Coursework commentaries 2015–16

CO3311 Neural networks

Coursework assignment 1

General remarks

This year's coursework assignment, as is often the case, had two main aims, covering both theory and practice. Question one aims to get students to read more about neural networks, and to look at the latest applications that are affecting or about to affect our lives. Such reading also brings students closer to understanding the real scale and complexities of applications of artificial neural networks. A compact subject guide cannot hope to cover the latest applications nor can practical work substitute for reading about large scale attempts to make useful applications. Question two aims to give students some experience in working with neural networks and how they might behave, albeit in very simplified circumstances.

Comments on specific questions

Question 1

Part a) required students to summarise a short article in about 50 words (Gigaom 2014, https://gigaom.com/2014/11/18/google-stanford-build-hybrid-neural-networks-that-can-explain-photos/). The 50 word limit was intended to encourage students to extract just the essential information from the article which had around 500 words on the topic. Deciding what is essential should, by stage three, be a reasonably easy task but the key is that it needs to be focussed on neural networks, not on headlines. There were some good answers to this part of the question which got to the point and omitted the extraneous material from the article.

The rest of the question asked students to review the literature on understanding photos. Good answers were structured with an introduction, a main section divided appropriately into paragraphs, some conclusions, in-text citation and a list of references in the Harvard format. The introduction is important in setting the scene; the importance and usefulness of understanding images and setting a historical context. The main section, in good answers, looked at how the shortcomings of past attempts have been overcome and what new tools and techniques have been developed to do this. The final conclusion section of good answers took a view on how likely and how long it might be before human performance is matched or indeed exceeded by machines.

Good answers also included images and diagrams, properly labelled and cited, and might also include headings separating out the parts of the review.

Poor answers took too general a view, talked little about the neural network technologies and lacked the technical details asked for in the question. An important issue with many weak answers is that of excessive use of verbatim material (sometimes lacking quotation and/or citation, despite reminders about how to avoid plagiarism). As a general rule,

authors should only be quoted verbatim if their actual choice of words is important. This should be done sparingly as normally it is the meaning that is important, and this should be conveyed in the candidate's own words. Use your reading to build your own analysis and arguments.

Question 2

This question aimed to have students explore the input output relationships possible using simple networks of sigmoidal units. The coursework considered a sequence of increasingly powerful networks building up slowly in complexity.

For part a) the output of a single input sigmoidal unit was to be plotted as its input varies from -1 to 1. A set of input weights was given so that the effect of this on output could easily be seen.

Good answers commented on how output varies with weights as well as with bias. Very good answers used 3D graphs to show this pictorially and commented on their form. Poor answers just produced the graphs with little comment and sometimes omitted labelling of axes. In the worst cases, it was not always clear what was being plotted!

Another input was added for part b) and students were asked to describe what differences, if any, this made. Good answers used interesting graphs to represent the results and related these results to the equation of net and activation as a function of inputs and weights. Poor answers merely stated results with little or no comment.

Instead of adding another input, part c) required one unit to be used as input to another. Again, good answers included some detailed explanation of how the output is derived – not just formulae but explanation. One complication in this two-unit case is that there are now four variables, two weights and two biases. This makes it harder to illustrate, but good answers made an attempt at drawing graphs showing behaviour in a number of cases.

The final part, d), concerned a three-unit two-input network with two hidden units. Students were not penalised for not completing this part fully but what was looked for was a systematic attempt, good recording of methods and results and some attempt at reconciling what was found with what was being done. Good answers did this in a systematic way and gave a number of ways of representing the results.

One common shortcoming of the answers for this question relates to the instructions: 'Write up your experiments carefully so that they could be reproduced by your readers'. Many submissions lacked sufficient detail to enable examiners to give high marks on this criterion.

Good answers to question two showed that students had looked for advice on writing up in the module materials, and followed it. Use of the Harvard system for references and citations was requested but not always observed.