CS-552: Modern NLP
Project Description

Antoine Bosselut

EPFL

Context

- ChatGPT released in late 2022
- ChatGPT ingredients are things we were already going to cover in class:
  - Transformers
  - Pretrained Language models
  - Prompting, in-context learning, chain-of-thought reasoning
  - Model interpretability & explainability
  - Text generation: training with RL, evaluation

Context

- Wouldn’t it be fun if students could work with ChatGPT-like models for their class project?
- What would be an interesting setting to design these systems for?
- How could we fit the skills we want you to gain (fine-tuning, prompting, scale, evaluation, data, ethics) in this framework?

Build your own education assistant!

- **Course Project**: Build your own educational chatbot for EPFL courses
  - https://docs.google.com/document/d/1SY1HAfrpoj9B6FnO3LEChne4vdf1GOuswu-H7oUUt8A/
- Professors from over 100 courses on campus shared assessment materials from their courses
- TA staff for CS-552 (and researchers in the NLP Lab) prepared content from these courses into data that you can use for your project
- You'll use data from these courses as a starting to point to train education assistants!

Project: Three Stages

- **Collect demonstration data**
  - Training an educational assistant requires collecting of demonstrations for the task you want your chatbot to perform.
  - In the first part of the project, you'll distill these demonstrations from 100B-parameter scale LLMs.
- **Train a reward model**
  - To learn which demonstrations produced by your chatbot are better than others, you'll need a reward model that can score the demonstrations produced by your system
  - In the second stage, you'll train a reward a model that can accurately score good demonstrations relative to bad demonstrations
- **Train your chat engine**
  - In the third stage of the project, you'll use your supervised demonstrations and reward model to train your final educational assistant

Part 1: Planning, Lit Review, Data Collection

- Collect supervised fine-tuning data (i.e., demonstrations) for your chat assistant by distilling them from ChatGPT
  - Given ~100 questions from a course at EPFL
  - For each question, prompt ChatGPT to provide a suitable response
  - Explore different prompting methods for extracting suitable demonstrations
- Literature Review
  - Read about prompting methods and other related topics for the project
  - Each team member should submit a review of one paper
- Project plan for completing the other parts of the project over the next six weeks
  - Details in the project description

Part 2: Train a reward model

- Train a reward model to score the demonstrations produced by your system
- Organise a dataset for training this reward model
  - Use demonstrations you collected in Part 1
  - Use other sources of data
- Evaluate the quality of your reward model

Part 3: Train your chat assistant

- Fine-tune a generative pretrained language model (e.g., GPT2, BART, T5, etc.) so that it learns to produce better demonstrations when prompted with a question from your course.

- You should train your model using supervised learning on some of the data you have collected in the first two parts of your project.
  - This can be data you have distilled from ChatGPT or data you have collected from other sources.

- Use your reward function to evaluate the quality of the text generations produced by your model

- **Optional Bonus**: Use your reward model with RLHF to improve your assistant

Grading

- Milestone 1 (15%)
  - Collect first dataset of supervised demonstrations
  - Conduct literature review
  - Proposal for remainder of project
- Milestone 2 (15%)
  - Collect additional data from any source
  - Trained reward model
- Final code, data, report (30%)

Advising Policy

- Each team will be assigned a course TA to advise them over the course of your project
- When you have questions, you should first reach out to your supervisory TA before contacting other members of the course staff
- When you request it, your TA should make themselves available to you for discussion about the project during normal course hours
  - Wednesday, 9h - 12h; Thursday 13h - 16h
- If you (or they) are not available at that time, it is also possible to set an alternate time for an in-person or remote meeting.

Collaboration Policy

- You should work on this project in teams of three. All team members should contribute roughly equally to the submission.

- Grading breakdown:
  - The data collection and literature review of the first project milestone will be individually graded.
  - The project proposal, second milestone, and the final report will be graded for all team members.
  - With your final report, you should submit a Contributions statement (See project description).

- You may discuss your project with others in the course, though only the people on your team should contribute to the actual implementation and experimentation involved. You may build your work upon existing open-source codebases, but must clearly specify your team's contributions and how they differ from the pre-existing codebases in your reports.

Data Sharing

- In the NLP lab, we do research on large-scale LMs like ChatGPT, GPT-3/4, PaLM
- Teachers across campus (and Switzerland) have asked me:
  - “How could ChatGPT be used for my class?”
  - “Could it help us respond faster on discussion boards?”
  - “Could it provide study assistance to students for my course?”
  - “Could it teach students to be more critical about the answers they find online?”
- The data you’re going to collect for this project to train your educational assistants could be very interesting from a research perspective
- We’d like your permission to use the data you collect as part of this project for future research

Data Sharing

- Consent Form will be provided on Ed and here: https://docs.google.com/forms/d/e/1FAIpQLSeAYt5_2BjdHpqZh1VwKkprOiF0eYJzNKvKNjGdT1nY9AfEPw/viewform
- **Clarification:** permission to use data in the future will have **ZERO** bearing on your grade on the project and in the class
- Consent process will be managed by: Prof. Tanja Kaser, head of the Machine Learning for Education Lab
- **We will not see your decisions until after grades are entered**
- We hope you'll want to work with us, both in this, and on future research projects!

Next few days: Project Sign-ups

- **Today - Sunday:**
  - Look over the Project Description
  - Fill out team registration form
  - Fill out consent form
  - After filling out consent form, ML4ED will send API keys for accessing ChatGPT through GPTWrapper
  - Look for announcement to find GPTWrapper Package for access to ChatGPT
- **Sunday:**
  - Project packages released
  - API keys activated to provide access to ChatGPT