University of the Witwatersrand
School of Computer Science and Applied Mathematics
COMS4054A & COMS7062A & COMS7066A:
Natural Language Processing
Lab 2 (Convolutional Neural Networks)

1 Instructions

For this lab you will be implementing the convolutional neural network (CNN) discussed in the lecture. You may work in groups of two or three people. The topic which we will be experimenting on this time is architectural design and the effect of considering more words at once. To complete the base version of the lab you must:

1. Read in a corpus of text either from a text file (we will be using the Harry Potter books again).
2. Split the text by whitespace and remove punctuation so that only the words are left.
3. Use your encoder from Lab 1 to embed the words into an embedding space.
4. Train a CNN classifier to predict which book a given page of HP comes from when given the embedded text.

You may use as many pages from each book as you like to build your classifier (since this is a lot of data), but your accuracy will be taken into account for successfully completing the lab. You must implement the CNN yourself but may use libraries such as PyTorch, Jax and Keras (Tensorflow) to implement the network.

For this lab we will be discussing the broad topic of architectural design and how it affects the receptive field of the model. Some example sub-topics may be:

1. How does adding and additional layer to the network affect performance?
2. How does increasing the width of the kernels affect the performance of the model?
3. What happens when we also train the embedding layer as part of the architecture?
4. What happens when we also fine tune the word2vec embedding layer as part of the architecture?

Essentially any meaningful deviation from the base implementation which may lead to some insight into the working of the model and the CNN receptive fields. You will need to explore one such sub-topics. The purpose is not to make a large breakthrough in our understandings of CNNs but rather to run a small controlled experiment and evaluate the results well. So the use of interpretability techniques is recommended over aiming to run a bunch of very general experiments. Please ensure that you have added your group to the google sheet and you are welcome to propose your own sub-topic on this sheet. Anyone with a blank sub-topic after one week from the lab being released will be allocated one (there's no penalty for not suggesting your own one). Suggested sub-topics are not final and I may still change your sub-topic but I will do my best to not be prescriptive.

You will also be expected to write a one-page (double column) report on the topic you covered (a second page may be used for figures, tables, your contribution statement and references). Please use the IEEE format for this. Please see the rubric below for more details on what should be included in the write-up. This write-up should focus on your methodology, results and insight for your particular topic. Naturally there will be overlap in what is written by each group, however, your aim should be to spend as much time discussing decisions or results for your particular setting.

2 Submission

Due Date: 4 September 2024 at 18:00.

For the submission you may work in pairs. You will be required to:

1. Submit your full code implementation (in a single file called "nbc.py").
2. Submit a one-page report which includes a small statement on the contribution of each person if you worked in pairs. This must be completed on a new paragraph.

Table 1 shows the rubric which will be used to assess your write-up and discussion. Once again, negative marking will be used for poor formatting and language, and false statements. See the comment on ChatGPT below for more one this.

3 On the Use of ChatGPT

These labs do not count much individually for the course, and yet they are crucial to understand the material and prepare for other assessments. Thus, I urge you to take them seriously and engage with the material. I am aware though that there is an incentive to just complete these labs as quickly as possible which would result in the use of generative tools to speed up the process. This is an NLP course though and the use of ChatGPT-like software is at least a learnable experience for us. Thus, you are welcome to use generative models for the written portion of these assessments. However, greater emphasis will now be placed on the factual correctness of what is said and the degree of insight which is shown in the write-ups. If I detect something resembling a clear "hallucination" (a generative model making up facts) you will receive 0. Negative marking will also be implemented for poor writing or formatting and incorrect information or incoherent reasoning. You will also receive less marks for extremely generic facts or information. The strategy then is to use these tools to get started but then add insight in afterwards - particularly insight directed towards the sub-topic that you are investigating. Equally, clever prompt-engineering will likely go a long way here. Appropriate use of both strategies will be rewarded. Similarly, using generative models to help you code is fine but the usual plagiarism rules for the school remain (it is not tolerated).

Table 1: Rubric for Lab 2

Mode	0% to 20%	20% to 40%	40% to 60%	60% to 80%	80% to 100%
Write-up Structure (10%) [Negative Marking]	Adequate use of language and structure. Text in paragraphs and does not go over page limit.	Fair use of language and structure. Paragraphs, appropriate tone and within page limit.	Well written and clear. It is easy to understand the writing and one section leads naturally to the next.	Good use of language and structure. Good linking between sections, easily understood. Figures where appropriate with helpful captions.	Excellent use of language, very well written and structured. Helpful and clear figures with legible captions, labelling and legends.
Method (30%)	No clear description of the architecture, data or approach to training	Some description of high-level details	Fair description on the details of the base model but little elaboration of the approach to answering the sub-topic	Base approach is described in detail and steps are well justified. Adequate discussion on the approach to answering the sub-topic	Excellent description and motivation for all parts of the method including on how the sub-topic was answered
Results (30%)	Results are not given or irrelevant	Some results given with inappropriate metrics	General results presented with appropriate metrics	General and sub-topic results presented with appropriate metrics	Thorough results which are appropriate for answering the sub-topic and display the general correctness of the model
Discussion Section (30%)	No interpretation of results or incorrect interpretation. Little knowledge of the topic displayed	Some general interpretation of results broadly	Results are interpreted which display some understanding of the mechanics of the model. Displays a basic understanding of the topic	Results are interpreted and contextualized to begin to answer the sub-topic. Clear demonstration of knowledge of the general topic	Results are interpreted and contextualized to answer the sub-topic and display insight into the working of the model or original thought on the concepts