Faculty of Technology – Course work Specification

Module name:	**Artificial Neural Networks**		
Module code:	**IMAT5235**		
Title of the Assignment:	A neural network model for detecting intrusions or attacks on a computer network		
This coursework item is: (delete as appropriate)	Summative		
This summative coursework will be marked anonymously	Yes		
The learning outcomes that are assessed by this coursework are: 1. Experience creating an ANN to solve a intrusion attack problems 2. Experience pre-processing large data sets 3. Experience using Matlab 4. Experience using different ANN algorithms implemented in Matlab using the ANN tool box.			
This coursework is: (delete as appropriate)	Individual		
If other or a mixed ... explain here:			
This coursework constitutes 70 % **to the overall module mark.**			
Date Set:	**Pending**		
Date & Time Due:	**Pending**		
The 'normal' coursework return date for this work is:			
When completed you are required to submit your coursework to: 1. Blackboard Turnitin			
Late submission of coursework policy: Late submissions will be processed in accordance with current University regulations which state: *"the time period during which a student may submit a piece of work late without authorisation and have the work capped at 40% if passed is **14 calendar days**. Work submitted unauthorised more than 14 calendar days after the original submission date will receive a mark of 0%. These regulations apply to a student's first attempt at coursework. Work submitted late without authorisation which constitutes reassessment of a previously failed piece of coursework will always receive a mark of 0%."*			
Academic Offences and Bad Academic Practices: These include plagiarism, cheating, collusion, copying work and reuse of your own work, poor referencing or the passing off of somebody else's ideas as your own. If you are in any doubt about what constitutes an academic offence or bad academic practice you must check with your tutor. Further information is available at: http://www.dmu.ac.uk/dmu-students/the-student-gateway/academic-support-office/academic-offences.aspx and http://www.dmu.ac.uk/dmu-students/the-student-gateway/academic-support-office/bad-academic-practice.aspx			
Tasks to be undertaken: The aim of this project is to develop and test a neural network model to be able to detect network intrusions. The neural network model should be capable of distinguishing between ``bad'' connections, called intrusions or attacks, and ``good'' normal connections. In order to develop this neural network model, you will use the KDD Cup 1999 Data set (http://kdd.ics.uci.edu/databases/kddcup99/kddcup99.html) which was used for The Third International Knowledge Discovery and Data Mining Tools Competition. The database contains several intrusions simulated in a military network environment.			

In order to simplify things, the construction of the neural network model will be based entirely (training and testing) on kddcup.data_10_percent.gz data subset which contains a dataset sample of only 10 % of the entire dataset.

The web-link above contains all the dataset descriptions and details in terms of inputs an outputs.

Task
You have a number of tasks:

- Grab the data set kddcup.data_10_percent.gz from the web site to produce a data set for training and testing your neural network.

- Split the available data sets for training and testing the neural network. It is up to you to decide how many of the inputs are needed as well as how much data is needed to construct the neural network (training and testing data sets). You might wish to use cross validation.

- Train and test a neural network that can identify good and bad connections (intrusion or attack).

We will be looking for:

- Sensible manipulation of the data.
- Sensible choice of training and test data.
- Appropriate choice of network topology.
- Careful thought about the various design parameters for a neural network.

Deliverables to be submitted for assessment:
We will be looking for the following:

Deliverable 1:
Executive Summary
You will write a single A4 sheet (**one single side page only**) executive report (Please see: https://unilearning.uow.edu.au/report/4bi1.html for examples of executive summaries) with the main highlights of the implementation. This can include the main novelties and a summary of the results.

Deliverable 2:
Some thought has gone into how to use the data for training. You should show that you have thought about the topology of the networks (inputs, hidden units, and hidden layers). You should have thought about what data to use for which purpose – training, testing etc, and the data transformation techniques used.

Deliverable 3:
Viva and demo of the system
As part of the deliverables, you are also required to give a power point based presentation of 15 minutes shown the main results obtained with your neural network model. Following the presentation, there will be 15 minutes for questions and an actual demonstration.
IMPORTANT: This viva is * COMPULSORY *** and will be worth 10 points of your final mark**. The remaining 60 points will come from the results and the report for a total of

70 points. Highlighting of the main contributions will also be required. Distance learners need to be prepared to do your demo using Skype. Time slots will be specified near the time. My Skype user name is: **david.elizondo**

How the work will be marked:

A- An excellent, well-written report that is well structured and makes an interesting read. You will have explored the data in a number of ways and have neural networks that perform well. You have analysed the performance of the networks and presented the results in an interesting and sound way.

B - A well-written report that is well structured and an interesting read. You have neural networks that perform well on the data and you have analysed their performance. You have exhibited some initiative in the approach taken and the results are presented clearly.

C- A reasonable report that presents an account of the approach taken and the trained neural networks for the data. The neural networks perform well and the results are presented reasonably clearly.

D **- A report that presents some results of trained neural networks for the data.**

F **- Either no report submitted or a report that shows little or no understanding of how to train neural networks.**

Module leader/tutor name:	**Prof David Elizondo**
Contact details:	**elizondo@dmu.ac.uk**

Extensions: Please read the regulations for extensions. ONLY IF you believe that you fall into any of the criteria, please send me an email clearly highlighting the criteria that justifies an extension.

What constitutes acceptable grounds for extension, and, more importantly, what does not.

The student regulations give a range of **acceptable** grounds, and these can be found at this link

http://www.dmu.ac.uk/dmu-students/the-student-gateway/academic-support-office/deferral-of-assessments.aspx

The link also indicates that third-party evidence will normally be required.

In particular, these are examples of grounds that are considered **unacceptable** grounds for granting an extension:

- Failure of technical media resulting in lost files, this includes hard disk crashes, memory stick failure, memory stick loss, virus attack on a computer. As users of technology, students should make regular backups of all their work; their account on the DMU network is a good place to store files as they are backed up by the server network automatically
- Several assignments all being due in at the same time; students should plan their time around all their assessment deadlines

There are two other points to bear in mind:

- If there is some technical incident that applies to the whole module or class, then the module leader could and should take some appropriate action, for example extend the deadline for all the students
- If there are relevant local rules in programme handbooks, then that should also be taken into account