

Alexander Y. Ku, Curriculum Vitae

Email address: alexku@princeton.edu

Last updated: July, 2025

Overview

My research focuses on the computational principles underlying cognitive flexibility and long-term efficiency in humans, with the goal of translating these insights into building continually adaptive AI systems.

Education

PhD in Psychology & Neuroscience, Princeton University, 2028 (expected)

Doctoral advisors: Thomas L. Griffiths & Jonathan D. Cohen

MS in Electrical Engineering & Computer Science, UC Berkeley, 2018

BA in Computer Science, UC Berkeley, 2017

Research Appointments

Research Scientist, Google DeepMind, 2018–present

Research Intern, Google Brain, Summer 2018

Research Intern, Google Brain, Summer 2017

Publications

Peer-Reviewed Journal Articles

- [13] Jiahui Yu, Yuanzhong Xu, Jing Yu Koh, Thang Luong, Gunjan Baid, Zirui Wang, Vijay Vasudevan, Alexander Ku, Yinfei Yang, Burcu Karagol Ayan, et al. “Scaling autoregressive models for content-rich text-to-image generation”. In: *Transactions on Machine Learning Research* (2022).
- [25] Ryan Poplin, Pi-Chuan Chang, David Alexander, Scott Schwartz, Thomas Colthurst, Alexander Ku, Dan Newburger, Jojo Dijamco, Nam Nguyen, Pegah T Afshar, et al. “A universal SNP and small-indel variant caller using deep neural networks”. In: *Nature biotechnology* 36.10 (2018), pp. 983–987.

Peer-Reviewed Conference Proceedings

- [5] Declan Campbell, Sunayana Rane, Tyler Giallanza, Nicolò De Sabbata, Kia Ghods, Amogh Joshi, Alexander Ku, Steven M Frankland, Thomas L Griffiths, Jonathan D Cohen, et al. “Understanding the Limits of Vision Language Models Through the Lens of the Binding Problem”. In: *The Thirty-Eighth Annual Conference on Neural Information Processing Systems*. 2024.

- [7] Yasumasa Onoe, Sunayana Rane, Zachary Berger, Yonatan Bitton, Jaemin Cho, Roopal Garg, Alexander Ku, Zarana Parekh, Jordi Pont-Tuset, Garrett Tanzer, et al. "DOCCI: Descriptions of Connected and Contrasting Images". In: *The 18th European Conference on Computer Vision ECCV 2024*. 2024.
- [8] Sunayana Rane, Alexander Ku, Jason Baldridge, Ian Tenney, Tom Griffiths, and Been Kim. "Can Generative Multimodal Models Count to Ten?" In: *Proceedings of the Annual Meeting of the Cognitive Science Society*. Vol. 46. 2024.
- [9] Jiahui Yu, Vijay Vasudevan, Alexander Yeong-shiuh Ku, Yonghui Wu, Jason Michael Baldridge, Yuanzhong Xu, Jing Yu Koh, Thang Minh Luong, Gunjan Baid, Zirui Wang, et al. *Vector-Quantized Image Modeling*. US Patent App. 18/698,997. Dec. 2024.
- [10] Siddhartha Datta, Alexander Ku, Deepak Ramachandran, and Peter Anderson. "Prompt expansion for adaptive text-to-image generation". In: *Proceedings of the 62nd Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*. 2023.
- [11] Zi Wang, Alexander Ku, Jason Baldridge, Thomas L Griffiths, and Been Kim. "Gaussian Process Probes (GPP) for Uncertainty-Aware Probing". In: *Thirty-seventh Conference on Neural Information Processing Systems*. 2023.
- [12] Aishwarya Kamath, Peter Anderson, Su Wang, Jing Yu Koh, Alexander Ku, Austin Waters, Yinfei Yang, Jason Baldridge, and Zarana Parekh. "A New Path: Scaling Vision-and-Language Navigation with Synthetic Instructions and Imitation Learning". In: *The IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023*. 2022.
- [14] Alexander Ku, Peter Anderson, Jordi Pont-Tuset, and Jason Baldridge. "Pangea: The panoramic graph environment annotation toolkit". In: *Proceedings of the Second Workshop on Advances in Language and Vision Research*. 2021.
- [15] Jiahui Yu, Xin Li, Jing Yu Koh, Han Zhang, Ruoming Pang, James Qin, Alexander Ku, Yuanzhong Xu, Jason Baldridge, and Yonghui Wu. "Vector-quantized image modeling with improved vqgan". In: *The Tenth International Conference on Learning Representations*. 2021.
- [16] Ming Zhao, Peter Anderson, Vihan Jain, Su Wang, Alexander Ku, Jason Baldridge, and Eugene Ie. "On the evaluation of vision-and-language navigation instructions". In: *Proceedings of the 16th Conference of the European Chapter of the Association for Computational Linguistics: Main Volume*. 2021.
- [17] Alexander Ku, Peter Anderson, Roma Patel, Eugene Ie, and Jason Baldridge. "Room-across-room: Multilingual vision-and-language navigation with dense spatiotemporal grounding". In: *Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP)*. 2020.

- [18] Haoshuo Huang, Vihan Jain, Harsh Mehta, Alexander Ku, Gabriel Magalhaes, Jason Baldrige, and Eugene Ie. “Transferable representation learning in vision-and-language navigation”. In: *Proceedings of the IEEE/CVF international conference on computer vision*. 2019, pp. 7404–7413.
- [19] Vihan Jain, Gabriel Magalhaes, Alex Ku, Ashish Vaswani, Eugene Ie, and Jason Baldrige. “Stay on the Path: Instruction Fidelity in Vision-and-Language Navigation”. In: *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics*. 2019.
- [20] Gabriel Magalhaes, Vihan Jain, Alexander Ku, Eugene Ie, and Jason Baldrige. “General evaluation for instruction conditioned navigation using dynamic time warping”. In: *Advances in Neural Information Processing Systems Workshop on Visually Grounded Interaction and Language*. 2019.
- [22] Niki Parmar, Ashish Vaswani, Jakob Uszkoreit, Łukasz Kaiser, Noam Shazeer, Alexander Ku, and Dustin Tran. “Image Transformer”. In: *Proceedings of the 35th International Conference on Machine Learning*. 2018.
- [23] Joshua C Peterson, Jordan W Suchow, Krisha Aghi, Alexander Y Ku, and Thomas L Griffiths. “Capturing human category representations by sampling in deep feature spaces”. In: *Proceedings of the 40th Annual Meeting of the Cognitive Science Society (CogSci 2018)*. 2018.
- [24] Joshua Peterson, Krishan Aghi, Jordan Suchow, Alexander Ku, and Thomas Griffiths. “Sampling from object and scene representations using deep feature spaces”. In: *Journal of Vision* 18.10 (2018), pp. 403–403.

Patents

- [4] Deepak Ramachandran, Alexander Ku, Peter James Anderson, and Siddhartha Datta. *Generating images by expanding prompts using generative neural networks*. US Patent App. 18/950,898. May 2025.
- [6] YU Jiahui, Xin Li, Han Zhang, Vijay Vasudevan, Alexander Yeong-Shiuh Ku, Jason Michael Baldrige, Yuanzhong Xu, Jing Yu Koh, Thang Minh Luong, Gunjan Baid, et al. *Vector-Quantized Image Modeling*. US Patent App. 18/520,083. Apr. 2024.

Preprints / Manuscripts Under Review

- [1] Alexander Y Ku, Thomas L Griffiths, and Stephanie CY Chan. “Predictability Shapes Adaptation: An Evolutionary Perspective on Modes of Learning in Transformers”. In: *arXiv preprint arXiv:2505.09855* (2025).
- [2] Alexander Ku, Declan Campbell, Xuechunzi Bai, Jiayi Geng, Ryan Liu, Raja Marjeh, R Thomas McCoy, Andrew Nam, Ilia Sucholutsky, Veniamin Veselovsky, et al. “Using the tools of cognitive science to understand large language models at different levels of analysis”. In: *arXiv preprint arXiv:2503.13401* (2025).

- [3] Andrew K Lampinen, Arslan Chaudhry, Stephanie CY Chan, Cody Wild, Diane Wan, Alex Ku, Jörg Bornschein, Razvan Pascanu, Murray Shananhan, and James L McClelland. “On the generalization of language models from in-context learning and finetuning: a controlled study”. In: *arXiv preprint arXiv:2505.00661* (2025).

Teaching & Mentorship

Teaching Assistant

PSY 360: Computational Models of Cognition, Princeton University, Fall 2025
NEU 502A: Cognitive Neuroscience, Princeton University, Spring 2025
PSY 254: Developmental Psychology Princeton University, Fall 2024
Data 8: Data Science, UC Berkeley, Fall 2017
CS 188: Artificial Intelligence, UC Berkeley, Spring 2017
Data 8: Data Science, UC Berkeley, Fall 2016

Mentorship

Host for 4 research interns at Google DeepMind
Declan Campbell, Summer 2025
Siddhartha Datta, Summer 2023
Sunayana Rane, Summer 2022
Roma Patel, Summer 2019

Professional Service

Reviewing: NeurIPS, ICLR, ICML, ACL, EMNLP