MSc research internship (CS) - with Rodrigo Otoni and Marieke van Vugt

Title

Logic-Centred Natural Language Processing for Monastic Debates

Description

Debates held by Tibetan monks follow a unique structure, with their focus being on finding inconsistencies in participants' positions, rather than trying to convince the opponent of one's own position. These debates have been studied at length, and have been shown to be quite beneficial in education. In light of this, a chatbot capable of serving as an automated debate partner can be a useful tool. The goal of this project is to take the first step towards developing a prototype of such a chatbot, focusing on natural language processing (NLP) to handle user input, with a first-order logic (FOL) representation of the input being the concrete target.

Methodology and Timeline

The student will start by reviewing the necessary background material regarding monastic debates, NLP, and FOL. Then, the chatbot front-end will be designed and implemented, having a limited scope in terms of debate topic(s). Importantly, a logic-centered approach will be followed, with Boolean satisfiability (SAT) and satisfiability modulo theories (SMT) solvers as envisioned reasoning engines, rather than large language models (LLMs). An evaluation will be conducted based on literature descriptions of monastic debates, and in particular a previous symbolic implementation of Tibetan monastic debate.

The envisioned timeline is as follows:

- Week 1-2: Read about monastic debates, summarise their structure, and choose a domain of discourse, i.e., debate topic, which will be the focus of the project.
- Week 3-4: Read about NLP techniques and tools, revise FOL principles, and design a logic template to represent the domain of discourse chosen.
- Week 5-6: Design and implement a chatbot front-end, whose aim is to translate user input into the logic template designed; refine the logic template as needed. Decide on evaluation methods for the system.
- Week 7-8: Finalise the implementation and perform an evaluation on available material.
- Week 9-10: Write the project report and prepare a presentation.

Deliverables

- Chatbot front-end implementation, with appropriate documentation.
- Report describing the related literature, chatbot architecture, logic template structure, and evaluation performed; design decisions and lessons learned should be highlighted.
- Presentation giving an overview of the project's motivation, challenges, and outcomes.

Grading

Technical contribution: 40%; project management: 20%; report: 20%; presentation: 20%.