# Rajeev V. Rikhye, Ph.D.

Machine Learning · Consumer Health Research · Generative AI

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## Summary

I am a MIT-trained AI/ML researcher. As a tech lead, I have successfully launched numerous consumer-facing health products, including a new dermatology experience on Google Lens, which allows users to better understand their skin conditions. I have also authored numerous papers in computational neuroscience, speaker identification and medical AI technologies. I am passionate about developing, evaluating and deploying novel AI personal assistants.

More broadly my research interests are: **1.** generative AI **2.** LLM evaluation and **3.** personalized assistants

## Work Experience

### Google DeepMind, Gemini Applications

*Seattle, WA*

Senior Machine Learning Engineer — *Nov 2024 - Present*

- Leading the training and evaluation of Gemini models.

### Apple AI/ML, Health AI

*Seattle, WA*

Senior Research Scientist — *March 2024 - Nov 2024*

- Leading the development of various consumer health AI products using the latest on-device generative AI technologies.
- Managing a team of 3 ML engineers, and coordinating tasks across multiple cross-functional partners including Clinical and Design teams.
- Spearheading the development of LLM auto-grader models and human annotation pipelines for RL-HF.
- Responsible for developing q-LoRA and end-to-end fine-tuned LLMs for on-device personalized health assistants.

### Google Research, Health AI

*Mountain View, CA*

Senior Machine Learning Engineer — *October 2020 - March 2024*

- Senior Tech Lead on the Consumer Health Research Team where I am leading evaluation efforts (autograder, RL-HF and red-teaming) to develop auto-rater models for consumer health Large Language Models.
- Lead ML Engineer on the Health AI team at Google Research where I research and develop novel machine learning models for consumer health applications. I also lead a collaborative effort with partners at Stanford Medicine.
- Successfully launched a new smart-phone based dermatology experience on *Google Lens* and was the tech-lead for *DermAssist*.
- From 2020 - 2022, I developed deep-learning based embedded speech technologies for end-to-end speech recognition, in particular speaker identification and separation. I lead the launch of *QuickPhrases* on Google Home.
- Consistently ranked among the top 5% of engineers at Google.

### Vicarious AI*

*Union City, CA*

Research Scientist — *October 2018 - October 2020*

- Developed novel computer vision algorithms for object detection, semantic segmentation and pose estimation with applications to robotics.
- Spearheaded independent research efforts in Computational Neuroscience including a novel generative model for sequential data, with applications to navigation, planning and language processing.
- (* Acquired by Google DeepMind in April 2022.)

## Education

### Massachusetts Institute of Technology

*Cambridge, MA*

Doctor of Philosophy (Ph. D.) in Neuroscience — *August 2012 - July 2016*

- **GPA: 5.0/5.0**. Advanced course-work in computer vision, machine learning, inference and statistics
- Thesis: The mechanisms of reliable coding in mouse visual cortex. Advisor: Prof. Mriganka Sur
- Supported by the HHMI International Student Predoctoral Fellowship

### Imperial College London

*London, UK*

Master of Engineering (M. Eng.) in Biomedical Engineering with Electrical Engineering — *October 2006 - October 2010*

- **First Class Honors**. Top 1% of graduating class
- Thesis: Modeling synaptic calcium dynamics. Advisor: Dr. Weifeng Xu
- Visiting scholar at MIT from Aug 2009 – Aug 2010 GPA: 4.9/5.0

# Postdoctoral Research Experience

## Massachusetts Institute of Technology

*Cambridge, MA*

Postdoctoral Research Fellow

*July 2017 - October 2018*

- Led two independent research projects aimed at understanding the role of cortico-thalamic neural circuits in rule-guided behaviors.
- Built multiple data analysis pipelines and computational tools to parse complex and high-dimensional neural data.

## Howard Hughes Medical Institute / Janelia Research Campus

*Ashburn, VA*

Research Specialist

*July 2016 - July 2017*

- Engineered an image analysis pipeline in JavaScript to rapidly detect and segment neurons in calcium and voltage imaging data-sets.
- Developed an end-to-end data analysis pipeline to screen for novel genetically-encoded voltage indicators.

# Honors & Fellowships

2021 **Google Patent Milestone Award**, Google

2014 **International Student Research Fellowship**, Howard Hughes Medical Institute

2012 **Henry E. Singleton Fellowship**, Dept. Of Brain and Cognitive Sciences, MIT

2009 **Tensor Society Mathematics for Engineers Award**, Imperial College London

# Publications

## Journal Articles

Differences between Patient and Clinician Submitted Images: Implications for Virtual Care of Skin Conditions
**Rikhye, Rajeev V.** Grace Hong, Aaron Loh, ... Yun Liu, Justin Ko, Steven Lin
*Mayo Clinic Proceedings: Digital Health* (2024)

Closing the AI generalization gap by adjusting for dermatology condition distribution differences across clinical settings
**Rikhye, Rajeev V.** Aaron Loh, ... Yun Liu, Justin Ko, Steven Lin
*Lancet eBioMedicine* (2024)

Reinforcement-guided learning in frontal neocortex: emerging computational concepts
Abhishek Banerjee, **Rikhye, Rajeev V.** Adam Marblestone
*Current Opinion in Behavioral Sciences* (2021)

Clone-structured graph representations enable flexible learning and vicarious evaluation of cognitive maps
Dileep George, **Rikhye, Rajeev V.** Nishad Gothoskar, J. Swaroop Guntupalli, Antoine Dedieu, Miguel Lázaro-Gredilla
*Nature Communications* (2021)

Reliable sensory processing in mouse visual cortex through inhibitory interactions between Somatostatin and Parvalbumin interneurons
**Rikhye, Rajeev V**, Murat Yildirim, Vincent Breton-Provencher, Ming Hu, Mriganka Sur
*The Journal of Neuroscience* 41.42 (2021)

Prefrontal computation as active inference
Thomas Parr, **Rikhye, Rajeev V**, Michael M Halassa, Karl J Friston
*Cerebral Cortex* (2020)

Thalamic regulation of switching between cortical representations enables cognitive flexibility
**Rikhye, Rajeev V**, Aditya Gilra, Michael M Halassa
*Nature Neuroscience* 21.12 (2018)

Toward an integrative theory of thalamic function
**Rikhye, Rajeev V**, Ralf D Wimmer, Michael M Halassa
*Annual Review of Neuroscience* 41 (2018)

Jointly reduced inhibition and excitation underlies circuit-wide changes in cortical processing in Rett syndrome
Abhishek Banerjee, **Rikhye, Rajeev V**, Vincent Breton-Provencher, Xin Tang, Chenchen Li, Keji Li, Caroline A Runyan, Zhanyan Fu, Rudolf Jaenisch, Mriganka Sur
*Proceedings of the National Academy of Sciences* 113.46 (2016)

Spatial Correlations in Natural Scenes Modulate Response Reliability in Mouse Visual Cortex
**Rikhye, Rajeev V**, Mriganka Sur
*The Journal of Neuroscience* 35.43 (2015)

## Conference Proceedings

Differences between Patient and Clinician Submitted Images: Implications for Virtual Care of Skin Conditions
**Rikhye, Rajeev V**, al

*AMIA 2023 Annual Symposium*

Personal VAD 2.0: Optimizing Personal Voice Activity Detection for On-Device Speech Recognition
Shaojin Ding, **Rikhye, Rajeev V**, Quan Wang, Qiao Liang, Yanzhang He, Ian McGraw
*Proc. Interspeech 2022*

Closing the Gap between Single-User and Multi-User VoiceFilter-Lite
**Rikhye, Rajeev V**, Quan Wang, Qiao Liang, Yanzhang He, Ian McGraw
*Speaker Odyssey 2022*

Multi-user VoiceFilter-Lite via Attentive Speaker Embedding
**Rikhye, Rajeev V**, Quan Wang, Qiao Liang, Yanzhang He, Ian McGraw
*IEEE ASRU 2021*

Personalized Keyphrase Detection using Speaker and Environment Information
**Rikhye, Rajeev V**, Quan Wang, Qiao Liang, Yanzhang He, Ian McGraw
*Proc. Interspeech 2021*

Memorize-Generalize: An online algorithm for learning higher-order sequential structure with cloned Hidden Markov Models
**Rikhye, Rajeev V**, J Swaroop Guntupalli, Nishad Gothoskar, Miguel Lázaro-Gredilla, Dileep George
*Conference on Cognitive Computational Neuroscience 2019*