

EECS 595: Natural Language Processing

Fall 2021

Final Project Description

October 11, 2021

1 Introduction

This project provides you an opportunity to work on something that you are interested in. You can choose any topics related to natural language processing or the application of NLP techniques to your own research areas. You can choose to work by yourself, or with a team of *up to three members*. A team of *two people* is strongly recommended. The scope of the project must be proportional to the size of the team. For example, if your team has three people, then your project may have three different perspectives (e.g., approaches) to address the same problem and then you can compare and contrast. You need to show that there is an equal division of the effort and the overall scope of the project justifies the size of the team. ***If it's a team project, you need to include a brief statement in the proposal and the final report about the work division and responsibility of each team member.*** You are also free to use any available software or resources given that proper acknowledgment is provided.

2 Potential Topics

The ACL Anthology (<https://www.aclweb.org/anthology/>) makes available a large collection of research papers on various topics in NLP. As in most fields in Computer Science, for the NLP/Computational Linguistics community, the latest research advances are often first reported at conferences (although some of them may have appeared ahead of time as pre-prints, e.g., on arXiv). The conferences particularly relevant to this class include (but not limited to): the Annual Meeting of the Association for Computational Linguistics (ACL), the Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL), and the conference on Empirical Methods in Natural Language Processing (EMNLP). You are encouraged to explore these resources to identify the topic you would like to work on.

The following potential topics are for your reference only. When considering these topics, you are encouraged to think outside the box. For example, you can use the data made available for these topics to define some new interesting problems which are not traditionally approached with these data. You can also choose to work on the default topic illustrated below.

2.1 Semantic Evaluation (SemEval)

The Semantic Evaluation (SemEval) competitions have developed a collection of tasks and datasets to evaluate machines' ability in semantic processing. This ranges from lexical semantics such as

word sense disambiguation to sentence-level semantics such as semantic parsing. You can start with <https://en.wikipedia.org/wiki/SemEval> and browse through the SemEval competition each year (up to 2018). A number of tasks were defined for each competition, providing a range of interesting problems. Data for these tasks are often provided, as are the relevant papers. You will be able to compare your results with the published results.

2.2 Natural Language Inference Tasks

In the NLP community, recent years have seen a surge of research activities that address machines' ability to perform deep language understanding which goes beyond what is explicitly stated in text, rather relying on **inference and knowledge of the world**. Many benchmark datasets and tasks have been created to support the development and evaluation of such natural language inference ability. Please check out this survey paper of such datasets - Recent Advances in Natural Language Inference: A Survey of Benchmarks, Resources, and Approaches (<https://arxiv.org/abs/1904.01172>). If you are interested in these tasks, you can follow the paper and find relevant datasets. This survey paper will give you a starting point to explore different options.

2.3 Other Potential Topics

The Stanford NLP group has made many resources/tools available to the community. Besides those tools, you can also find some example final projects from their NLP class: <http://nlp.stanford.edu/courses/cs224n/>.

2.4 Default Topic: TRIP

If your group has no other ideas, you may use this as a default topic. Tiered Reasoning for Intuitive Physics (TRIP) is a new NLP dataset from the SLED Research Lab at UMich. It poses a multi-layered physical commonsense reasoning task where NLP systems must determine which of two stories (each describing a series of physical actions applied to household objects) is plausible. Further, they must justify their decision by identifying which sentences in the implausible story are conflicting with each other, and the specific physical state changes that cause the conflict. When we evaluate systems on this tiered prediction, baseline results are very low (only up to 10% of stories are classified correctly and verified with coherent supporting evidence). For this project, you may consider approaches to improve the baseline performance on TRIP. If interested in working on TRIP, you can find the pre-print at <https://arxiv.org/abs/2109.04947>, and the code and data at <https://github.com/sled-group/Verifiable-Coherent-NLU>.

3 Grading of the Project

The final project is counted for 40 points out of 100. It consists of the following components. It is your responsibility to make sure each component is delivered on time to receive a full point. If it's a team project, you only need to make one submission from one of the team members. **Please use the Groups feature on CANVAS to form your project team and submit all project deliverables.**

3.1 Project Proposal (15pts)

You need to submit a two page project proposal for approval. In your proposal, you should specify the following:

1. The problem you are trying to address.
2. The proposed approaches.
3. The data set that will be used.
4. Any previous work on this topic? Provide references.
5. The plan of implementing your approach and milestones for the rest of the semester.
6. The composition of the team and work division between team members.

The proposal is due on **November 3, 11:59pm EST**. The required length of the proposal is 2 pages regardless of team size.

3.2 Project Presentation (10pts)

You will present your project to the class on either **December 8** or **December 10**. The exact form of presentation will be determined around mid-November. After the presentation, you will need to submit the slides for the presentation by **December 10, 11:59pm EST**.

3.3 Project Final Report (15pts)

The final report of the project is due on **December 16, 11:59pm EST**. Including figures and references, the report must be at least 6 pages for a 1-person project, 9 pages for a 2-person project, and 11 pages for a 3-person project. Your report should include the following sections:

1. **Introduction:** The problem statement.
2. **Related Work**
3. **Approaches:** Detailed description of your approaches (note if you have multiple people on your team, multiple approaches are expected).
4. **Evaluation:** Comparison between different approaches, different configurations of your approaches. If baseline results are reported in published work, you should include that comparison too.
5. **Discussion** of your results and an overall comparison of the approaches.
6. **Conclusion**
7. **Division of Work** (only needed if it's a team project)
8. **References**

For a team project, it is expected everyone on the team contributes to the idea and implementation of the work as well as the writing of the report. You may jointly contribute to the Introduction and Related Work sections, however each member is expected to have their own sections reflecting their work, e.g., on the Approaches and Evaluation. The Discussion section can be a joint effort of an overall comparison and discussion. In the Division of Work section, every team needs to clearly state who contributes to what sections. Note that, depending on the effort, it is possible that individuals on the same team may receive different scores for the project.

The goal of the final project is for you to gain some hands-on experience in solving NLP problems. If the problem you choose to work on has been studied by previous work, do not worry if your results do not outperform the published results. You should elaborate what you have learned from this experience.

4 A Summary of Timeline

Please keep the following timeline in mind:

- Project proposal: due **November 3, 11:59pm**
- Project presentation: in class either **December 8** or **December 10**
- Presentation slides or posters: due **December 10 11:59pm**
- Project report: due **December 16 11:59pm**

5 Final Report Template

For both of your proposal and final report, you should use the ACL paper format. The templates (emnlp2021-latex.zip) are available in CANVAS (the **Final Project** directory).

6 Computing Resources

Google Colab could be an option for you to run large jobs, as it provides free GPU access. You may look into that at <https://colab.research.google.com/notebooks/welcome.ipynb>. Some helpful resources for using Colab are below:

- Justin Johnson provides a great Colab tutorial for his EECS 498 section: <https://web.eecs.umich.edu/~justincj/teaching/eecs498/FA2020/colab.html>. Some steps will not be relevant, and there is no need to import Python code from external files.
- Another beginner tutorial for Colab:
<https://www.marktechpost.com/2019/06/09/getting-started-with-pytorch-in-google-collab-with-free-gpu/>
- A starter notebook for using Colab with pre-trained transformer language models can be found here:
https://colab.research.google.com/drive/1Y4o3jh3ZH70t16mCd76vz_IxX23biCPP.

6.1 Need More?

Note, please do not use your Greatlake account for the final project as it's only budgeted for Homework4. You should use Colab for your final project. If you need more computing resources, please contact us. There is no guarantee but we may be able to help.