

T. Anderson Keller

Kempner Institute Research Fellow

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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,
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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 Zappella. 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 Hoogetboom, 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.

<<https://arxiv.org/abs/2309.13167>>

Latent Traversals in Generative Models as Potential Flows *ICML 2023*

Yue Song, T. Anderson Keller, Nicu Sebe, & Max Welling. Jan. 2023.

<<https://arxiv.org/abs/2304.12944>>

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.

<<https://arxiv.org/abs/2306.16058>>

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. 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)
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 forecasting.

<<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>

Feb. '24 **Traveling Waves in Recurrent Neural Networks**

Podcast Interview

- Interview: https://www.youtube.com/watch?v=sA6v4_KWn2I

Sept. '23 **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>