Liang Ze WONG, PhD liangze.wong@gmail.com

Research scientist and mathematician, with a focus on theory and applications of language models

Areas of Expertise

Natural Language Processing, Large Language Models, Machine Learning, Statistics, Data Science & Analytics, Category Theory, Algberaic Topology, Algebra, Mathematics

Appointments

National University of Singapore	**Adj. Asst. Prof.**	Jun 2022 – Jun 2025
Institute of High Performance Computing	**Senior Scientist**	Apr 2022 – Dec 2024
	Research Scientist	Aug 2019 – Mar 2022
Institute for Infocomm Research	Research Engineer	Sep 2012 – Aug 2014

Research Projects

Tensor-theoretic analysis of language models — Jan 2025 – Present
Independent research

- *Developed a tensor-theoretic framework for analyzing attention heads in transformers, and identified a common mechanism for generalizations and hallucinations*

Computational Inference of Public Attitudes and Opinions — Aug 2019 – Dec 2024
Multiple grant-funded and industry-funded projects

- *Developed and evaluated an LLM pipeline for end-to-end thematic analysis of focus group and interview transcripts in a highly traceable and transparent manner*
- *Developed and piloted an LLM chatbot for conducting automated online interviews with separate agents for following topic guides and adhering to interview best practices*
- *Developed NLP models for sentiment analysis, stance prediction, topic modelling, and user segmentation, including a fine-tuned BERT model that predicted psychological constructs with better accuracy than IBM Watson Personality Insights*
- *Created interactive visualizations for text datasets and frontend apps and dashboards*
- *Engaged key government and industry stakeholders, mentored graduate students, and delivered talks and tutorials on using LLMs and NLP in social science research*

Heterogeneous Sense-making & Learning Networks — Sep 2012 – Aug 2014
*A*STAR Sense & Sense-abilities National Program*

- *Developed a novel architecture for training sparse auto-encoders (SAEs) to produce interpretable hidden-layer features even in the presence of missing data*

Teaching

Foundations of Business Analytics — Fall 2022, Fall 2023
Core course for NUS Masters of Science in Business Analytics (∼120 students/cohort) covering models (SVMs, Random Forests, etc.) and metrics (precision, recall, F1, etc.)

Education & Honors

Ph.D. in Mathematics, University of Washington (*GPA: 3.92*) — June 2019
Ann Giles Graduate Fellowship; Academic Excellence Award

B.A. in Mathematics, Cornell University (*GPA: 3.919*) — May 2012
Magna cum Laude; Distinction in All Subjects; Dean's List

Awards & Recognition

Letter of Commendation for Teaching, *NUS Business School*	2022 – 2023
National Science Scholarship (Doctorate), *A*STAR*	2014 – 2019
National Science Scholarship (Undergraduate), *A*STAR*	2009 – 2012

Selected Papers

L.Z. Wong. *'Generalization is hallucination' through the lens of tensor completions*, arXiv:2502.17305 (2025).

L.Z. Wong. *Paying attention to facts: Quantifying the knowledge capacity of attention layers*, arXiv:2502.05076 (2025).

L.Z. Wong, P. Bhattacharya, B.S. Loh, A.E. Pink, et al. *Utilizing LLMs to conduct Thematic Analysis: A Case Study on Focus Groups Transcripts*, (under review).

H. Zhang, Q.N. Nguyen, W. Gao, **L.Z. Wong**, et al. *Enhancing Stance Classification on Social Media Using Quantified Moral Foundations*, IEEE/ACM ASONAM (2024).

D. Carranza, B. Doherty, K. Kapulkin, M. Opie, M. Sarazola & **L.Z. Wong**, *Cofibration category of digraphs for path homology*, Algebraic Combinatorics, 7 no. 2 (2024).

Z. Lai, A.B. Ng, **L.Z. Wong**, S. See, & S.W. Lin. *Dependently typed knowledge graphs*, arXiv:2003.03785 (2020).

C. Kapulkin, Z. Lindsey & **L.Z. Wong**, *A co-reflection of cubical sets into simplicial sets, with applications to model structures*, New York Journal of Mathematics (2019).

J. Beardsley and **L.Z. Wong**, *The Operadic Nerve, Relative Nerve, and the Grothendieck Construction*, Theory and Application of Categories, v34 (2019).

J. Beardsley & **L.Z. Wong**, *The enriched Grothendieck construction*, Advances in Mathematics, 344 (2019).

A. Chirvasitu, S.P. Smith and **L.Z. Wong**, *Noncommutative geometry of homogenized quantum* $\mathfrak{sl}(2,\mathbb{C})$, Pacific Journal of Mathematics **292** (2018), no. 2, 305-354.

L.Z. Wong, H.L. Chen, D.C.L. Chen & S.W. Lin, *Imputing Missing Values in Sensor Networks using Sparse Data Representations*, ACM MSWiM (2014).

L.Z. Wong, T.Q.S. Quek and M. Padilla, *An Ordinal Potential Function for Network Selection in Heterogeneous Wireless Networks*, IEEE ICASSP (2014).

Invited Talks

Applications of LLMs in Social Sciences, AI Wednesdays (government-wide community of practice for artificial intelligence), Singapore (October 2024).

An Introductory Workshop on using LLMs in Social Science, Summer Institute in Computational Social Science (SICSS), Singapore (June 2024).

Weak equivalences between categories of models of type theory, Joint Mathematics Meeting (JMM), San Diego (January 2018).

Distributive laws, strings attached, International Category Theory Conference 2017, University of British Columbia, Vancouver (July 2017).

Technologies & Languages

Python (PyTorch, Pandas, Numpy, Scikit-learn, Transformers, Seaborn, Streamlit, Django, Flask, FastAPI), Javascript (React with Hooks, Chart.js, D3), R, SQL, PostgreSQL, MongoDB, AWS, Azure, Heroku, Docker, Git, Github, Gitlab, Bitbucket

Visa Note

Sponsorship required. Eligible for H-1B1 visa as a Singaporean, in addition to H-1B.