Exercise 5

Deadline: 10.01.2024, 16:00

Regulations

Create a PDF `project-ideas.pdf` with the description of your project topics. Make sure your names are clearly visible at the top of your PDF!

Zip all files into a single archive `ex05.zip` and upload this file to MaMPF before the given deadline. Moreover, please set your **Anzeigename/display name** and **Name in Uebungsgruppen/name in tutorials** in MaMPF to your real name, which should be identical to your name in `muesli` and make sure you **join the submission** of your team via the invitation code before the submission deadline. Check out `https://mampf.blog/handing-in-homework-assignments` for instructions.

Note: Even though you only will submit a single PDF, please zip it as described above as this makes the tutor workflow easier. Thank you!

1 Final Project Topics

In preparation for the final projects, this exercise asks you to come up with interesting topic proposals. **You should come up with as many proposals as the number of members of your team (i.e. two or three)**. This does not mean that each team member should come up with a proposal independently: all proposals should be the result of brainstorming and discussion within the whole group. The topics should be chosen such that they can be realistically addressed in the available time and resources, and you will have fun working on them.

1.1 Choosing Topics

Brainstorm for topics you would like to work on during your final mini-research project. Here are some ideas:

- Look at one of the major machine learning conferences and pick a paper you would like to replicate. These papers are freely accessible on the internet: NIPS/NeurIPS (`https://papers.nips.cc/`), ICLR (`https://openreview.net/group?id=ICLR.cc`), ICML (`https://icml.cc/`), ICCV/CVPR (for image analysis applications, `https://www.thecvf.com/?page_id=100`). To identify good papers, watch for interesting titles, best paper awards, positive coverage on twitter or in blogs, highly cited work etc.
- Alternatively, you may take the perspective of scientific applications and look into major conferences for different branches of scientific computing, e.g. MICCAI (`http://www.miccai.org/`) for medicine.
- Consult Kaggle (`https://www.kaggle.com/`) for interesting challenges.
- Ask people in our lab or in a research group/company you are in contact with.

Make sure that your proposals fit the lecture's topic – they should involve science and generative neural networks!

1.2 Writing Proposals

Your project proposals should use machine learning concepts, preferably from this semester's lecture (e.g. neural networks, Gaussian processes, graphical models, causality, even if some of it is still to come in the lecture). Write up a **description for each of your proposals** (at most one page per proposal) that covers at least the following points:

1. Which scientific questions do you want to answer, and why are they interesting?
2. Which relevant papers did you find? What are their pros and cons? Which among these papers do you propose to build upon, and why?
3. What methods will you try, and why do you consider them promising to answer the questions?
4. What will your data sources be? How large are the data sets and how high do you think the quality is? Can you use simulated data when real data is scarce?
5. What computational resources do you need (e.g. GPUs)? How will you get access to these? How much time will the computations need?
6. What difficulties do you anticipate in the project?

If your proposal is missing some of this crucial information, we may deduct points from your total. Feel free to add relevant information which is not present in this list.

In addition, keep in mind the following:

- You should have fun working on your project – propose topics you find really appealing.
- Don't choose projects whose solution can be downloaded from the internet. This is cheating!
- Your projects should neither be too easy nor too hard. Your team should be able to produce a reasonable solution within ≈ 90 hours per team member (equivalent to 3 ECTS).
- The same applies to hardware requirements: don't choose a project that needs hardware you don't have access to (e.g. lots of GPUs). On the other hand, you can often get free access to GPU power in the cloud. Google Colab (`https://colab.research.google.com/`) and Paperspace Gradient (`https://gradient.paperspace.com/`) are recommended, but other options include Kaggle (`https://www.kaggle.com/`), AWS (`https://aws.amazon.com/de/free/`) and CodaLab (`https://codalab.org/`).

The project descriptions will be judged (and graded) by how carefully you search for and reason about what is interesting and doable. Thus, picking the first thing that comes along will probably not be the most clever strategy.

1.3 Additional Information

If you wish to take part in the final project, you **must** complete this exercise sheet. You may also submit project proposals (and gain the points for this exercise sheet) even if you don't intend to take part in the final project.

After submitting this exercise, you will have a few days to provide self- and cross-feedback as usual. This gives you an opportunity to reflect on how your proposals could be improved as well as to see the proposals of another group. Then the tutors will grade your proposals and inform you which of your topic(s) we recommend to actually carry out in the final project. Finally, you will be asked to fill in a spreadsheet with your chosen project idea. From this point on you can start working on the project. The final project report will be due on **March 25, 2024**. An extension of up to two weeks may be granted in exceptional cases upon request to Prof. Köthe.