Reference [30 marks]
3. Mathematics: math equations will be your model of the system, math in your coding & report needs to be both used and presented correctly [30 marks]
4. Source Code: quality, extent, and commentary [25 marks]

## Deadline and Submission

The deadline information for submission is on the AINT515 DLE page via the submission link.

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## Plagiarism

This is an **individual** assignment and must reflect the work of that individual. Thus, while you may discuss this assignment in general with your colleagues and give each other technical help, your scientific literature review must be entirely your own work.

**The University treats plagiarism very seriously. If you cannot satisfy me that your work is your own, formal plagiarism procedures will be started.**

The penalty for submitting work which is wholly or partially the work of someone else is usually, at least, a mark of zero for the assignment. Do not be tempted to help a colleague by giving them your work, as both parties will be guilty of an assessment offence, and both face the risk of a zero mark. Please refer to your student handbook for guidance as to what constitutes original/individual work.

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## Module Learning Outcomes Assessed

- **ALO-1:** Demonstrate a systematic understanding of the underpinning vision theories and techniques applicable in object recognition.
- **ALO-2:** A critical evaluation of current research and methods in artificial vision.
- **ALO-3**: Design and implement an original practical vision system.