Assignment Brief

Submission Deadline	Marks and Feedback
Before 10am on: **Tue 18/04/2023 (week 11)**	**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 2: Random Search Optimisation and Meta Learning**
Assessment type	WR
Weighting of assessment	50%
Unit learning outcomes	1. Identify and analyse efficient ways of solving a problem that requires to explore a large number of routes to find the best solution for a minimal number of steps 2. Justify results of using at least two AI techniques capable of finding an acceptable solution to the given problem 3. Evaluate and compare the performances of the techniques in terms of the number of steps required for finding a solution to the problem

✒ Completing Your Assignment

What am I required to do in this assignment?

Task

Students will use one or more strategies such as: (1) Random Search, (2) Meta Learning, (3) Adaptive Boosting, or (4) Cascade Correlation to optimise the structure and parameters of Artificial Neural Networks (ANNs) on a given benchmark problem. Such optimisation is required to maximise the recognition accuracy of ANNs designed for solving biometric tasks. In practice the optimal structure and parameters of ANNs are difficult to find because of the needs of multiple experiments with the different numbers of principal components, hidden neurons, learning rate, and types of gradient algorithms.

COVID related alternatives

There are alternatives which students can find interesting within the unit scope.

Method and Technology

Students will attempt to optimise ANNs which were manually designed in Assignment 1. To achieve the goal, students will apply one or more optimisation strategies with different parameters. The following examples: (i) Random Search, (ii) Meta Learning, (iii) Adaptive Boosting as well as (iv) MATLAB search strategies which are discussed in the unit tutorials. Advanced students can use Python, MATLAB, or R to optimise Deep Learning, Convolutional Networks, or Conventional ANNs. The 2nd assignment is an extension of the 1st and so they are dependent and could be compared on the same data. The above listed strategies are new approaches to the optimisation task, supported by many other online tutorials.

Example of Optimisation Solution

An example of an ANN optimisation in MATLAB is presented by a conference paper published by the Computer Science students in Springer proceedings. Other solutions will be discussed.

Evaluation

Group managers will rank individual solutions within their groups. The designed solutions will be evaluated on a validation/test data set in terms of the recognition accuracy. Individual members will describe and explain their experiments with different parameters of optimisation methods.

Reports

Similar to Assignment 1, students will describe their experiments in individual reports to be submitted via BREO. A report template could be recommended. A similarity level of reports will be evaluated via BREO Turnitin.

Is there a size limit?

2000 words on average

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

Google Colab is a recommended platform, however advanced students can use other development environments
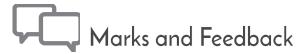
1. Identify one or more parameters of an optimisation strategy which can be implemented (15%)
2. Demonstrate the results obtained with a chosen optimisation strategy (15%)
3. Describe the main factors which influence the recognition accuracy (12%)
4. In total 42% to pass

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

5. Find a set of parameters required within an optimisation strategy
6. Explain how the optimisation parameters influence the results
7. Run experiments in order to verify a designed solution on a data benchmark
8. Analyse and compare the results of experiments with different optimisation parameters
9. Compare the accuracy between the 1st and 2nd assignments using the same data and an advanced technique
10. Describe how to improve the 1st assignment by using a search optimisation or other technique
11. Students could optionally record a 5-min video demonstration of developed artefact (and then include a video link in the appendix to report)

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

Search and Optimisation algorithms as well as use cases 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 2nd – 50-59%	Upper 2nd – 60-69%	1st 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 a single set of parameters	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 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