

# MUHUA (黄牧华) HUANG

**Research Interests:** Social Computing, Psychometrics, LLM, Generative AI, Societal AI, Human-AI Cooperation

**Engineering:** High-Performance Computing (AWS, Azure), Relational Database, OOP, HCI, Algorithm Design

**Quantitative:** LLM-Agent, Structural Equation Modelling, Factor Analysis, Regression, Ensemble Models, Neural Networks, Word Embedding, Fine Tuning, Validation and Evaluation, RAG

## EDUCATION

<b>Stanford Graduate School of Business, California</b>	<b>2025.9 – 2030.6</b>
PhD in Organizational Behavior	
<b>The University of Chicago, Illinois</b>	<b>2023.9 – 2025.6</b>
MA in Computational Social Science; GPA: 3.9/4.0	
<b>The University of British Columbia (UBC), Canada</b>	<b>2018.9 – 2023.5</b>
BA in Computer Science & Psychology (Honours); GPA: 4.2/4.3	
<b>Summer Institute in Computational Social Science (SICSS), Beijing</b>	<b>2024.6 – 2024.7</b>
<b>Google Research Mentorship Program Scholar, Google</b>	<b>2020.9 – 2021.1</b>

## JOURNAL AND CONFERENCE PROCEEDINGS

- [1] Huang, M., & Evans, J. (In Press). Institutions as cached computation for resource-rational negotiation. *Behavioral and Brain Sciences*. <https://doi.org/10.1017/S0140525X2510174X>
- [2] Huang, M., Zhang, X., Soto, C., & Evans, J. (Under Review). Designing AI-Agents with Personalities: A Psychometric Approach. *Personality Science*. [Preprint].
- [3] Bai, Y., Duan, S., Huang, M., Yao, J., Liu, Z., Zhang, P., ... & Xie, X. (Under Review). IROTE: Human-like Traits Elicitation of Large Language Model via In-Context Self-Reflective Optimization. [Preprint].
- [4] Zhang, H., Huang, M., & Wang, J. (Under Review). Evolving Collective Cognition in Human-Agent Hybrid Societies: How Agents Form Stances and Boundaries. [Preprint].
- [5] Zhang, X., Huang, M., Sun, J., & Savalei, V. (2025). Improving the Measurement of the Big Five via Alternative Formats for the BFI-2. *Journal of Personality Assessment*. <https://doi.org/10.1080/00223891.2025.2531187>.
- [6] Yao, J., Yi, X., Duan, S., Wang, J., Bai, Y., Huang, M., ... & Xie, X. (2025). Value compass benchmarks: A comprehensive, generative and self-evolving platform for llms' value evaluation. In *Proceedings of the 63rd Annual Meeting of the Association for Computational Linguistics (Volume 3: System Demonstrations)* <https://doi.org/10.18653/v1/2025.acl-demo.64>.
- [7] Kim, H., Yi, X., Bak, J., Yao, J., Lian, J., Huang, M., Duan, S., & Xie, X. (2025). The Road to Artificial SuperIntelligence: A Comprehensive Survey of Superalignment. *SuperIntelligence - Robotics - Safety & Alignment*, 2(1), Article 1. <https://doi.org/10.70777/si.v2i1.13963>
- [8] Savalei, V., & Huang, M. (2025). Fit Indices Are Insensitive to Multiple Minor Violations of Perfect Simple Structure in Confirmatory Factor Analysis. *Psychological Methods*. <https://dx.doi.org/10.1037/met0000718>
- [9] Laurin, K., Engstrom, H., & Huang, M. (2024). What will my life be like when I'm 25? How social class predicts kids' answers to this question, and how their answers predict their futures. *Journal of Social Issues*. <https://doi.org/10.1111/josi.12650>

## CONFERENCE POSTER PRESENTATIONS

- [1] Huang, M., Biedma, P., Yi, X., Huang, L., Sun, M., Evans, J., Xie, X. (2025, July). *Beyond Anthropomorphism: Unveiling Unique Value Structure of Large Language Models (LLMs) via a Psychometric Approach*. 11th International Conference on Computational Social Science (IC2S2), Norrköping, Sweden.
- [2] Huang, M. & Huang, N. (2025, August). *Re-Discovering the Big Five: Using LLM Embeddings to Understand Personality Structure*. American Psychological Association (APA) Convention, Denver, USA.
- [3] Zhang, X., & Huang, M. (2025, June). Designing AI-agents with personalities using BFI-2 in different formats.
- [4] Zhang, X., Huang, M., Sun, J., & Savalei, V. (2025, July). Designing AI-agents with personalities using BFI-2 in different formats.
- [5] Huang, M. (2024, August). *Designing LLM-Agents with Personalities: A Psychometric Approach* [Poster]. American Psychological Association (APA) Convention, Seattle, USA.
- [6] Huang, M., Zhang, X., & Savalei, V. (2023, August). *How to measure Big Five personality traits better? Exploring alternative scale formats for BFI-2* [Poster]. American Psychological Association (APA) Convention, Washington, DC.
- [7] Huang, M., Engstrom, H., & Laurin, K. (2021, May). *Exploring the Association between Socioeconomic Status and Children's Imagined Future: A Study Using Machine Learning* [Poster]. Association for Psychological Science (ASP) Annual Convention.
- [8] Savalei, V., & Huang, M. (2023, October). *Can SEM Fit Indices Distinguish Between CFA and EFA Data Structures?* [Paper]. Annual Meeting of the Society for Multivariate Experimental Psychology (SMEP), Iowa City, Iowa.
- [9] Engstrom, H., Huang, M., & Laurin, K. (2022, July). *Social class differences in children's hopes and expectations for the future: A machine learning approach* [Talk]. Society in the classroom: Integrating perspectives on how socioeconomic disparities unfold in educational settings, London, England.

- [10] Conati, C., Murali, R., & **Huang, M.** (2022, June). Gauging Student Engagement with an XAI interface via Eye-tracking [Paper]. *IJCAI 2022 Workshop on Explainable Artificial Intelligence*, 168.
- [11] Engstrom, H., **Huang, M.**, & Laurin, K. (2022, February). *Different social class backgrounds, different imagined futures* [Talk]. 2022 Society for Personality and Social Psychology (SPSP) Annual Convention, San Francisco, CA.

## INVITED TALK

- [1] Yang, L., Sun, L., **Huang, M.**, Wang, J., Jiang, R., & Xu, F. (November 14, 2024). Panel discussion: LLM-driven social science and generative agents. [2024 MSR Asia TAB Workshop: Shaping the Future with Societal AI](#). Microsoft Research Asia, Beijing, China.
- [2] **Huang, M.** (January 13, 2025). Designing LLM-agents with personalities: A psychometric approach. Invited talk at the Quantitative Methods Forum, York University, Toronto, Canada.

## INTERNSHIP

### [Microsoft Research Asia] Research Intern

2024.7 – 2024.10

Advisor: Dr. Xiaoyuan Yi, Dr. Xing Xie

#### [Python] On the Dynamics of LLMs' Values as A Community

- Engineered a scalable multi-agent system facilitating interactions among up to hundreds of AI agents, incorporating several cognitive modules, Retrieval-Augmented Generation (RAG), and parallel processing.
- Applied social science theories (e.g., Schwartz's Theory of Basic Values) as the theoretical frameworks to model and analyze the evolution of AI agents' values through social interactions.
- Utilized Social Network Analysis to examine the formation, structure and change of social networks among agents.
- Leveraged GraphRAG and NLP to investigate Social Emergence (e.g., unique language, cultural practices, organizations and institutions) in LLM-agent communities.
- Designed and conducted experiments to assess the impact of value diversity, population size, and temporal factors on agent interactions and social outcomes.

## RESEARCH EXPERIENCE

### [UChicago] Master's Thesis in LLM-Agent X Psychometrics

2023.9 – 2024.6

Advisor: Dr. James Evans

#### [Python] Designing LLM-Agents with Personalities: A Psychometric Approach

- Examined the embeddings of 5 Big-Five personality tests using OpenAI's large, contextualized embeddings, analyzed their convergent correlations, suggesting new paradigm as response-free psychometric test analysis.
- Investigated personality assignment strategies using real world data and parametric simulations, allowing controllable, fine-grained and replicable personality assignments to LLM-Agents.
- Collected data from 350 participants and conducted direct comparison for humans and Agents' response.
- Validated the predictability of Agents' moral and risk-taking decisions with their personality and comparing that with human participants, showing promising potential to use Agents to substitute humans in behavioral research.
- Conducted systematic evaluations via Confirmatory Factor Analysis (CFA), regression, convergent correlations.

### [UBC] Research Assistant in Quantitative Psychology

2020.4-2023.8

Advisor: Dr. Victoria Savalei

#### [R] Exploring the Factor Structure of the Big Five Inventory-2 (BFI-2) in Alternative Scale Formats

- Analyzed survey responses using Structural Equation Modeling (SEM) and compared the psychometric properties of four scale formats: Likert, Expanded, Item-Specific-Full, and Item-Specific-Light.
- Found that the Expanded format has the best reliability and model fit for BFI-2, followed by Item-Specific-Full, and Item-Specific-Light. All the alternative scales improved the psychometric properties compared to Likert scale.
- My honors thesis was nominated for multiple Canadian national undergraduate research awards (e.g., Belkin, CPA).

#### [R] SEM Fit Indices' Sensitivity to Omitted Crossloadings in CFA

- Developed an R Shiny app to simulate experimental data and produce interactive visualizations.
- Examined the performance of fit indices across various conditions where CFA models are fit to EFA-like data.
- Conducted extensive literature search, review and replication on CFA and EFA models.
- Assisted with manuscript preparation, editing and proof.

### [UBC] Research Assistant in Social Psychology

2020.8 – 2021.9

Advisor: Dr. Kristin Laurin

#### [Python, R] Socioeconomics and Imagined Future Study

- Analyzed over 10,000 essays and socioeconomic data using supervised and unsupervised ML and NLP algorithms, revealing insightful patterns of clearer and more substantiated future visions among wealthy youth.

- Supervised a group of 20 research assistants for data cleaning task and developed protocols, including a word distribution and performance tracking system, to provide technical support.
- Utilized ML models (Random Forest, Regression and Neural Network), NLP models (Structural Topic Model, LSTM, One-Hot Encoding, Word2Vec Embedding), Packages (Scikit-learn, Keras, Pandas)

#### [UBC] Research Assistant in Human-Centered AI

2021.10-2022.9

Advisor: Dr. Christina Conati

#### [R] Personalized Explainable AI for Intelligent Tutoring System Study

- Evaluated a personalized explainable AI tutoring system by analyzing participants' eye-tracking data and their cognitive and personality data using a linear mixed model.
- Discovered that students with high perceptual speed spent a larger proportion of time on visual information.
- Demonstrated that AI tutoring systems are more effective when tailored to student's cognitive ability.

## WORK EXPERIENCE

#### Computational Social Science Workshop Coordinator

2024.10 – 2025.6

- Organized the weekly MACSS Computational Social Science Workshop, featuring distinguished speakers to promote advanced computational methods and interdisciplinary research.
- Managed advertising through campus channels, GitHub, and email lists to boost participation and enhance the workshop's visibility within the academic community.

#### Deep Learning Textbook Editor

2023.10 – 2024.10

- Assisting with proofreading and editing the textbook "Thinking with Deep Learning" by Dr. James Evans.
- Designed the Latex templates for the textbook and for Journal of Social Computing.

#### Teaching Assistant, UBC

2021.01 – 2022.12

- Courses 1: Human Computer Interaction Methods.
- Courses 2: Systematic Program Design.
- Courses 3: Introduction to Systematic Program Design.
- Directed labs and tutorials, effectively teaching UI/UX design principles, Figma, and React, along with guiding students through design, user study, and prototyping processes; earned recognition for teaching excellence with an invitation to continue as a TA for advanced levels, a distinction usually reserved for graduate students.
- Collaborated with the teaching team, focusing on practical application of HTML, CSS, and product management.
- Demonstrated outstanding communication and teaching skills; Received highly favorable review of 4.7/5 from students; Received return offer three times.

#### Crisis Respondent, Kids Help Phone

2019.09 – 2020.08

- Completed crisis intervention trainings, provided over 230 hours of crisis counselling, and helped more than 550 individuals in severe mental distress, used professional techniques to calm them down, and directed them to professional help when needed.

## AWARDS & HONORS

EDGE Doctoral Fellowship (\$12,800)	2025
UChicago Outstanding Thesis Award (\$1,000)	2025
Microsoft Research Asia Outstanding Intern Award (Stars of Tomorrow Certificate)	2024
OpenAI Researcher Access Program (\$3,500)	2024
SICSS-Beijing 2024 Merit Based Scholarship (¥ 3,600)	2024
UChicago Computational Social Science Research Poster Competition (Honorable Mention, 2 <sup>nd</sup> Place)	2024
UChicago Quadrangle Research Scholarship (\$80,000)	2023, 2024
UChicago Social Sciences Promise & Merit Scholarship (\$10,000)	2023, 2024
Quinn Research Assistantship Award (\$8,300)	2021
UBC International Community Achievement Award (\$5,000)	2021
UBC Trek Excellence Scholarship (\$2,000)	2019, 2020
UBC Faculty of Arts International Student Scholarship (\$8,800)	2019, 2020, 2022