ECE 1786

Creative Applications of Natural Language Processing

Lecture 6 Part 2: Project Ideation & Approval & Proposal





Project Timeline and Deliverables

Date	Item
01-Oct	Project Discussion in Class - done
15-Oct	Team Forming Deadline – done
24-Oct	Approval-in-Principle due - form
04-Nov	Project Proposal Document Due
04-Nov	Project Proposal Slides Due
05-Nov/06-Nov	In-Class Proposal Present + Extra Class in Evening + Next Eve
18-Nov	Progress Report Due
04-Dec	Final Presentation Slides Due
03-Dec/04-Dec	Final Presentations + Extra Class in Evening + Next Eve
10-Dec	Final Report Due



Note on Extra Course Presentation Hours

- There are extra course hours for Proposal Presentations
 - There are **two extra** sessions: November 5 and 6
 - That is three total sessions:
 - Nov 5: 9-11 (OISE 2212) and 6pm-9pm (BA 1160); Nov 6 6-9pm (Medical Sciences 2172)
- You'll present during one of these sessions
- You'll be doing a peer review in another session
 - I'd like everyone to see many of the presentations;
- So, be sure you're available 6pm-9pm Nov 5 and November 6; let me know if not
 - Bring food in the evening!



Project Ideas: from Yourself



Your Own Ideas

- What do you care about?
 - Peace, happiness, success, health?
- What makes you happy?
 - Maybe humour
- Humour often comes from language
 - Jokes
 - Joke generation; perhaps in one or more specific genres
 - Joke classification
 - Generation of funny stories; how to stimulate latest models to produce humour?



Ideas from Internet



Internet

- Stanford CS 224n Natural Language Processing with Deep Learning
 - <u>https://web.stanford.edu/class/cs224n/project.html</u>
 - Multiple years
 - More research-oriented, but plenty of applications too
 - Look at previous year's projects for inspiration:
 - <u>https://www.eecg.utoronto.ca/~jayar/ece1786.2022/</u>
 - <u>https://www.eecg.utoronto.ca/~jayar/ece1786.2023/</u>



Some Curated Ideas

From Researcher and TAs



From Dr. Kieran Quinn

- Researcher at Mt. Sinai who does clinical trials of new drugs, and new uses of drugs
- Clinical Trials require the recruitment of people who need to consent to be in the trial
 - There could be danger, and so proper consent is important
- In some consent documents, the participant is presented with a document and asked to click 'consent'
 - This is problematic why? People won't read it.
- Next slides are Dr. Quinn's ideas of things a multi-agent LLM might do, in a Class-2 type project



Identification & Recruitment of Participants for a Clinical Trial

- Design a LLM that acts as a research coordinator (RC) and assists in identifying and recruiting eligible participants for a clinical trial.
- Your RC model should be able to identify eligible participants from a synthetic dataset to simulate real-world recruitment scenarios using a defined set of inclusion and exclusion criteria.
- You will also develop a separate LLM that simulates a patient who is interested in joining the trial.
- The RC model will then contact the participant model to inquire about their interest in participating in the trial. The participant model will respond to the RC model's queries about their health, background, and preferences. In parallel, you will also develop an agentic LLM that is capable of evaluating the RC model's quality, accuracy, empathy, use of adaptive language for readability, and acceptability to the participant model. This project will help you understand how AI can streamline participant selection in healthcare research.



Obtaining Consent from Participants in Clinical Trial

- Design two LLMs that acts as a research coordinator (RC) LLM and assists a simulated patient LLM through the process of informed consent for participation in a clinical trial.
- The RC model should be able to clearly explain the trial, address the participant model's concerns and questions about the trial, and ensure comprehension at different literacy levels using adaptive language.
- In parallel, you will also develop an agentic LLM that is capable of evaluating the RC model's quality, accuracy, empathy, and use of adaptive language for readability in facilitating the informed consent process.
- Your participant model should be able to rate the acceptability of the RC model in obtaining informed consent based on its empathy and readability. Synthetic datasets will help simulate various consent scenarios, enabling you to design a patient-friendly, trustworthy AI assistant for medical research.



Outcome Measures Participants in a Clinical Trial

- Design a LLM that acts as a research coordinator (RC) and assists in recording and tracking essential patient data, including baseline characteristics, post-randomization metrics, and outcome measures in a clinical trial.
- The RC model must be able to interact with a separate simulated patient LLM and capture accurate patient-reported outcome measures throughout the trial at pre-defined points in time (e.g., 6 months).
- In parallel, you will also develop an agentic LLM that is capable of evaluating the RC model's data quality, consistency, and adaptability to participant feedback. Use synthetic datasets to model trial scenarios and explore how Al can enhance data collection in clinical research.



Dissemination of Clinical Trial Results

- Design an LLM that translates clinical trial findings (KT model) into clear, understandable information for different audiences, including participants, healthcare professionals, and the public.
- The model must accurately and clearly summarize results and generate compelling deliverables such as infographics, interactive tools, and other forms of knowledge translation tools.
- You will design a second LLM that serves as a knowledge user (e.g., member of the lay public, healthcare provider, policy maker) that will interact with the KT model that will answer its questions, and adapt language for readability and accessibility.
- You will also design a separate agentic LLM that will review the output from the KT model for accuracy, clarity, and effectiveness in conveying the results. This project will simulate real-world dissemination challenges and ensure that your AI model can communicate complex medical data in an engaging way.



Suggestions from TAs

Raw, Recently Received



Put Spreadsheet Here!



Next Steps: After You've got an Idea



- 1. Look for prior work in the literature
 - Will need to quote 2-3 relevant papers in proposal
 - General search; look at ACL conferences/journals.
 - This will help you see what has been done, what is hard, what is possible
- 2. Look for a Dataset
 - <u>https://datasetsearch.research.google.com</u>
 - https://www.kaggle.com
- 3. Contemplate if/how you can add to the data collection and/or labelling task
 - Recall this is a (tricky) requirement of the project



Next Step: Approval-in-Principle (AIP)



Request for Approval-in-Principle form

- Due by October 24, but sooner is better.
- https://forms.office.com/r/gHVaKngvds
- 1. What & Why: 2-3 sentences that describe what the project is and how it is motivated. (Not How)
- 2. Data Source: Your initial thoughts on where you will find relevant data, and what role you plan to take in the collection/labelling
- 3. Name: Give your Project a Name
 - name should convey the essence of project; used for tracking
 - Creates your group identity! Logos also welcomed!



How to Describe Your Topic?

Key is to say what & why

- engineers tend to think about *how* too soon, be warned
- You will need to think about how to make the *what* feasible, but not in first description for someone else to understand
- What should be the completion of this sentence: "The goal of our project is to ..."
- Another way to force yourself to focus on **what**:
 - The inputs are:
 - The outputs are:



Project Proposal Document



Document **must** have the Following sections:

- 1. Introduction
 - What and why (i.e. motivation)
- 2. Background
 - Describe 2-3 related papers you've found
- 3. Source of Data and Processing
 - Where will you get the data for part of project?
 - Requirement: some collection/labeling the data
 - But can't take up a big chunk of the project either



Proposal Document, cont'd

- 4. Architecture of the model/Structure of System
 Case 1, Old style:
 - Rough guesses of type and structure of model
 - Describe other parts of software that are involved if any

Case 2: GPT-4 style

Describe the interactions of the LLM you're going to make

5. Comparison

Case 1, Old style:

- Describe a simple baseline model that you'll compare against
- Simple model or hand-coded heuristic

Case 2: GPT-4 style

- You'll need to work on a metric that tells you if you're succeeding
- Often evaluated by hand; perhaps also by GPT-4 classifier



Proposal Document, cont'd

- 6. Plan
 - Discuss how you're going to work together
 - Especially important if you don't know each other well
 - List of sub-tasks
 - Your guess as to how much time each task will take
 - Use to create estimate of end-to-end time
- 7. Risks
 - Predict what might go wrong & how you'd recover
- Document also graded on structure, grammar and mechanics



Proposal Document, cont'd

Hard Limit of 1200 words total

- Doesn't count pictures or references
- 1% penalty for every word in excess of 1200
- Put word count and compute penalty on front cover of proposal
 - 5% penalty if this is missing
 - These words (the count & penalty) not included in count
- Due Monday November 4 at 9pm.

Upload under Assignment – Project Proposal Document

- Just one per group
- Quercus will know your group, it will be the name you selected in your Approval-in-Principle



Proposal Presentations

November 5/6 2024



Similar structure **but not same** as Document:

- You choose the best order:
- 1. Introduction and Illustration
- 2. Data Collection and Processing
- 3. Architecture/Structure and Comparison
- 4. Risks
- 5. What You'll Have completed by November 18
 - For the progress report
 - Giving you a target to shoot at, that **is not** the end



Proposal Presentation

4 minutes maximum to present

- Timer will be set & presentation ended at 4 mins.
- 8 Slides maximum (including title slide)
- Font size **minimum** 20

This is difficult: must choose essential messages

Urge you to practice the talk at least 2-3 times

- Make sure you make sense to yourself and team
- All team members must speak, roughly equally



Slides Due

Slides due Monday November 4 at 9pm

- Uploaded to Quercus 'Assignment' Proposal Presentation
- Must be either **powerpoint (pptx or ppt)** or **PDF**
- No google doc web links, must convert to pdf/ppt;
 - check that it is correct



Proposal Presentation

- I will put up the schedule of which team is presenting in which time slot
 - Three possible times to present
 - November 5: During Regular Class: 9am-11am, Ol 2212
 - Nov 5 Extra Evening Class: 6:00pm-9:30pm in **BA 1160**
 - Nov 6: Extra Evening Class: 6:00pm-9:30pm in MS 2172



Peer Review of Proposals/Presentations

- You will be asked to review another group's document and presentation
- You'll be scheduled to do that in a different time period, one of the three
- If you have a hard conflict with one of the periods, you must email me what it is and why.



Questions?

Next week, TA Mentors here the whole lecture!

I'm away see video for Lecture 7

