NSERC Undergraduate Student Research Award (USRA) Presentation

Human-AI Interaction: Crafting Quality Questions with LLMs

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August 20 (Tuesday), 2024, 3:30pm-4:30am

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Abstract

In the rapidly evolving landscape of educational technology, the potential of large language models (LLMs) like ChatGPT, Midjourney, MS Copilot, Claude, and open-source AI Llama, and is becoming increasingly apparent. These advanced AI tools typically utilize a chat-based interface that simulates a one-on-one conversation. However, when it comes to generating complex educational materials, e.g. question generation, these interfaces often fall short. The inherent challenge lies in the difficulty of articulating specific requirements succinctly, achieving clarity and alignment often necessitates extended dialogue.

This USRA research project aims to bridge this gap by

- **assessing the state-of-the-art of LLM-based AI tools in question generation**,
- overcoming the current limitations by using Retrieval-Augmented Generation (RAG) and new prompting methods, to mitigate the issue of AI hallucinations, where the model generates plausible but incorrect or nonsensical information
- developing a **web-based LLM-powered AI system designed for human-AI interaction, specifically dedicating to the development of automated AI assistant capable of executing actions via a User Interface (UI), targeting the generation of formative assessment questions.** The UI of this innovative system is crafted to reflect a real-life collaborative approach between teachers and AI, moving beyond traditional chat-based models. We have tested this interface against a set **of quality validation criteria (QVC) grounded** in instructional design principles to ensure its effectiveness and usability.

Using a live demonstration and PPT presentation, this talk will delve into the methodologies employed, the challenges faced, and the promising future of AI in education.

The use of AI in education extends decades of work to move toward more personalized learning in schools, including in ways that might support children who confront difficulties in learning to read. Aspirations for computer-based personalized learning are driven by the belief that computers might enable the more widespread customization of instruction for children and would allow them to progress at their own pace and in ways that are responsive to their learning needs. At present, personalized learning has remained more a dream than a reality. Proponents of AI argue that it represents new possibilities for personalized learning that overcome past technological constraints by generating and adapting content and providing tailored support to students through systems that are quick, cheap, and higher-quality than previous tools (Furini et al., 2022; Watters, 2021)

The recent emergence of large language models that provide accessible, quick, and purportedly quality tools to produce text (e.g., ChatGPT, Google Bard) makes it possible to explore how AI might be used to differentiate reading materials for children.

whether the large foundation models are capable of assisting complex assessment tasks that involve creative thinking or high-order reasoning.