T. Anderson **Keller**

Kempner Institute Research Fellow

Website
akandykeller.github.io

Mail
TAKeller@
fas.harvard.edu

Twitter
@t_andy_keller

Telephone
+1 (925) 336 9079

Git
akandykeller

Programming
Python ★★★★★
C/C++ ★★★☆☆
Matlab ★★★☆☆

Packages
PyTorch, Tensorflow, JAX, Numpy, SciPy, Weights & Biases, Pandas, Scikit-learn

Interests
Comp. Neuroscience
Cognitive Science
Rep. Learning,

Languages
English ★★★★★
French ★★★★☆

Address
150 Western Ave,
Office 6.113
Allston, MA 02134

Academic Background

'23 - Present **Kempner Institute Research Fellow** Harvard University
Collaborators: Talia Konkle, Demba Ba

'18 - '23 **Ph.D. Machine Learning** University of Amsterdam
Supervisor: Max Welling
Thesis: Natural Inductive Biases for Artificial Intelligence

'15 - '17 **M.S. Computer Science** University of California San Diego
Supervisor: Garrison Cottrell
Thesis: Comparison and Fine-grained Analysis of Sequence Encoders for NLP

'11 - '15 **B.S. Computer Science (Honors)** California Institute of Technology
Related Coursework: Machine Learning, GPU Programming (CUDA), Stochastic Modeling

Industry Research

Jun. '22 - Oct. '22 **Research Science Intern** Apple
Developed "Homomorphic Self-Supervised Learning", a framework which subsumes data augmentation in self-supervised learning through structured equivariant representations.

Jun. '16 - Sept. '18 **Deep Learning Data Scientist** Intel Nervana
Researched symbol-binding in RNNs with fast-weight associative memory. Developed few-shot object localization models for live recognition and tracking of race cars.

Selected Publications

A Spacetime Perspective on Dynamical Computation *Nat. Comms. Perspective*
T. Anderson Keller, Terrence Sejnowski, Lyle Muller, & Max Welling. Aug, 2024.
<https://arxiv.org/abs/2409.13669>. In Submission.

Traveling Waves Encode the Recent Past and Enhance Sequence Learning
T. Anderson Keller, Lyle Muller, Terrence Sejnowski & Max Welling. *ICLR 2024*
<https://arxiv.org/abs/2309.08045>

Neural Waves Machines: Learning Spatiotemporally Structured Representations
T. Anderson Keller & Max Welling. Jan. 2023. *ICML 2023*
<https://openreview.net/forum?id=5tJSt3kn4s>

Locally Coupled Oscillatory Recurrent Neural Networks Learn to Exhibit Traveling Waves and Topographic Organization COSYNE 2023
T. Anderson Keller & Max Welling. Dec. 2022.
<https://akandykeller.github.io/papers/LocoRNN.pdf>

Topographic VAEs learn Equivariant Capsules *NeurIPS 2021*
T. Anderson Keller & Max Welling. 3 Sept 2021. <https://arxiv.org/abs/2109.01394>

Modeling Catagory-Selective Cortical Regions with TVAEs *SVRHM @ NeurIPS 2021*
T. Anderson Keller* , Qinghe Gao* & Max Welling. 25 Oct 2021. (**Best Paper Award**)
<https://arxiv.org/abs/2110.13911>

Predictive Coding with Topographic VAEs *Visual Inductive Priors Workshop ICCV 2021*
T. Anderson Keller & Max Welling. 26 Jul 2021. (**Oral**)
<https://openreview.net/pdf?id=WvUOFEESncx>

Additional Publications

Towards the Use of Relative Representations for Model-to-Brain Mappings *CCN 2024*
T. Anderson Keller, Talia Konkle & Colin Conwell. Aug. 2024.
<https://2024.ccneuro.org/pdf/492_Paper_authored_AnchorEmbeddings_CCN2024_named.pdf>

Homomorphic Self-Supervised Learning *TMLR 2023*
T. Anderson Keller, Xavier Suau & Luca Zapella. Oct. 2022.
<https://arxiv.org/abs/2211.08282>

Self Normalizing Flows *ICML 2021 & Beyond Backpropagation Workshop @ NeurIPS 2020*
T. Anderson Keller, Jorn W.T. Peters, Priyank Jaini, Emiel Hoogeboom, Patrick Forré, Max Welling. 14 Nov 2020. <https://arxiv.org/abs/2011.07248>

Image segmentation with traveling waves in an exactly solvable recurrent neural network *PNAS 2024, under review*
Luisa Liboni, Roberto Budzinski, Alexandra Busch, Sindy Lowe, T. Anderson Keller, Max Welling, & Lyle Muller. Nov. 2023.
<https://arxiv.org/abs/2311.16943>

Unsupervised Representation Learning from Sparse Transformation Analysis
Yue Song, T. Anderson Keller, Nicu Sebe & Max Welling. *Under Review, 2024*.

Flow Factorized Representation Learning *NeurIPS 2023*
Yue Song, T. Anderson Keller, Nicu Sebe & Max Welling. Nov. 2023.

Latent Traversals in Generative Models as Potential Flows *ICML 2023*
Yue Song, T. Anderson Keller, Nicu Sebe, & Max Welling. Jan. 2023.

DUET: 2D Structured and Equivariant Representations *ICML 2023*
Xavier Suau, Federico Danieli, T. Anderson Keller, Arno Blaas, Chen Huang, Jason Ramapuram, Dan Busbridge, & Luca Zappella. Jan. 2023.

As easy as APC *Workshop on Self Supervised Learning @ NeurIPS 2021*
Fiorella Wever, T. Anderson Keller, Victor Garcia, Laura Symul. 29 Jun 2021.
<https://arxiv.org/abs/2106.15577>

Fast Weight Long Short-Term Memory *ArXiv Preprint 2018*
T. Anderson Keller, S. Sridhar, X. Wang. Fast Weight Long Short-Term Memory. 18 Apr 2018. <https://arxiv.org/abs/1804.06511>

Invited Talks

29 Sep '24	**Wu Tsai Neuro AI Reading Group**	Yale University
29 Sep '24	**From Neuroscience to AI Systems (NAISys)**	Cold Spring Harbor Labs
16 Sep '24	**Comp. Neuro. Next Generation Symposium**	Washington Univ., STL
12 Aug '24	**NeurReps International Speaker Seminar Series**	Virtual
09 July '24	**Woods Hole Comp. Neuro Workshop**	Telluride
06 Feb '24	**CMS Machine Learning Seminar**	CERN, Switzerland (Virtual)
02 Feb '24	**Fiete Lab**	Massachusetts Institute of Technology
22 Jan '24	**Gerstner Lab**	École polytechnique fédérale de Lausanne (Virtual)
09 Nov '23	**Giersch School & Intl. Conference**	Frankfurt Institute for Advanced Studies
23 Oct '23	**Workshop on Structured Learning**	Chalmers AI Research Center
25 May '23	**Computational Neurobiology Lab**	Salk Institute (Virtual)
05 Jan '23	**Kanwisher Lab**	Massachusetts Institute of Technology
03 Mar '22	**Seminar on Advances in Probabilistic Machine Learning**	Aalto University

Master's Thesis Supervision

'21 **Modeling the Emergence of Face Selective Cortical Regions** Qinghe Gao
Employing generative models combined with novel topographic priors to study the emergence of domain-selective cortical regions (such as the Fusiform Face Area) in modern deep neural networks. Comparison with macaque data shows strong similarities.
<https://arxiv.org/abs/2110.13911>

'20 **As Easy as APC** Fiorella Wever
Researching Autoregressive Predictive Coding (APC) as a self-supervised representation learning solution to handle datasets with high levels of missing data and class imbalance simultaneously – demonstrated benefits over existing data imputation and class imbalance methods on a synthetic dataset, achieved SoTA AUPRC on Physionet 2012 medical dataset.
<https://arxiv.org/abs/2106.15577>

'20 **Spatio-Temporal Forecasting On Graphs w/ Incomplete Data** Noah van Grinsven
Combining graph neural networks with data imputation for spatio-temporal forcasting.
<https://scripties.uba.uva.nl/search?id=719556>

'19 **Geometric Priors for Disentangling Representations** Samarth Bhargav
Researching the use of non-euclidean priors as a supervisory signal for disentangled representation learning of topologically equivalent generative factors.
<http://scriptiesonline.uba.uva.nl/document/676481>

Teaching Assistant Positions

Winter '20 **Leren (Bachelor's Machine Learning)** University of Amsterdam
Designed practice problems for matrix derivatives and PCA.

Winter '19 **Machine Learning 2 (Master's)** University of Amsterdam
Ran practical labs including implementations of ICA, message passing, EM & VAEs.

Winter '16 **Data Visualization** University of California, San Diego
Designed homework assignments, demos, and class tutorials for D3.js & Bokeh.

Media Coverage & Recorded Talks

Sept. '24 **A Spacetime Perspective on Neural Info. Proc. Sys.** Recorded Talk

- NeurReps Seminar: https://www.youtube.com/watch?v=FeVHfmRSicQ

Sept. '21 **Natural Neural Structure for Artificial Intelligence** Recorded Talk

- Active Inference Institute Seminar: https://www.youtube.com/watch?v=1uIRljnLtc4

Sept. '21 **Topographic Variational Autoencoders** Media Coverage

- Yannic Kilcher (18K Views): https://www.youtube.com/watch?v=pBau7umFhjQ

Sept. '18 **Live Tracking and Few-Shot Classification of Racecars** Keynote & Podcast

- Keynote: https://youtu.be/pSZn__bYA1k?t=3990
- TWiML Podcast: https://goo.gl/6NeMNp

https://www.youtube.com/watch?v=1uIRljnLtc4