
Coursework commentary

2017–2018

CO3311 Neural networks

Coursework assignment 2

General remarks

On the whole coursework assignment 2 was well answered, with a majority of students gaining very good or excellent marks. However, it was disappointing to see a number of students choose not to answer both questions. Leaving out a question is a guarantee of losing a significant number of marks. The average mark for each section was around 60%.

Comments on specific questions

Question 1

One of the aims of Question 1 is to give students an understanding of some of the many measures that are used to evaluate the training of an artificial neural network. Of course, this is a huge and important topic. Some information on this was given in the course guide but there is much more to it than we had space and time to summarise. Even in this coursework assignment we can only scratch the surface of this vital subject.

There has been much hype and many overblown claims about the success of artificial neural networks. In order to train an ANN we need to have a robust way of evaluating how well it has trained and how well it does at its task.

Students were required to summarise the measures that are used to evaluate the training of an artificial neural network, in about 1000 words. Students should understand that when a word count is given it should be used as a guide to depth and detail of answer required. Some weak answers were given in less than 500 words. Whilst meeting the exact word count is not important, it is unlikely that an answer much shorter than the suggested length can cover the topic in the required depth.

Students were given six headings under which to write their summary. A surprising number chose not to use these headings but instead chose to give a much less structured response. Although marks are given for the content as presented, it is much easier for examiners to award marks where they can see a clear correspondence with the demands of a question.

Students were asked to use the databases of academic papers made available to them through the University's library as well as Google Books and Google Scholar. In order to separate the marketing hype from well-founded research results it is important that students check the provenance of their sources, and the ones suggested are easier to check. Some students place too much reliance on marketing information as sources.

The six headings were: a) Introduction b) The need for evaluation techniques, c) The main requirements for convergence criteria, d) The pros and cons of major evaluation measures, e) Conclusions and f) References.

For the introduction, good answers set the scene, giving an indication of the wide range of ANN applications as well as the range of ANN types.

The need for evaluation techniques varies widely: for example, legal, financial and safety issues might demand certain reliability constraints. Good answers covered each of these whilst some weaker ones even omitted this section altogether.

In order to choose a suitable measure, the main requirements for convergence criteria need to be ascertained. Sometimes we are looking for ‘ball park’ predictions from our ANNs whilst at other times some certainty is needed. Questions such as the relative ‘costs’ of false positives and false negatives need to be answered. Good answers explored these issues.

Only once we have explored these issues can we move on to look at the pros and cons of major evaluation measures. Good answers started with the naïve measures given in the guide and went on to more technical and specialised measures in detail. Weaker answers merely listed some of the more common measures.

Answers to questions of this type should always end with a short conclusion, summarising the main findings of the reading done by students. Good answers covered all the major points made, whilst weaker ones omitted important points or introduced new material.

Last, but by no means least, whenever a literature-based question such as this is answered, a full list of sources should be included. It is our convention to use the Harvard system and students should use this for both referencing and citation. Weak answers in this respect either omitted a references section or were sloppy with the style. Whilst this is not a great problem in itself, it may leave the reader wondering if similar sloppiness applies to the rest of the work.

It is very difficult to fully appreciate the application of ANNs without having actually attempted one. Whilst students do not have the time (nor perhaps the expertise) to do this at full scale, Question 2 gives them a taster on a very small example.

Question 2

It was disappointing to see a number of students who chose not to submit answers to this part of the coursework assignment. By doing so, they lost marks and probably missed an important part of their learning.

A set of data was given, and students were to train a number of Kohonen-Grossberg networks (with no Grossberg layer) with this data. The exercise was to see how well (or otherwise) the data could be classified by sequences of networks which either added or removed units from a previous run.

Students could use Excel, or a tool of their choice to implement a Kohonen network which was to have up to five units. This was to be made flexible so that units can be added and subtracted easily. Most students used Excel as this was a simple exercise, but some chose other means which were also successful.

Given the contents of Question 1 of this coursework assignment, it was disappointing that some chose not to use similar evaluation techniques in this work.

One instruction read ‘You may include more columns for measures of error if you wish, but make sure that you give an explanation of all of the measures that you use.’ This was included to encourage students to think about the experiments, and perhaps come up with something novel themselves. Unfortunately, few took this opportunity.

As in Question 1, instructions were given about the format of the answer to be handed in. Again, an introduction summarising the work would

have been nice and a few students produced this. A discussion of the error measurements, and in particular how these relate to the progress of the ANN in classifying the data was also expected. Good answers included a graphical representation of progress. Such representations help in our understanding of what is going on.

Another essential item is a description of the way the networks were implemented, sufficient to enable others to duplicate the work. Programs or spreadsheets alone are not sufficient. An account of both the strategy and tactics is needed.

Few answers referred to sources other than the course material. Good answers showed that some students looked at write-ups of published works for inspiration.

In questions such as those in these coursework assignments, we are not looking for particular answers but for the approach taken by students and the quality of their reporting of it. Results, analysis and conclusions are important as they indicate the student's understanding of the behaviour of ANNs and how they might behave in differing circumstances.

The average mark on this question was also around 60%. Sections on analysis and on conclusions received fewer average marks than the program and results section. Students need some practice writing up their work – especially if they are to go on to CO3320.