

Assignment Brief

Submission Deadline	Marks and Feedback
Before 10am on: Sat 01/04/2023 (week 6)	20 working days after deadline (L4, 5 and 7) 15 working days after deadline (L6) 10 working days after deadline (block delivery)



Submit assignment



Marks and feedback

Unit title & code	CIS006-2: Concepts and Technologies of Artificial Intelligence
Assignment number and title	Assignment 1: Design of Machine Learning Solution for Biometric Recognition Task
Assessment type	WR
Weighting of assessment	50%
Unit learning outcomes	<ol style="list-style-type: none">1. Demonstrate results of using an established AI technique which is capable of finding a solution to a given AI problem represented by a data set2. Identify the cases of correct and incorrect outcomes generated by the technique on the given data set3. Evaluate the accuracy of the technique in terms of rates of correct outcomes



Completing Your Assignment

What am I required to do in this assignment?

Task

Students will develop a Machine Learning (ML) solution to solve a biometric recognition task with the highest recognition accuracy. The facial images are taken from real subjects in slightly different conditions, and so some images can be incorrectly recognised. This makes the ideal 100% accurate recognition difficult or even impossible. Students will design a ML solution providing the minimal recognition error.

Examples

Students who studied this unit have achieved excellent results in Biometric Face Recognition published as follows:

1. journal [paper](#)
2. conference [paper](#) in Springer [proceedings](#)
3. Springer book [chapter](#)
4. conference [paper](#)

Examples of previous assignment reports will also be discussed. Alternatively students can use other benchmark data available in the [Kaggle](#) subject area. For example students could be interested in early detection of bone pathologies in X-ray images, as described in a [paper](#) published in Scientific Reports.

Method and Technology

To achieve the minimum error, students will use ML techniques such as Artificial Neural Networks (ANNs) which can be implemented by using a new powerful programming platform [Google Colab](#) supporting languages related to ML. Alternatively advanced students can use other programming platforms using programming languages such as Python, MATLAB, or R. Advanced students can also be interested in a high performance ML technique such as Deep Learning, Convolutional Networks, and/or Gradient Boosting, demanded on the market. The Google Colab is a recommended platform, however advanced students can use other Integrated Development Environments eg [Spyder](#).

Project Data and Scripts

The project biometric data include facial images of 30 persons. Each person is represented by 50 images taken under different conditions. When students use Colab, the data zip [file](#) has to be uploaded to your [Google drive root](#). The project scripts [process_yale_images](#) and [classify_yale](#) have to be uploaded to your Colab project.

Individual Reports

Students will run individual experiments by using the project scripts on a benchmark data set. First students are expected to achieve the unit threshold requirements, and then they could develop work to a higher grade. A [template](#) for individual reports can be used. Exclude paste© to avoid plagiarism.

Is there a size limit?

2000 words on average

What do I need to do to pass? (Threshold Expectations from UIF)

1. Create a Colab project account (5%) [applicable for other IDEs]

2. Upload the project data and scripts (5%)
3. Run the project scripts to build an ANN on the data (10%)
4. Analyse and describe the ANN outcomes (22%)
5. Total to pass 42%

How do I produce high quality work that merits a good grade?

6. Identify a set of parameters required to be adjusted within an ANN technique in order to optimise the solution in terms of recognition accuracy
7. Explain how the ANN parameters influence the recognition accuracy
8. Run experiments in order to verify the solution on a data set
9. Analyse and compare the results of the experiments
10. For A grades (>70%), students could optionally make a 5-min recorded video demonstration of developed artefact (include a video link in the report Appendix)
11. For A+ grade (>75%) external examiners would like to see reports at a publishable level demonstrated in the above Examples Section

How does assignment relate to what we are doing in scheduled sessions?

Image Processing, ANN techniques, and use cases developed in Colab Python will be considered during lectures and tutorials



Marks and Feedback

How will my assignment be marked?

Your assignment be marked according to the threshold expectations and the criteria on the following page.

You can use them to evaluate your own work and estimate your grade before you submit.

#	Weight, %	Lower 2 nd – 50-59%	Upper 2 nd – 60-69%	1 st Class – 70%+
1	Analysis (30)	Fair analysis of the basic approaches	Relatively good analysis of the relevant literature, mainly covering the state-of-art	Excellent analysis of the relevant literature, fully covering the state-of-art
2	Design (40)	Fair design of a basic solution providing a reasonable performance within	Design of a solution providing a fair performance in a series of experiments	Design of a solution providing a performance, competitive to known from the literature, in a

		a single set of parameters	with different sets of parameters	series of experiments with different sets of parameters
3	Conclusion (30)	Fair conclusion on the experimental results obtained within a single set of parameters	Conclusion on and comparison of the experimental results obtained within two different sets of parameters	Conclusion on and comparison of the experimental results obtained within multiple sets of parameters, demonstrating a solution which provides a competitive performance