

# Alexander Ku

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## Education

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

BA in Computer Science from UC Berkeley, 2017

## Research Interests

I'm interested in understanding the mechanisms that enable abstract conceptualization in both people and machine learning models. In particular, how concepts form via sensory-motor experiences, language use, and a combination thereof. My goal is to understand how concepts are represented, organized, and flexibly used to make inductive inferences (i.e. "generalize" in the machine learning setting). As machine learning models become increasingly powerful, they become an exciting testbed to validate theories in cognitive science. My current research uses tools from deep learning interpretability to identify whether deep neural networks (e.g. models for text-to-image generation) learn abstract representations that resemble those described in computational models of human behavior.

## Professional Positions

Research Software Engineer at Google Research, Since December 2018

Grounded language understanding and image generation.

Research Intern at Google Brain, Summer 2018 and Summer 2017

Variant calling, genome assembly, and image generation.

Graduate Student Researcher at UC Berkeley, Fall 2016 to Spring 2018

Computational cognitive science and computational biology.

Graduate Student Instructor for Data 8 at UC Berkeley, Fall 2017 and Fall 2016

Foundations of data science.

Graduate Student Instructor for CS 188 at UC Berkeley, Spring 2017

Introduction to artificial intelligence.

## Publications

### Journal articles

J Yu, Y Xu, JY Koh, T Luong, G Baid, Z Wang, V Vasudevan, **A Ku**, Y Yang, BK Ayan, B Hutchinson, W Han, Z Parekh, X Li, H Zhang, J Baldridge, Y Wu (2022). Scaling autoregressive models for content-rich text-to-image generation. *Under review*.

R Poplin, P Chang, D Alexander, S Schwartz, T Colthurst, **A Ku**, D Newburger, J Dijamco, N Nguyen, PT Afshar, SS Gross, L Dorfman, CY McLean, MA DePristo (2018). A universal SNP and small-indel variant caller using deep neural networks. *Nature Biotechnology*, 36 (10), 983.

### Conference papers

A Kamath, P Anderson, S Wang, JY Koh, **A Ku**, A Waters, Y Yang, J Baldridge, Z Parekh (2022). A New Path: Scaling Vision-and-Language Navigation with Synthetic Instructions and Imitation Learning. *Under review*.

J Yu, X Li, JY Koh, H Zhang, R Pang, J Qin, **A Ku**, Y Xu, J Baldridge, Y Wu (2021). Vector-quantized image modeling with improved vqgan. *Tenth International Conference on Learning Representations (ICLR'21)*.

**A Ku**, P Anderson, J Pont-Tuset, J Baldridge (2021). Pangea: The panoramic graph environment annotation toolkit. *Proceedings of the Second Workshop on Advances in Language and Vision Research (NAACL'21 ALVR)*.

M Zhao, P Anderson, V Jain, S Wang, **A Ku**, J Baldridge, E Ie (2021). On the evaluation of vision-and-language navigation instructions. *The 16th Conference of the European Chapter of the Association for Computational Linguistics (EACL'21)*.

**A Ku**<sup>\*</sup>, P Anderson<sup>\*</sup>, R Patel, E Ie, J Baldridge (2020). Room-Across-Room: Multilingual Vision-and-Language Navigation with Dense Spatiotemporal Grounding. *Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP'20)*.

H Huang<sup>\*</sup>, V Jain<sup>\*</sup>, H Mehta, **A Ku**, G Magalhaes, J Baldridge, E Ie (2019). Transferable Representation Learning in Vision-and-Language Navigation. *Proceedings of the IEEE International Conference on Computer Vision (ICCV'19)*.

G Magalhaes, V Jain, **A Ku**, E Ie, J Baldridge (2019). Effective and General Evaluation for Instruction Conditioned Navigation using Dynamic Time Warping. *Advances in Neural Information Processing Systems Workshop on Visually Grounded Interaction and Language (NeurIPS'19 ViGIL)*.

V Jain\*, G Magalhaes\*, **A Ku\***, A Vaswani, E Ie, J Baldridge (2019). Stay on the Path: Instruction Fidelity in Vision-and-Language Navigation. *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics (ACL'19)*.

N Parmar\*, A Vaswani\*, J Uszkoreit, Ł Kaiser, N Shazeer, **A Ku**, D Tran (2018). Image Transformer. *Proceedings of the 35th International Conference on Machine Learning (ICML'18)*.

JC Peterson, JW Suchow, K Aghi, **AY Ku**, TL Griffiths (2018). Capturing human category representations by sampling in deep feature spaces. *Proceedings of the 40th Annual Conference of the Cognitive Science Society (CogSci'18)*.

## Open Source Software

DeepVariant: [github.com/google/deepvariant](https://github.com/google/deepvariant)

Analysis pipeline for calling genetic variants from DNA sequencing data.

Nucleus: [github.com/google/nucleus](https://github.com/google/nucleus)

Python and C++ library for processing genomics data in TensorFlow.

Pangea: [github.com/google-research/pangea](https://github.com/google-research/pangea)

Web toolkit for annotating in interactive virtual environments.