

Yen-Ling Kuo

Department of Computer Science
School of Engineering and Applied Science
University of Virginia
Charlottesville, VA, 22903

Olsson Hall 261
151 Engineer's Way
Charlottesville, VA, 22903
ylkuo@virginia.edu

RESEARCH INTEREST

My research aims to **enable robust generalizations in human-AI/robot interactions** – building machines that can generalize their learned models to robustly interact with humans in novel scenarios. Toward this vision, I develop machine learning models and representations that provide robots with generalizable reasoning skills including **language understanding** and **social interactions**.

EDUCATION

Doctor of Philosophy, Computer Science, minor in Cognitive Science 2016 - 2022
Massachusetts Institute of Technology, Cambridge, MA

Thesis: Compositional Robot Learning for Generalizable Interactions
Advisors: Boris Katz, Andrei Barbu

Master of Science, Computer Science and Information Engineering 2009 - 2012
National Taiwan University, Taipei, Taiwan

Thesis: A Multiagent Reasoning System for Commonsense Knowledge Integration
Award: Best Master Thesis Award by the Taiwanese Association of Artificial Intelligence
Advisor: Jane Yung-jen Hsu

Visiting Student, Media Arts and Sciences 2011
Massachusetts Institute of Technology, Cambridge, MA
Advisor: Henry Lieberman

Bachelor of Science, Computing Science, minor in Physics 2005 - 2009
National Taiwan University, Taipei, Taiwan

RESEARCH & EMPLOYMENTS

Assistant Professor Aug 2023 - Present
Department of Computer Science, University of Virginia
Faculty member of Cyber-Physical System Link Lab

Research Affiliate Aug 2022 - Present
Computer Science & Artificial Intelligence Laboratory, MIT
Collaborating on research projects about theory-of-mind reasoning and visual social attention prediction

Visiting Assistant Professor Aug 2022 - Jul 2023
College of Intelligent Computing, Chang Gung University
Advised research projects in robotics, intelligent medicine/healthcare, and manufacturing

Research Intern May 2022 - Aug 2022
MIT-IBM Watson AI Lab
Host: Dan Gutfreund

Designed methods for social interactions in robotic game planning

Research Assistant
MIT CSAIL & CBMM

Sep 2016 - May 2022

Designed agents that plan actions with compositional language models and logic formalism
Developed models for understanding social interactions and human symbolic communication

Research Intern
Toyota Research Institute

Jun 2021 - Aug 2021

Host: Guy Rosman
Created interpretable models to predict behaviors of road agents by leveraging linguistic representations

Software Engineer
Shopping, Google Inc.

Oct 2012 - Aug 2016

Tech Lead for *Shot the Look* features (highlighted on [Google AdWords blog](#) and [TechCrunch](#))
Developed advanced shopping search features including product knowledge panels and comparison
Developed machine learning and crowd-sourcing methods to extract product attributes from images

Research Assistant
Intelligent Agents Lab, NTU CSIE

Jun 2008 - Jan 2012

Built the largest Chinese commonsense knowledge base (part of MIT Open Mind Common Sense Project)
Developed a multi-agent to integrate reasoning results from multiple knowledge bases

Software Engineering Intern
Comparison Ads, Google Inc.

Jun 2011 - Aug 2011

Developed methods to automatically build entity comparison tables from large-scale crawled web data

PUBLICATIONS

Published 23 peer-reviewed conference/journal papers and 9 peer-reviewed workshop/short papers in venues such as ICRA, IROS, CoRL, IJCAI, AAIL, ACL, CVPR, C&C, HCOMP, TiiS, and Frontiers in Robotics and AI. Have 3 papers under review and 1 pending patent.

Advisees of YLK are underlined; * indicates equal contribution; [†] indicates equal supervision.

Preprints

- (P1) [MuMA-ToM: Multi-modal Multi-Agent Theory of Mind](#).
Haojun Shi, Suyu Ye, Xinyu Fang, Chuanyang Jin, Layla Isik, **Yen-Ling Kuo**, Tianmin Shu.
arXiv:2408.12574, 2024.
- (P2) [MENSA: Leveraging Mental Simulation for Dynamic Experience Retrieval in LLM Agents](#).
Chung-Che Chang, Erick Chandra, **Yen-Ling Kuo**, Jane Yung-jen Hsu.
2024.
- (P3) [Incorporating Task Progress Knowledge for Subgoal Generation in Robotic Manipulation through Image Edits](#).
Xuhui Kang, **Yen-Ling Kuo**.
2024.
- (P4) [NashFormer: Leveraging Local Nash Equilibria for Semantically Diverse Trajectory Prediction](#).
Justin Lidard, Oswin So, Yanxia Zhang, Jonathan DeCastro, Xiongyi Cui, Xin Huang, **Yen-Ling Kuo**, John Leonard, Avinash Balachandran, Naomi Leonard, Guy Rosman.
arXiv:2305.17600, 2023.

Invited Articles

- (I1) *Learning Representations for Robust Human-Robot Interaction.*
Yen-Ling Kuo.
AAAI Conference on Artificial Intelligence (**AAAI**), 2024 New Faculty Highlights Program.

Refereed Journals

- (J1) *Compositional RL Agents that Follow Language Commands in Temporal Logic.*
Yen-Ling Kuo, Boris Katz, Andrei Barbu.
Frontiers in Robotics and AI 2021.
- (J2) *Planning for Reasoning with Multiple Common Sense Knowledge Bases*
Yen-Ling Kuo, Jane Yung-jen Hsu.
ACM Transactions on Interactive Intelligent Systems (TiiS) 2012.

Refereed Conference Papers

- (C1) *MMToM-QA: Multimodal Theory of Mind Question Answering.*
Chuanyang Jin, Yutong Wu, Jing Cao, Jiannan Xiang, **Yen-Ling Kuo**, Zhiting Hu, Tomer Ullman, Antonio Torralba, Joshua B Tenenbaum, Tianmin Shu.
The 62nd Annual Meeting of the Association for Computational Linguistics, 2024.
Outstanding Paper Award
- (C2) *Summarize the Past to Predict the Future: Natural Language Descriptions of Context Boost Multi-modal Object Interaction.*
Razvan-George Pasca, Alexey Gavryushin, **Yen-Ling Kuo**, Luc Van Gool, Otmar Hilliges, Xi Wang.
IEEE/CVF Computer Vision and Pattern Recognition Conference, 2024. Acceptance rate: 23.6%
- (C3) *Neural Amortized Inference for Nested Multi-agent Reasoning.*
Kunal Jha, Tuan Anh Le, Chuanyang Jin, **Yen-Ling Kuo**, Joshua B Tenenbaum, Tianmin Shu.
AAAI Conference on Artificial Intelligence (**AAAI**), 2024. Acceptance rate: 23.75%
- (C4) *Zero-shot Linear Combinations of Grounded Social Interactions with Linear Social MDPs.*
Ravi Tejjwani*, **Yen-Ling Kuo***, Tianmin Shu, Bennett Stankovits, Dan Gutfreund, Joshua B. Tenenbaum, Boris Katz, and Andrei Barbu.
AAAI Conference on Artificial Intelligence (**AAAI**), 2023. Acceptance rate: 19.6%
- (C5) *Reconstructing Action-Conditioned Human-Object Interactions Using Commonsense Knowledge Priors.*
Xi Wang*, Gen Li*, **Yen-Ling Kuo**, Muhammed Kocabas, Emre Aksan, Otmar Hilliges.
International Conference on 3D Vision (3DV) 2022.
- (C6) *Motion-centric Tools to Reflect on Digital Creative Experiences and Created Outputs.*
Yen-Ting Cho, **Yen-Ling Kuo***, Yen-Ting Yeh*, Huai-Hsuan Liang, Yu-Ting Li.
Creativity and Cognition (C&C) 2022.
- (C7) *Quantifying the Emergence of Symbolic Communication.*
Emily Cheng, **Yen-Ling Kuo**, Josefina Correa, Ignacio Cases, Boris Katz, Andrei Barbu.
Annual Meeting of the Cognitive Science Society (CogSci).
- (C8) *Trajectory Prediction with Linguistic Representations.*
Yen-Ling Kuo, Xin Huang, Andrei Barbu, Stephen G. McGill, Boris Katz, John J. Leonard, Guy Rosman.
International Conference on Robotics and Automation (**ICRA**), 2022.
- (C9) *Incorporating Rich Social Interactions Into MDPs.*
Ravi Tejjwani*, **Yen-Ling Kuo***, Tianmin Shu, Bennett Stankovits, Dan Gutfreund, Joshua B. Tenenbaum, Boris Katz, Andrei Barbu.
International Conference on Robotics and Automation (**ICRA**), 2022.

A short version won **Excellent Paper Award** at 2021 IROS Cognitive and Social Aspects of Human Multi-Robot Interaction Workshop.

- (C10) *Compositional Networks Enable Systematic Generalization for Grounded Language Understanding.*
Yen-Ling Kuo, Boris Katz, Andrei Barbu.
Findings of Empirical Methods in Natural Language Processing (Findings of EMNLP).
- (C11) *Social Interactions as Recursive MDPs.*
Ravi Tejjwani*, **Yen-Ling Kuo***, Tianmin Shu, Boris Katz, Andrei Barbu.
Conference on Robot Learning (**CoRL**), 2021.
- (C12) *IntuModels: Enabling Interactive Modeling for the Novice through Idea Generation and Selection.*
Yen-Ting Cho, **Yen-Ling Kuo***, Yen-Ting Yeh*, Yen-Yi Huang, Po-Lun Huang.
Creativity and Cognition (C&C) 2021.
Best Paper Honorable Mention
- (C13) *Learning a Natural-language to LTL Executable Semantic Parser for Grounded Robotics.*
Christopher Wang, Candace Ross, **Yen-Ling Kuo**, Boris Katz, Andrei Barbu.
Conference on Robot Learning (**CoRL**), 2020.
- (C14) *Encoding Formulas as Deep Networks: Reinforcement Learning from Zero-shot Execution of LTL Formulas.*
Yen-Ling Kuo, Andrei Barbu, Boris Katz.
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2020.
- (C15) *Deep Compositional Robotic Planners that Follow Natural Language Commands.*
Yen-Ling Kuo, Andrei Barbu, Boris Katz.
International Conference on Robotics and Automation (**ICRA**), 2020.
- (C16) *Deep Sequential Models for Sampling-based Planning.*
Yen-Ling Kuo, Andrei Barbu, Boris Katz.
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2018.
- (C17) *Resource-bounded Crowd-sourcing of Commonsense Knowledge.*
Yen-Ling Kuo, Jane Yung-jen Hsu.
International Joint Conference on Artificial Intelligence (**IJCAI**), 2011.

Refereed Short and Workshop Papers

- (W1) *Baba Is AI: Break the Rules to Beat the Benchmark.*
Nathan Cloos, Meagan Jens, Michelangelo Naim, **Yen-Ling Kuo**, Ignacio Cases, Andrei Barbu, Christopher J. Cueva.
ICML Workshop on LLMs and Cognition, 2024.
- (W2) *A Transformer-Based Model for the Prediction of Human Gaze Behavior on Videos.*
Suleyman Ozdel*, Yao Rong*, Berat Mert Albaba, **Yen-Ling Kuo**, Xi Wang, Enkelejda Kasneci.
ACM Symposium on Eye Tracking Research & Applications (ETRA), 2024.
- (W3) *Gaze-Guided Graph Neural Network for Action Anticipation Conditioned on Intention.*
Suleyman Ozdel*, Yao Rong*, Berat Mert Albaba, **Yen-Ling Kuo**, Xi Wang, Enkelejda Kasneci.
ACM Symposium on Eye Tracking Research & Applications (ETRA), 2024.
- (W4) *Imagined Subgoals for Hierarchical Goal-Conditioned Policies.*
Xuhui Kang, Wenqian Ye, **Yen-Ling Kuo**.
CoRL Workshop on Learning Effective Abstractions for Planning (LEAP), 2023.
- (W5) *Reconstruction of 3D Interaction Models from Images Using Shape Prior.*
Mehrshad Mirmohammadi, Parham Saremi, **Yen-Ling Kuo**, Xi Wang
IEEE/CVF ICCV Workshop on Recovering 6D Object Pose (R6D), 2023
- (W6) *Toward Modeling the Emergence of Symbolic Communication.*
Emily Cheng, **Yen-Ling Kuo**, Ignacio Cases, Boris Katz, Andrei Barbu.
ICRA Workshop on Social Intelligence in Humans and Robots, 2021.

- (W7) [MovIPrint: Move, Explore and Fabricate](#).
Yen-Ting Cho, **Yen-Ling Kuo**, Yen-Ting Yeh, and Yi-Chin Lee.
ACM International Conference on Multimedia (ACM-MM), 2019.
- (W8) [Contextual Commonsense Knowledge Acquisition from Social Content by Crowd-sourcing Explanations](#).
Yen-Ling Kuo, Jane Yung-jen Hsu, Fuming Shih.
AAAI Workshop on Human Computation (HCOMP), 2012.
- (W9) [Community-based Game Design: Experiments on Social Games for Commonsense Data Collection](#).
Yen-Ling Kuo, Kai-yang Chiang, Cheng-wei Chan, Jong-Chuan Lee, Rex Wang, Edward Shen, Jane Yung-jen Hsu.
KDD Workshop on Human Computation (HCOMP), 2009.

Patent

- (P1) [Deep Compositional Robotic Planners that Follow Natural Language Commands](#).
Yen-Ling Kuo, Boris Katz, and Andrei Barbu.
US Patent App. 17/112,699.

HONORS

- 2024 **Outstanding Paper Award**, *Annual Meeting of the Association for Computational Linguistics (ACL)*
- 2024 **AAAI New Faculty Highlights**
- 2022 **Anita Jones Junior Faculty Fellowship**, *University of Virginia*
- 2022 **Outstanding Reviewer**, *International Conference on Machine Learning*
Top 10% of the reviewers.
- 2021 **Best Paper Honorable Mention**, *ACM Conference on Creativity & Cognition*
Top 5% of the submissions.
- 2019 **Top 10%**, *ICFP Programming Contest 2019*
With Eric Stansifer, MIT.
- 2018 – 2022 **CBMM Siemens Graduate Fellowship**, *Siemens Healthineers*
Awarded to one graduate student at MIT CBMM ([announcement on CBMM website](#)).
- 2018 – 2020 **MIT Sandbox Innovation Fund**, *Massachusetts Institute of Technology*
Developed physics simulations and stories in VR for STEM education.
Exhibited at National Taiwan Science Education Center (year-long),
Pacific Science Center (one day), and Clippers SoCal Science Festival (two days).
Built an interactive webXR experience with Smithsonian about Apollo 11.
- 2016 **MIT Greater China Computer Science Fellowship**, *Massachusetts Institute of Technology*
- 2012 **Best Master Thesis Award**, *Taiwanese Association of Artificial Intelligence*
Awarded annually to three master students in AI research among all universities in Taiwan.
- 2011 **Irving T. Ho Memorial Scholarship**, *Irving T. Ho Memorial Foundation*
- 2011 **Google Anita Borg Memorial Scholarship**, *Google Inc.*
- 2010 **Outstanding Teaching Assistant Award**, *Department of CSIE, NTU*

SERVICES

Organizers

10/2024	ECCV Workshop on Human-inspired Computer Vision
03/2024	AAAI Spring Symposium on Empowering Machine Learning and Large Language Models with Domain and Commonsense Knowledge (AAAI-MAKE 2024)
08/2023 – Now	UVA AI & Machine Learning Seminar
07/2023	AAAI Summer Symposium on Embodied Intelligence
09/2018 – 06/2021	MIT Discussion Group on Language and Computation

Reviewer & Program Committee

IEEE Robotics and Automation Letters: 2019, 2020, 2021
 IEEE Transactions on Pattern Analysis and Machine Intelligence: 2023
 Frontiers Social Physics: 2021
 ICRA: 2020, 2021, 2022, 2023
 IROS: 2019, 2022
 CoRL: 2022, 2023
 RSS: 2024
 AAAI: 2016, 2022, 2023, 2024
 NeurIPS: 2021, 2022, 2023
 ICLR: 2022, 2023, 2024
 ICML: 2022, 2023, 2024
 IJCAI: 2019
 ACL: 2024
 SouthNLP: 2024
 IUI: 2013, 2019
 CHI: 2021
 C&C: 2021
 RSS Workshop on Social Intelligence in Humans and Robots: 2023

Mentor

MIT Summer Research Program for Brain and Cognitive Science	Jun 2018 – Aug 2018
MIT Undergraduate Women in EECS Buddy Program	2018

Departmental Services

Postdoc and Graduate Student Council, MIT CSAIL	2021 – 2022
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Other Services

Panel of “Navigating the Frontiers of Artificial Intelligence: AI’s Advantages, Potential and Associated Risks”, UVA Center for Politics	Oct 2023
Participant & Google Interviewer, Grace Hopper Celebration of Women in Computing	Oct 2015
Tech Intern Mentor & Interviewer, Google Inc.	2013 – 2016
President, AIESEC (International Association of Students in Economics and Management)	2007 – 2008
National Taiwan University Local Committee	

SUPERVISION

Doctral Students

Xuhui Kang, UVA CS	Feb 2023 – Now
Sean Sung-Wook Lee, UVA CS	Sep 2023 – Now
Yufeng Gao, UVA CS	Jan 2024 – Now

Master’s Students

Klaus Peng, UVA CS	Jan 2024 – Now
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Tongxuan Tian, UVA CS	Sep 2023 – Now
Frithiof Ekström, Master in Data Science, ETH Zürich (<i>co-advise with Xi Wang</i>) <i>Part Affordance Learning from Geometry</i>	2022
Razvan-George Pasca, Master in Computer Science, ETH Zürich (<i>co-advise with Xi Wang</i>) <i>INTENT - Interaction TENDency towards Targets</i>	2022
Emily Cheng, MEng in EECS, MIT (<i>co-advise with Ignacio Cases</i>) <i>Modeling the Emergence of Symbolic Communication</i>	2021
Bert Chen, Master in Computer Science, National Taiwan University (<i>co-advise with Jane Hsu</i>) <i>Drug-Drug Interaction Discovery using Entity-based Embeddings from BERT</i>	2020
Sabrina Chen, Master in Data Science, HTW Berlin <i>Aspect-based Sentiment Analysis: An Unsupervised Approach to Expand Sentiment Lexicon</i>	2020
Yu-Siang Wang, Master in Applied Computing, University of Toronto <i>Look-ahead Decoders for Maximum-likelihood Sequence Models</i>	2019

Undergraduate Researchers

Gang-Mu Liu, UVA Math & CS	Mar 2024 – Now
Supported by Ingrassia Family Research Grants for Echols Scholars	
Yuyan Wang, UVA CS & Stats	Feb 2024 – Now
Luke Kaplan, UVA CS & Stats	Feb 2024 – Now
Eric Li, UVA CS	Apr 2024 – Aug 2024
Matthew Tzong, UVA CS	Feb 2024 – May 2024
Anjini Verdia, UVA CpE	Jan 2024 – Jul 2024
Supported by Dean’s Undergraduate Engineering Summer Fellowship	
Mehrshad Mirmohammadi, Undergrad Intern, ETH Zürich (<i>co-advise with Xi Wang</i>)	2022
Parham Saremi, Undergrad Intern, ETH Zürich (<i>co-advise with Xi Wang</i>)	2022
Audrey Douglas, UROP, MIT (<i>co-advise with Lucia Schiatti</i>)	2022
Daniel Sun, UROP, MIT	2019
Victor Turbiner, Undergrad Intern, then at Stanford	2019 Summer
Michael Saterson, MIT Summer Research Program, City University of New York	2018 Summer
Justin Yu, UROP, MIT	2018

PhD Committees

Dane Williamson, UVA CS: Qualification (2024)
Aidan San, UVA CS: Qualification (2023)
Lauren Bramblett, UVA Systems and Information Engineering: Proposal (2023)
Wanyu Du, UVA CS: Proposal (2023), Dissertation (2024)
Zhendong Cho, UVA CS: Proposal (2023), Dissertation (2024)

Master’s Thesis Committees

John Shen, UVA CS (2024)
John Chrosniak, UVA CS (2023)

INVITED TALKS

Learning Representations for Robust and Flexible Human-Robot Interaction

AAAI New Faculty Highlight Program	Feb 2024
College of Intelligent Computing, Chang Gung University	Dec 2023
TAAI Young Women Rising Star in AI	Nov 2023
Link Lab Research Day, University of Virginia	Oct 2023

Teaching Robots to Infer about Futures for Robust Human-AI Interaction

TAAI AI Forum	May 2024
AAAI Summer Symposium on Embodied Intelligence	Jul 2023
Possibilities in Human-AI Interaction: From AI & Robots to Clothing & Design	
WIE Lunch	May 2024
Fun AI 2024 Keynote	Feb 2024
Generalizable Human-AI Interactions with Compositional Learning	
Agency for Science, Technology and Research (A*STAR), Singapore	Jul 2023
Department of Electrical Engineering, National Taiwan University	Nov 2022
College of Intelligent Computing, Chang Gung University	Sep 2022
University of Virginia	Apr 2022
George Mason University	Mar 2022
University of Texas at Austin	Feb 2022
Using Language to Understand the World and the Brain	
Center for Brains, Minds, and Machines, MIT	2021

TEACHING

Instructor, University of Virginia	
CS 6501: Learning for Interactive Robots	Fall 2024
CS 4710: Artificial Intelligence	Spring 2024
CS 6501: Learning for Interactive Robots	Fall 2023
Participant, University of Virginia	
Center for Teaching Excellence: Spark program	Aug 2024
Instructor, Chang Gung University	
Robot Learning and Interaction (Graduate-level)	Spring 2023
Introduction to Artificial Intelligence (Undergraduate-level, medical school)	Fall 2022
Introduction to Artificial Intelligence (Graduate-level)	Fall 2022
Teaching Assistant, Marine Biology Lab	
Brains, Minds, and Machines Summer Course	Aug 2017, 2018, 2019, 2022
Led and taught Deep Learning and Reinforcement Learning tutorials.	
Supervised projects of graduate students and postdocs from computer science, cognitive science, and neuroscience.	
Teaching Assistant, Massachusetts Institute of Technology	
Aspects of a Computational Theory of Intelligence	Fall 2018
Teaching Assistant, National Taiwan University	
Artificial Intelligence	Spring 2010, 2011
Advanced Artificial Intelligence	Fall 2010

SELECTED PRESS

UVA and the Toyota Research Institute Aim To Give Your Car the Power To Reason. UVA Engineering News	2024
https://engineering.virginia.edu/news-events/news/uva-and-toyota-research-institute-aim-give-your-car-power-reason	
Scientists are trying to give robots social skills. Discover Magazine	2022
https://www.discovermagazine.com/technology/scientists-are-trying-to-give-robots-social-skills	

Giving robots social skills. MIT News https://news.mit.edu/2021/robots-social-skills-1105	2021
A robotic planner that responds to natural language commands. Tech Xplore https://techxplore.com/news/2020-03-robotic-planner-natural-language.html	2020
Combining artificial intelligence with their passions – Robots that understand language. MIT News https://cbmm.mit.edu/news-events/news/combining-artificial-intelligence-their-passions-mit-news	2019
Model helps robots navigate more like humans do. MIT News https://news.mit.edu/2018/model-helps-robots-navigate-like-humans-1004	2018