Final Project Instructions

Deep Learning • **COMP 647** • **Fall 2023**

Proposal Due: 11.59pm, November 19, 2023 (End of week 13)

Proposal Approved by Instructor: 11.59pm, November 22, 2023

(Optional) Final Project Presentation Due: 11.59pm, December 7, 2023

Final Project Report & Software Due: 11.59pm, December 10, 2023

The final project allows you to dig deeper and solve a problem using deep learning in which you might be interested. The final project is flexible and you may choose to pursue a variety of problems and possibilities. It is designed to give you a flavor of working collaboratively to develop software to solve a problem of your choosing. However, to ensure that the project fits within the scope of the course and the allotted time, you must obtain instructor approval for your project proposal. The project will be completed in teams of 4 (or occasionally 5) students.

Each student must work on some specific component of the project that fits into the overall project and the team must submit a report outlining a very brief literature review on the topic, the methods used to solve the problem, the results, and comparison with state-of-the-art methods, if available. You cannot choose problems that have been discussed in the contact sessions.

Your final project topic could be based on problems focusing on different areas, such as,

- the development of methods, e.g.,
    - optimization methods
    - activation functions
    - new layers
    - new types of units for specific applications, such as LSTM or GRU for sequential data
    - hyperparameter tuning
    - ...
- application domains, e.g.,
    - biomedical applications, such as, medical image analysis for a certain organ or disease
    - language models in general, such as extensions of BERT
    - language models for specific applications, such as BioBERT
    - recommender systems
    - clustering
    - specific computer vision applications, e.g., object recognition or tracking
    - specific applications at the intersection of computer vision and NLP, e.g., visual question-answering or image captioning
    - ...
- ethics, e.g.,
    - methods to discover and/or quantify ethical concerns with deep learning models w.r.t. to training data, biases, ...
    - methods to mitigate biases in deep learning models

– ...

- interpretation and explainability of models, e.g.,

  – layer-wise relevance propagation models

  – models focusing convolutional networks

  – methods for interpreting sequential models

  – ...

- particular types of model families or paradigms, e.g.,

  – types of GAN models

  – variational auto-encoder models

  – reinforcement learning models

  – ...

- ...

Note that this is, by no means, an exhaustive list of topics that you might select. You are encouraged to look into various theoretical and practical directions in deep learning research, brainstorm with your teammates, and decide on the topic.

The Proposal: The proposal should be a document of 250-400 words describing your chosen topic, possibly including the names of some models/architecture/methods that you are planning to apply or implement.

The Report: Reports should follow the two-column IEEE conference templates found here: `https://www.ieee.org/conferences/publishing/templates.html`. The report should be between 4-6 pages long with suitable additional references as needed. The report should briefly refer to prior work in the area with suitable references, describe the dataset and the problem/objectives, clearly outline the methods used and the results, along with comparison with state-of-the-art (if available).

Grading Rubrics:

1. **The Proposal (10 points)**: Does the proposal clearly convey the topic, the dataset, and a proposal of the methods? Does it clearly define the objectives or the problem statement that you are trying to solve?

2. **Communication (20 points)**: Is your report well-written? Is the grammar and spelling correct? Is the content organized in a coherent manner?

3. **Prior Work (10 points)**: Does your report clearly indicate prior work in the area or related areas? Does your report mention if you are using any of these methods or building your own method?

4. **Description of methods (30 points)**: Have the methods been described lucidly? Have the nuances/highlights of the methods been captured appropriately?

5. **Results (20 points)**: Are the results presented in a meaningful and understandable way? Have the results been compared to relevant state-of-the-art methods? Have the results and the shortcomings of the methods discussed appropriately in light of the methods used?

6. **Visual communication (10 points)**: Has there been appropriate use of figures, tables, and other means to visually communicate ideas? Are the figures of adequate resolution and readable at 100% scale?

Some tips for writing a good report:

- Avoid using first person as much as possible.

- Avoid using colloquial language.

- Check spelling and grammar.

- Decide on a citation style and follow it throughout.

- Do not write overly long paragraphs. Split long paragraphs into multiple meaningful paragraphs.

- Follow the style of published papers.

- Write the full form of an acronym when you use it for the first time.

- Cite the source for every algorithm, dataset, and method.

- All figures and tables must have self-explanatory captions.

- Figures and tables must be of adequate size and resolution to be easily understandable at 100% size.

- All the font sizes in figures must be of adequate size to be legible at 100% size.

- When directly using figures and/or tables from other papers, cite the source in the caption.