Exercise Sheet 10

Sequence Modeling: Recurrent and Recursive Nets

Deadline: 02.02.2021, 23:59

Instructions

Start with exercise 10.3, and if you have time, do exercises 10.1 and 10.2. You can submit your solution for exercise 10.3 in a separate pdf file or even share a link if you are using some online application. Choose the best format and make sure that I do not need to do anything extra to check your submission (signing up for an application/website is fine).

Question 10.1 was not covered during the lecture on 26.02, so you can either submit it by Wednesday 03.02.2021 23:59, or just search for the answer on Internet and prepare yourself for the lecture. There are plenty of resources, e.g. this article.

Exercises

Exercise 10.1 - Architecture (0.5 + 1.5 = 2 points)

 a) What is the benefit of an LSTM over RNN? Give a short explanation (2-4 sentences).

 b) Draw an LSTM cell and provide the formulas used to calculate each element. Explain the function of each element.

Exercise 10.2 - Embeddings (1 + 0.5 + 0.5 = 2 points)

To perform the following exercise you have to read an article about static and contextualized embeddings. Answer the following questions based on the article:

 a) Give short explanations of static and contextualized word embeddings. Provide examples.

 b) What are the advantages of contextualized (dynamic) word embeddings over static ones?

 c) What is transfer learning? On which task is a model (e.g. BERT) pre-trained? (**Hint:** read the article till the end) Can we pre-train without any task? Why / why not?

Answer the questions with your own words, provide your own examples where possible. Points will be subtracted if you just copy the text.

The article goes quite deep into detail about the internal structure of BERT, but it is not necessary for this exercise. However, try to understand what is the function of each block.

If you want to read more about embeddings, here are good sources:

- Neural Network Embeddings Explained

- Machine learning core course, chapter on embeddings

Exercise 10.3 - Exam Preparation (6 points)

Start preparing for the exam:
Go over all the chapters and create the structure of the course. You can do it in form of a mind map, bullet points structure etc., whatever format works better for you.
What means 'create structure':

- Write down the name of each chapter. You can formulate the name in your own way if you want: it should represent the contents of the chapter and make sense for you.

- Link chapters to each other. Make sure you understand why we need the information from each chapter. If you think that the order of the chapters is not ideal, reorder them.

- Go over the main concepts of each chapter, write them down. Do **not** go into details, stay on the **conceptual** level.

- Link the concepts to each other. Do not try to explain everything here; just make sure that you understand the importance of each concept and its place. Again, feel free to reorder information so that it makes sense to you.

- Work in a top-down manner: better cover all the chapters in less details than few chapters but very detailed.

If something is unclear after creating the diagram/mind map/etc., prepare your questions. During the tutorial we will try to cover most problematic areas. If more questions arise after submission deadline, you can post them in Teams, public or through personal messages, we will discuss them during the tutorial. Make sure to post your questions **before Thursday** so that I have time to prepare the tutorial.

Submission instructions

The following instructions are mandatory. If you are not following them, tutors can decide to not correct your exercise.

- You have to submit the solutions of this assignment sheet as a team of 2-3 students.

- Hand in a **single** PDF file with your solutions.

- Make sure to write the student Teams ID and the name of each member of your team on your submission.

- Your assignment solution must be uploaded by only **one** of your team members to the course website.

- If you have any trouble with the submission, contact your tutor **before** the deadline.