Alexander Alemi

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Current position

2024-present	*Senior Research Scientist*, Google Deepmind

Previous experience

2018-2024	*Senior Research Scientist*, Google Research, Machine Perception
2016-2018	*Software Engineer*, Google, Mountain View, CA.
2015-2016	*Postodoc*, Disney Research, Boston
2009-2015	*Research Associate*, Laboratory of Atomic and Solid-State Physics (LASSP), Cornell
2015	*Research Intern*, Google, Mountain View, CA.
2014	*Research Intern*, Disney Reseach, Boston.

Areas of specialization

Neural Scaling Laws • Approximate Bayesian Inference • Information Theory & Deep Learning •
Representation Learning • Physics • Machine Learning • Python Programming

Education

2015	PhD in Physics, Cornell with Jim Sethna
2013	MSc in Physics, Cornell
2009	BSc in Physics, California Institute of Technology (Caltech)

Publications

2024 K Everett, L Xiao, M Worstman, AA Alemi, R Novak, PJ Liu, I Gur, J Sohl-Dickstein, LP Kaelbling, J Pennington "Scaling Exponents Across Parameterizations and Optimizers" *ICML* arXiv:2407.05872

B Lester, J Lee, AA Alemi, J Pennington, A Roberts, J Sohl-Dickstein, N Constant "Training LLM over Neurally Compressed Text" arXiv:2404.03626

2023 PAGI "Beyond Human Data: Scaling Self-Training for Problem-Solving with Language Models" *TMLR* arXiv:2312.06585

PAGI "Frontier Language Models are not Robust to Adversarial Arithmetic, or "What do I need to say to you so you agree 2+2=5?"" arXiv:2311.07587

M Wortsman, PAGI "Small-scale proxies for large-scale Transformer training instabilities" *ICLR 2024 oral* arXiv:2309.14322

I Seroussi, AA Alemi, M Helias, Z Ringel "Speed Limits for Deep Learning" arXiv:2307.14653

AA Alemi, B Poole "Variational Prediction" Submitted to AABI

2022 Y Ruan, S Singh, WR Morningstar, AA Alemi, S Ioffe, I Fischer, JV Dillon "Weighted Ensemble Self-Supervised Learning" *ICLR 2023*, arXiv:2211.09981

Y Du, D Ho, AA Alemi, E Jang, M Khansari "Bayesian Imitation Learning for End-to-End Mobile Manipulation" *ICML 2022*, arXiv:2202.07600

2021 I Korshunova, D Stutz, AA Alemi, O Wiles, S Gowal "A Closer Look at the Adversarial Robustness of Information Bottleneck Models" *ICML 2021 AML Workshop Poster*, arXiv:2107.05712

S Stanton, P Izmailov, P Kirichenko, AA Alemi, AG Wilson "Does Knowledge Distillation Really Work?" *NeurIPS2021*, arXiv:2106.05945

2020 AA Alemi, WR Morningstar, B Poole, I Fischer, JV Dillon "VIB is Half Bayes", *AABI 2021 Oral*, arXiv:2011.08711

WR Morningstar, AA Alemi, JV Dillon "PAC^m-Bayes: Narrowing the Empirical Risk Gap in the Misspecified Bayesian Region" *AISTATS2022*, arXiv:2021.09629

WR Morningstar, C Ham, AG Gallagher, B Lakshminarayanan, AA Alemi, JV Dillon "Density of States Estimation for Out-of-Distribution Detection", *AISTATS 2022 Oral*, arXiv:2006.09273

DS Karls, M Bierbaum, AA Alemi, RS Elliot, JP Sethna, EB Tadmor "The OpenKIM Processing Pipeline: A Cloud-Based Automatic Materials Property Computation Engine", *ChemPhys* arXiv:2002.05380

I Fischer, AA Alemi "CEB Improves Model Robustness", *Entropy*, arXiv:2002.05380

2019 R Novak, L Xiao, J Hron, J Lee, AA Alemi, J Sohl-Dickstein, SS Schoenholz "Neural Tangents: Fast and Easy Infinite Neural Networks in Python", *ICLR 2020* arXiv:1912.02803

AA Alemi "Variational Predictive Information Bottleneck", arXiv:1910.10831

R Shwartz-Ziv, AA Alemi "Information in Infinite Ensembles of Infinitely-Wide Networks", *AABI* arXiv:1911.09189

Z Dong, D Oktay, B Poole, AA Alemi "On Predictive Information in RNNs", arXiv:1910.09578

T Conte, E DeBenedictis, N Ganesh, T Hylton, JP Strachan, RS Williams, AA Alemi, L Altenberg, G Crooks, J Crutchfield, L del Rio, J Deutsch, M DeWeese, K Douglas, M Esposito, M Frank, R Fry, P Harsha, M Hill, C Kello, J Krichmar, S Kumar, SC Liu, S Lloyd, M Marsili, I Nemenman, A Nugent, N Packard, D Randall, P Sadowski, N Santhanam, R Shaw, A Stieg, E Stopnitzky, C Teuscher, C Watkins, D Wolpert, J Yang, Y Yufik, "Thermodynamic Computing", *CCC* arXiv:1911.01968

B Seybold, E Fertig, A Alemi, I Fischer, "Dueling Decoders: Regularizing Variational Autoencoder Latent Spaces", arXiv:1905.07478

I Fischer, A Alemi, JV Dillon, TFP Team, "Variational Autoencoders with Tensorflow Probability Layers", *Tensorflow Blog*

B Poole, S Ozair, A van den Oord, AA Alemi, G Tucker, "On Variational Bounds of Mutual Information", *ICML 2019* arXiv:1905.06922

CB Clement, M Bierbaum, KP O'Keeffe, AA Alemi, "On the Use of ArXiv as a Dataset", *ICLR 2019 workshop RLGM* arXiv:1905.00075

2018   AA Alemi, JV Dillon, I Fischer, "Uncertainty in the Variational Information Bottleneck", *UAI 2018 workshop on Uncertainty in Deep Learning, contributed oral* arXiv:1807.00906

AA Alemi, I Fischer, "TherML: Thermodynamics of Machine Learning", *ICML 2018 Workshop, contributed oral.*, arXiv:1807.04162

AA Alemi, I Fischer, "GILBO: One Metric to Measure Them All", *NIPS 2018 Spotlight* arXiv:1802.04874

JV Dillon, I Langmore, D Tran, E Brevdo, S Vasudevan, D Moore, B Patton, A Alemi, M Hoffman, RA Saurous, "TensorFlow Distributions", *arXiv:1711.10604*

S Abu-El-Haija, B Perozzi, R Al-Rfou, A Alemi, "Watch your step: Learning graph embeddings through attention", *NIPS 2018 Poster* arXiv:1710.09599

AA Alemi, B Poole, I Fischer, JV Dillon, RA Saurous, K Murphy, "Fixing a Broken ELBO", *Oral ICML 2018* arXiv:1711.00464

2017   LX Hayden, AA Alemi, PH Ginparg, JP Sethna, "Jeffrey's prior sampling of deep sigmoidal networks", *arXiv: 1705.10589*

K Fragkiadaki, J Huang, A Alemi, S Vijayanarasimhan, S Ricco, R Sukthankar, "Motion Prediction Under Multimodality with Conditional Stochastic Networks" *arXiv: 1705.02082*

M Bierbaum, BD Leahy, AA Alemi, I Cohen, JP Sethna, "Light Microscopy at Maximal Prediction", *PRX 7 (4), 041007*, arXiv: 1702.07336

C Szegedy, S Ioffe, V Vanhoucke, AA Alemi, "Inception-v4, Inception-ResNet and the Impact of Residual Connections on Learning." *AAAI, 4278-4284*, arXiv: 1602.07261

AA Alemi, I Fischer, JV Dillon, KP Murphy, "Deep Variational Information Bottleneck", *ICLR 2017*, arXiv: 1612.00410

B Poole, AA Alemi, J Sohl-Dickstein, A Angelova, "Improved generator objectives for GANS" *NIPS GAN Workshop 2016*, arXiv: 1612.02780

2016   R Shin, AA Alemi, G Irving, O Vinyals, "Tree-Structured Variational Autoencoder" *ICLR 2017 Submission*

G Irving, C Szegedy, AA Alemi, N EEn, F Chollet, J Urban, "Deepmath-deep sequence modesl for premise selection". *NIPS 2016*, arXiv: 1606.04442

2015   CJM Mathy, F Gonda, D Schmidt, N Derbinsky, AA Alemi, J Bento, FM Delle Fave, JS Yedidia, "SPARTA: Fast global planning of collision-avoiding robot trajectories". Learning, Inference and Control of Multi-Agent Systems Workshop, *NIPS 2015*

AA Alemi, "Zombies Reading Segmented Graphic Articles on the ArXiv". PhD Thesis, Cornell University

JM Cashore, X Zhao, AA Alemi, Y Liu, PI Frazier, "Clustering via Content-Augmented Stochastic Blockmodels". arXiv: 1505.06538

LX Hayden, R Chachra, AA Alemi, PH Ginsparg, JP Sethna, "Canonical Sectors and Evolution of Firms in the US Stock Markets". *Quantitative Finance*, arXiv: 1503.06205

AA Alemi, P Ginsparg, "Text Segmentation Based on Semantic Word Embeddings", arXiv: 1503.05543

AA Alemi, M Bierbaum, CR Myers, JP Sethna, "You Can Run, You Can Hide: The Epidemiology and Statistical Mechanics of Zombies", arXiv: 1503.01104. Phys Rev E 92. 052801

2014   A Taloni, AA Alemi, E Ciusani, JP Sethna, S Zapperi, CAM La Porta, "Mechanical Properties of Growing Melanocytic Nevi and the Progression to Melanoma", *PloS one*, 9 (4), e94229

2013   MM Baraldi, AA Alemi, JP Sethna, S Caracciolo, C La Porta, S Zapperi, "Growth and Form of Melanoma Cell Colonies", *Journal of Statistical Mechanics: Theory and Experiment*, 2013, 02, p02032

PY Huang, S Kurasch, JS Alden, A Shekhawat, AA Alemi, PL McEuen, JP Sethna, UTE Kaiser, DA Muller, "Imaging Atomic Rearrangements in Two-Dimensional Silica Glass: Watching Silica's Dance", *Science* 342, 6155 p224-227

2011   RS Ottens, V Quetschke, S Wise, AA Alemi, R Lundoc, G Mueller, DH Reitze, DB Tanner, BF Whiting, "Near-field radiative heat transfer between macroscopic planar surfaces", *Physical Review Letters* 107 (1), 014301

Talks

2023	*Information Theory for Representation Learning*, InfoCog Workshop @ NeurIPS 2023
	What's Missing? A Speculative Sketch of the Future of Machine Learning and Science ML and the Physical Sciences Workshop @ NeurIPS 2023
	Variational Prediction, AABI2023
	A Tale of Two Worlds: The Variational Approach to Machine Learning, UCF CRCV
	Inferential Engines - Theoretical Physics for Machine Learning, Aspen
2022	*PAC^m Bayes* - Your Model is Wrong Workshop, NeurIPS 2021
2021	*Machine Learning and Thermodynamcis* - Scientific Machine Learning Mini-Course (SciML) @ CMU
	VIB is Half Bayes - Advances in Approximate Bayesian Inference Symposium
2020	*Machine Learning and Thermodynamics* - Informal Statistical Physics Seminar, University of Maryland
	TherML - American Physical Society Topical Group on Data Science
	Variational Predictive Information Bottleneck - Information Theory and Applications Workshop
2019	*A Case for Compression* - NeurIPS Workshop on Information Theory and Machine Learning
	TherML - Machine Learning and Physics, Aspen
2018	*Focusing on the Representation* - Cornell AI Seminar
	Thermodynamics and Machine Learning - Machine Learning and Statistical Physics Workshop at CUNY
	Thermodynamics and Machine Leanring - Chez Pierre Seminar at MIT
	Thermodynamics and Machine Learning - Physics Seminar at Cornell
	Panelist at Advances in Approximate Bayesian Inference Symposium, colocated at NeurIPS.
	Fixing a BrokenELBO - ICML
	Uncertainty in VIB - UAI UDL Workshop
2015	*The Statistical Mechanics of Zombies* - APS March Meeting
2014	*Finding Structure in the ArXiv* - APS March Meeting
2012	*A Group Theoretic Approach to Nonlinear and Gradient Elastic Terms for Graphene and Carbon Nanotubes* - APS March Meeting
2006	*Why Venus has No Moon* - AAS Meeting

Community Contributions

2021-present	Action Editor at TMLR
2021	Area Chair, NeurIPS
2020	Co-organizer for NeurIPS Workshop: Deep Learning through Information Geometry
	Program Committee for Uncertainty in Deep Learning Workshop at ICML
2017-2023	Regular reviewer for ICML, ICLR, NeurIPS, UAI, AABI, TMLR, JMLR

Grants, honors & awards

2023	Expert Reviewer for TMLR
2021	Top Reviewer for UAI
	Expert Reviewer for ICML
2019	Best Reviewer, ICML
2010	Stephen and Margery Russel Distinguished Teaching Award
2009	Upperclass Merit Award
2008	Upperclass Merit Award
2007	Green Memorial Prize
2005	National Merit Scholar - Siemen's Scholar

Teaching & Outreach

2023	Brainiversity - Introduction to Statistics through Randomization
2022	Brainiversity - Order of Magnitude Physics
2021	Brainiversity - Information Theory
2019	Guest Lecturer for CS 294-131: Trustworthy Deep Learning (Special Topics in Deep Learning), Berkeley
2018	Life outside Academia Talk to Cornell Graduate Students
2015	GRASSHOPR - Computing with Bins and Beans
2014	Expanding Your Horizons - The Physics of Bubbles
2013	Expanding Your Horizons - The Physics of Bubbles
2012	Expanding Your Horizons - The Physics of Bubbles
	TA - Physics 2218 - Physics III: Thermodynamics, Statistical Mechanics and Wave Phenomenon
2011	Physics Department Teaching Assistant Training Coordinator
	Expanding Your Horizons - The Physics of Bubbles
	GRASSHOPR - ... And Physics for All
2010	Physics Department Teaching Assistant Training Trainer
	grader - Physics 3317 - Applications of Quantum Mechanics
	TA - Physics 2217 - Physics II: Electricity and Magnetism
2009	TA - Physics 2213 - Physics II: Heat/Electromagnitism