

# Research Statement

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## Background

Since the launch of ChatGPT in 2023, there has been a notable evolution in the application of generative AI, particularly Large Language Models (LLMs), in the realm of education. Even though ChatGPT is built for human Q&A, without proper contextual understanding and prompt engineering, ChatGPT may generate outputs that is vague, non-specific or even hallucinations (confident but inaccurate responses). This is not acceptable since education should be guiding the acquiring of knowledge and not introducing misconceptions and inaccurate information in the learning process. As a result, it is essential to focus on refining the pedagogical integration of generative AI, ensuring its seamless and responsible implementation in the educational landscape.

Beyond education, generative AI offers substantial opportunities for both AI researchers and non-technical individuals alike. On one hand, it allows for the fine-tuning of various models to accomplish specific tasks with high precision. On the other hand, it serves as a valuable tool that enables business professionals to implement solutions without extensive technical training. While it is of interest to leverage LLMs for various domains, including career trajectory prediction through fine-tuning; it can be worthwhile to investigate how generative AI can be harnessed in fields such as sustainability reporting through low code or no code approach.

## Research Areas

### AI in Education

With known problems of ChatGPT, such as hallucination, it is essential to build in guardrail or implement quality control within the tool and application so that generative AI can still be leveraged for its strength. One of the key focuses is evaluating the quality of generative AI or more specifically, LLMs, generated content for teaching and learning. Two projects are on-going: 1) working with Dr Steven Moore from CMU to formulate a series of metrics to evaluate MCQs; 2) creating a framework for grading semi open-ended questions using a collaborative AI-Instructor approach. Besides that, leveraging *SMU Educational Research Fellowship 2023* project on “DE.AI: Debunking misconceptions for Enhanced Student Learning with the Power of Generative AI”, misconceptions have been incorporated into teaching of IS215 and received positive feedback from students.

### Outcome:

1. co-PI of an awarded MOE-TRF project– “PromptTutor - Generative AI-enabled Personalised Tutor for Promoting Reflection and Learning in Programming Courses”
2. co-PI of a submitted MOE-TRF project– “Enhance Students' Interdisciplinary Learning through Large Language Model-Empowered Learning Analytics”
3. Published one journal paper at *Computers and Education: Artificial Intelligence* (sister journal of A\* journal *Computers and Education*)– ‘Harnessing the Power of AI-Instructor Collaborative Grading Approach: Topic-Based Effective Grading for Semi Open-Ended Multipart Questions’

4. Submitted one journal paper at *International Journal of Artificial Intelligence in Education* (A ranked journal) - 'De.AI: Debunking misconceptions for Enhanced Student Learning with the Power of Generative AI'
5. Various working papers (*details in page 3*).

#### Actionable situational intelligence for urban events

This project was funded by ST Engineering Mission Software & Services Pte Ltd (\$865,569 for 2 years – May 2021 to Apr 2023), to provide sense-making capability on an urban event based on social media content, which can be an incident of an armed assault or a crisis of a sudden riot. The research focuses on in-depth analysis of the event including timeline-based situational and emotional changes and relationship among the key-entities.

#### Outcome:

1. One published paper at *Information Processing and Management* journal, one published paper at *Information and Management* journal (both A ranked journal), and one working paper on the research findings (*details in page 3*).

#### ***Exploring new research areas:***

- Future of work: Working with Prof Lim Ee Peng on career trajectory. In the process of building a fine-tuned LLM to predict next job, which will eventually be developed into a chatbot or an AI career advisor
- Sustainability: Collaborating with Dr Andrew Koh (CIS) to explore sustainability reporting using LLM

## Publications and Outputs:

### *Journal papers*

1. Phyo Yi Win Myint, Siaw Ling Lo, Yuhao Zhang (2024), 'Unveiling the dynamics of crisis events: Sentiment and emotion analysis via multi-task learning with attention mechanism and subject-based intent prediction', *Information Processing & Management* 61 (4), Article 103695 <https://doi.org/10.1016/j.ipm.2024.103695>
2. Yuhao Zhang, Siaw Ling Lo and Phyo Yi Win Myint (2024), 'Empowering Crisis Information Extraction through Actionability Event Schema and Domain-Adaptive Pre-training', *Information & Management* 62 (1), Article 104065 <https://doi.org/10.1016/j.im.2024.104065>
3. Phyo Yi Win Myint, Siaw Ling Lo, Yuhao Zhang (2024), 'Harnessing the Power of AI-Instructor Collaborative Grading Approach: Topic-Based Effective Grading for Semi Open-Ended Multipart Questions' *Computers & Education: Artificial Intelligence* 7, Article 100339 <https://doi.org/10.1016/j.caeai.2024.100339>

### *Teaching Cases*

1. Siaw Ling Lo, Yi Meng Lau, Thomas Lim, 'Making the Customer Queen Again: The Fall and Rise of SaSa' published in SMU Case on 17 September 2024. <https://cmp-shop.smu.edu.sg/products/keeping-the-customer-satisfied-the-fall-and-rise-of-sa-sa-a-and-b?variant=42064765812778>

### Paper submitted:

1. 'De.AI: Debunking misconceptions for Enhanced Student Learning with the Power of Generative AI'- Siaw Ling Lo, Cheryl Sze Pei Goh, Andrew Koh - *International Journal of Artificial Intelligence in Education* (submitted on 4 June 2024)

### Paper in progress:

1. 'CAPPER: Crisis Actionability Processing Pipeline for Emergency Response' – Yuhao Zhang and Siaw Ling Lo –planning to submit to *Information Processing & Management*
2. 'Empowering Educators through an Agentic Multiple Choice Questions Evaluator,' -target to submit to AIED 2025 conference – Siaw Ling Lo, Steven Moore (CMU)
3. 'Enhancing Learning Outcomes, Motivation, and Self-Efficacy in Flipped Classrooms with LLM-Based PromptTutor' – Yuhao Zhang, Adam Ho, Kar Way Tan, Siaw Ling Lo, Feng Lin and Eng Lieh Ouh -target to submit to iTiCSE 2025 conference
4. 'Can Large Language Models (LLMs) be used to automate doubt identification in reflective learning' - Adam Ho, Chin Shen Kang, Siaw Ling Lo, Kar Way Tan and Eng Lieh Ouh -target to submit to iTiCSE 2025 conference
5. 'Evaluating ChatGPT-4o to answer Multi-Modal Exercises in Computer Science Education' - Eng Lieh Ouh, Kar Way Tan, Siaw Ling Lo and Benjamin Gan