

# Assignment Brief

Submission Deadline	Marks and Feedback
Before 10am on: week 7 (Fri 20 March 2020)	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	<b>Assignment 1: Design of Machine Learning Solution for Biometric Recognition Task</b>
Assessment type	WR
Weighting of assessment	50%
Unit learning outcomes	<ol style="list-style-type: none"><li>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 set</li><li>2. Identify the cases of correct and incorrect outcomes generated by the technique on the given data set</li><li>3. Evaluate the accuracy of the technique in terms of rates of correct outcomes</li></ol>



## 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, capable of providing the highest recognition accuracy. The facial images are taken from real subjects in slightly different conditions, so that the images can be erroneously identified, that makes the ideal 100% accurate recognition difficult or even impossible. Students will design a ML solution providing the minimal biometric recognition errors.

### Examples

Students have achieved excellent results having published a [conference](#) paper and earlier a [journal](#) paper on Face Recognition in international proceedings and journals. Examples of previous assignment reports will also be discussed.

## Method and Technology

To achieve the minimum error cost, 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 many languages related to ML. Alternatively students can use another programming platform supporting a ML-related language such as Python, MATLAB, or R.

Advanced students can also be interested in using for this assignment high performance ML techniques such as Deep Learning, Convolutional Networks, and/or Gradient Boosting, demanded on the market.

## Project Data and Script

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.

Alternatively students can use other biometric data benchmarks which are available in a subject area using ML techniques.

## Individual Report

Students can work in groups or individually on the Assignment task. In both cases students will need to run individual experiments using the ANN project scripts on the given Biometric Data to meet the unit threshold requirements. Students can further develop their work to a higher grade. A [template](#) for individual reports can be used. A similarity level of submitted reports must be  $< 20\%$ .

### 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%)

2. Upload the project data and scripts to the account (5%)
3. Using Colab, run the project script to build an ANN on the data (10%)
4. Analyse and describe the ANN and script 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 which are 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 given image set
9. Analyse and compare the results of the experiments.
10. For A-grades (>72%), students will make a 10 min presentation of the developed artefact

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

Image Processing, ANN techniques and use cases developed in MATLAB 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 <sup>nd</sup> – 50-59%	Upper 2 <sup>nd</sup> – 60-69%	1 <sup>st</sup> Class – 70%+
1	Analysis (20)	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 (50)	Fair design of a basic solution providing a reasonable performance within	Design of a solution providing a fair performance in a series of experiments with different sets of parameters	Design of a solution providing a performance, competitive to known from the literature, in a series of

		a single set of parameters		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