

AI in Education: Frontiers, Trenches & Guard Rails

Friday 10th November 2023, University of Technology Sydney

In person only: [venue map](#). Walk around the back of Building 22 (Connected Intelligence Centre) and enter the Ideation Studio via the banner and open door, next to the Children's Centre

A joint event hosted by the [Connected Intelligence Centre](#) and the [Centre for Research on Education in a Digital Society](#)

Sorry we're full! Registration now closed



Why this, why now?

There have been several “[AI winters](#)” over the decades when early hopes fizzled out. But they laid key foundations, and right now we are in the sweltering heat of a new AI summer. Most experts in AI and education recognise that we’ve crossed a line into a new level of capability, with profound implications for teaching and learning.

However, we all know that glossy ed-tech hype requires healthy doses of real world mud and sweat to really embed into effective practice. Hence the symposium’s title. We’ll see where new frontiers are being drawn, but with just as much attention to understanding what it’s like (or will soon be like) ‘in the trenches’ introducing AI to teachers and students, with appropriate safeguards.

This is not primarily a technical event. The speakers have been invited based on their work foregrounding how human-centred values, ethics, meaningful consultation and leadership can come together to invent futures we want to learn and teach in.

This symposium is the opportunity to create some reflection space, learn about local and international developments, and strengthen ties between the primary, secondary and tertiary education communities – leaders, educators, technologists, researchers and policymakers are all welcome.

Program + slides

(Abstracts and Bios below)

9.15 Refreshments

9.55 [Welcome](#)

Simon Buckingham Shum (Director, UTS Connected Intelligence Centre) & Simon Knight (Director, UTS Centre for Research on Education in a Digital Society)

10.00 **Keynote: Reimagining AI in Education at the [Institute for Student-AI Teaming \(iSAT\)](#)**

Tammy Sumner (University of Boulder at Colorado)

10.45 Q&A

11.00 [Democratising Policy: Participatory Approaches to Shaping the Future of AI in Education](#) Kalervo Gulson (Director, Education Futures Studio, University of Sydney)

11.15 Q&A

11.25 [AI Ethics Consultation as Deliberative Democracy](#)

Simon Buckingham Shum (UTS Connected Intelligence Centre)

11.40 Q&A

11.50 [What Expertise on Learning Offers for 'AI Ethics'](#)

Simon Knight (Director, UTS Centre for Research on Education in a Digital Society)

12.05 Q&A

12.15 Plenary: Reflections so far?

12.30 Lunch

1.30 [How AI Research and Practice Intersect in Education](#)

Shibani Antonette (UTS TransDisciplinary School)

1.45 Q&A

1.55 [Using Natural Language Processing to Understand and Support Mathematically-Rich Discussions in K12 Classrooms](#)

Tammy Sumner (University of Boulder at Colorado)

2.10 Q&A

2.20 Roundtables: GenAI@Scale: Frontiers, Trenches & Guard Rails?

*Breakout groups around **Ethics, Co-design, Assessment and Professional Learning** thinking about the new **Frontiers** that this could advance, the **in-the-Trenches** work required on the ground, and the different kinds of **Guard Rails** that need to be in place. Notes collated in Google Doc.*

3.15 Break

3.45 Plenary: feedback and reflections

4.30 Drinks

Talks and speaker bios

Reimagining AI in Education at the Institute for Student-AI Teaming (iSAT)

Tammy Sumner

The [NSF National AI Institute for Student-AI Teaming](#) (iSAT) is an interdisciplinary research community dedicated to transforming K-12 classrooms into more effective, engaging and equitable learning environments for all students. Towards this end, we are developing and studying how AI partners can support both students and teachers to engage in rich forms of collaborative learning. We believe that turning AI from intelligent tools towards social, collaborative partners in the classroom will help teachers get back to doing what they do best – inspiring and teaching students. We have integrated 60 researchers from 14 research areas, as well as community partners from two school districts, to engage in foundational research in curriculum

development, design and rapid prototyping, data curation and annotation, algorithm development, experimentation and evaluation, and community resource development. In this talk, I will focus on two AI partners we are currently developing and studying in partner classrooms, and describe how our work is being guided and informed by our Responsible Innovation Framework.

Ultimately, the mission of iSAT is:

- To develop foundational theories and AI technologies for creating next-generation collaborative learning environments composed of diverse student-AI teams.
 - To grow the diverse workforce of the future by engaging 5,000 middle and high school students in innovative AI education through AI-enabled pedagogies.
 - To serve as a national nexus point for empowering diverse collaborators to envision, co-create, critique and apply student-AI teaming in their communities.
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Using Natural Language Processing to Understand and Support Mathematically-Rich Discussions in K12 Classrooms

Tammy Sumner

The TalkMoves application uses automatic speech recognition and deep learning models to detect the presence of the teacher and student talk moves in recorded mathematics lessons, drawing on accountable talk theory. Talk moves can be used by both teachers and learners to construct conversations in which students share and build on others' ideas, and engage in sustained reasoning. This application addresses a significant challenge in education: providing teachers with immediate and actionable feedback on their use of these effective classroom discourse strategies.

The well-defined nature of talk moves, and the fact that they are firmly grounded in a large body of empirical research, make them well-suited for natural language processing and machine learning applications. The deep learning models in the TalkMoves application process classroom recordings to provide teachers with personalized visualizations and feedback on how talk moves were used in a particular class session, as well as over time. These deep learning models take teacher and student sentences as input and output the talk move associated with each corresponding sentence. These models were trained and evaluated using a dataset that our team curated (the TalkMoves dataset), which includes 567 transcripts from K12 mathematics lessons. In total, these lesson transcripts comprise 174,186

annotated teacher utterances, 59,874 student utterances, and 1.8 million words (15,830 unique).

We trained two independent models to identify teacher and student talk moves automatically. We began with a bi-directional long short-term (bi-LSTM) network and explored different model architectures for performing sentence-level classification, including transformer models such as BERT and Roberta . We found that the Roberta base model performed the best for both teacher (F1 = 76.32%) and student sentence classification (F1 = 73.12%). Through further experimentation, we found that using additional contextual cues boosted the performance of the teacher model to 78.92% F1 . The best performing models are deployed into the production pipeline of the TalkMoves application.

We will [demonstrate the TalkMoves application](#) and discuss its design and development, along with the results of a two-year longitudinal study of the application with K12 math teachers. We will also discuss the generalizability of this approach to other domains (STEM) and educational contexts (human tutoring), as well as current advancements we are working on.

Jacobs, J., Scornavacco, K., Harty, C., Suresh, A., Lai, V., & Sumner, T. (2022). Promoting rich discussions in mathematics classrooms: Using personalized, automated feedback to support reflection and instructional change. *Teaching and Teacher Education*, 112, 103631. <https://doi.org/https://doi.org/10.1016/j.tate.2022.103631>



[Tamara Sumner](#) is the Director of the [Institute of Cognitive Science](#) and a Professor in the Department of Computer Science and the Institute of Cognitive Science at the University of Colorado Boulder. She leads an interdisciplinary research and development lab that studies how computational tools – combining cognitive science, machine intelligence, and interactive media – can improve teaching practice, learning outcomes and learner engagement. This research and development team combines expertise in cognitive science, learning sciences, science education, user-centered design and evaluation, learning analytics, and speech and natural language processing. She is the Principal Investigator for the National Science Foundation-funded TalkMoves and SchoolWide Labs projects, and a co-Principal Investigator in the inaugural [NSF National AI Institute for Student-AI Teaming](#).

Democratising Policy: Participatory Approaches to Shaping the Future of AI in Education

Kalervo Gulson

The introduction of ChatGPT in 2022, and the myriad initial responses in education to it, from cautious use to banning, highlighted two interrelated but contradictory problems. One, that understanding AI systems are technically beyond the expertise of

most educators, and two, that any policy responses need to be developed using a wide range of experiences and expertises. This talk will outline an approach to democratising policy that involves addressing these two areas. It will outline the necessity of distributing technical expertise to understand what issues existing policy about AI in education address, and the necessity to build capabilities for people (including system leaders in education departments, teachers, parents, policy makers) to create policy to guide the development and use of AI systems necessary for people to navigate the uses of AI in education. It will focus on methods that can help stakeholders to: i) identify AI systems being used in education policy making and implementation; ii) experiment with AI systems; iii) explain how AI systems work; iv) evaluate the current and possible impact of systems; and v) decide which, if any, systems to use, and identify alternatives to the use of AI.



[Kalervo N. Gulson](#) is a Professor of Education Policy. His research is located across social, political and cultural geography, education policy studies, and science and technology studies. His current research programme investigates how new knowledge, methods and technologies from computing sciences, with a specific focus on Artificial Intelligence, will substantively alter education policy and governance. As part of his work, he heads up the [Education Futures Studio](#). This is a collective of people interested in helping people to understand and respond to the use of new technologies in education, such as AI. The studio focuses on issues of policy and governance, including building public engagement tools in collaboration with diverse stakeholders.

AI Ethics Consultation as Deliberative Democracy

Simon Buckingham Shum

Universities can see an increasing range of student and staff activity as it becomes digitally visible in their platform ecosystems. The fields of Learning Analytics and AI in Education have demonstrated the significant benefits that ethically responsible, pedagogically informed analysis of student activity data can bring, but such services are only possible because they are undeniably a form of “surveillance”, raising legitimate questions about how the use of such tools should be governed. Our prior work has drawn on the rich concepts and methods developed in human-centred system design, and participatory/co-design, to design, deploy and validate practical tools that give a voice to non-technical stakeholders (e.g. educators; students) in shaping such systems. We are now expanding the depth and breadth of engagement that we seek, looking to the Deliberative Democracy movement for inspiration (a response to the crisis in confidence in how typical democratic systems engage citizens in decision making). A hallmark is the convening of a Deliberative Mini-Public (DMP) which may work at different scales (organisation; community; region; nation) and can

take diverse forms (e.g. Citizens' Juries; Citizens' Assemblies; Consensus Conferences; Planning Cells; Deliberative Polls). DMP's combination of stratified sampling to ensure authentic representation, neutrally facilitated workshops, balanced expert briefings, and real support from senior leadership, has been shown to cultivate high quality dialogue in sometimes highly conflicted settings, leading to a strong sense of ownership of the DMP's final outputs (e.g. policy recommendations). The DMP model has informed university-wide consultation on the ethical principles that should govern the use of analytics and AI around teaching and learning data.



[Simon Buckingham Shum](#) is Professor of Learning Informatics at the University of Technology Sydney where he serves as inaugural Director of the [Connected Intelligence Centre](#) (CIC). Simon brings a human-centred design approach to sociotechnical systems, and is active in the fields of Educational Technology, Learning Analytics and AI in Education. CIC is a UTS innovation centre providing data-driven insights for staff, and inventing, evaluating and scaling platforms for personalised student feedback. Simon coordinates the [UTS Student Partnership in AI](#), which uses Deliberative Democracy methods to enable deep, respectful consultation with diverse stakeholders on the values they want to see govern educational analytics/AI. He is a founder of the field of Learning Analytics and served as Vice-President of the Society for Learning Analytics Research. He contributed to the recent TEQSA report "[Assessment Reform for the Age of Artificial Intelligence](#)."

What Expertise on Learning Offers for 'AI Ethics'

Simon Knight

Recent years have seen a proliferation of guidelines, principles, and design approaches for navigating the ethics of AI across a wide range of domains. This has included application to education, which has received particular attention within research, from institutions as they seek to adapt - in varying ways - to a range of challenges, and rights groups, governmental and supranational organisations. How do people learn about, with, and for these materials? How do people learn to navigate the nuanced ethical concerns that arise in application of technology to learning, and develop approaches (and material resources) to support this? It is not hard to find controversies, examples of bad practice and harms, however, a micro-ethics approach seeks to understand the moment-to-moment ethical judgements made - here, in the context of data production, analysis, and use - and their implications. I will set out some approaches and example resources, from some developing work drawing on my own previous learning analytics work, recent collaborations regarding ethics and LA, and analysis of wider literature from the field.



[Simon Knight](#) is Director the University of Technology Sydney, [Centre for Research on Education in a Digital Society](#) (UTS:CREDS), previous co-editor-in-chief of the *Journal of Learning Analytics*, and recent Australian Research Council, Discovery Early Career Award Fellowship (ARC DECRA). Simon researches how people learn to navigate uncertainty, disagreement, and evidence, and the mediating role of technology. His work has explored the use of data as a form of evidence, and design for learning towards epistemic and ethical reasoning. He has developed approaches to design learning analytics, particularly for writing.

How AI Research and Practice Intersect in Education

Shibani Antonette

Artificial Intelligence (AI) in education and Learning Analytics (LA) have been researched for well over two decades now, with principles and practices for bridging the gap between the potential and actual use of such emerging technologies in classrooms. However, the advent of user-friendly generative AI tools such as ChatGPT has prompted an era where practical applications are rapidly outpacing the developments in research and theoretical understanding. How can educators effectively use AI for intelligence augmentation (IA) by harnessing best practices that are grounded in research?

In this talk, I will discuss several examples where AI research and practice intersect, such as co-designing learning analytics tools with stakeholder engagement, how analytics can help moderate our dependence on AI for writing, and why we should design student assessments for critical engagement with AI. These can inform and enhance our understanding of the optimal partnership between technological assistance and human cognition.



[Shibani Antonette](#) is a Lecturer in the UTS TD School (TransDisciplinary Innovation). She researches applied areas of data science and artificial intelligence, with a particular focus on educational technology and writing analytics. Her work spans learning analytics, automated feedback tools, ethical use of artificial intelligence, human-AI complementarity, navigating misinformation and conflict in social media, and more broadly, data for social impact. Much of her research uses text analysis and natural language processing to uncover insights from data along with other qualitative and quantitative methods. Shibani was an Executive Committee member of the Society for Learning Analytics Research (SoLAR) and co-hosts the podcast 'SoLAR Spotlight: Conversations on Learning Analytics'.

