T. Anderson **Keller**

Machine Learning PhD Candidate

Website
akandykeller.github.io

Mail
T.Anderson.Keller@
gmail.com

Twitter
@t_andy_keller

Telephone
+31 6 83027405

Git
akandykeller

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

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

Interests
Comp. Neuroscience
Cognitive Science
Consciousness

Languages
English ★★★★★
French ★★★★☆

Address
Marnixstraat 356-4A,
1016 XV Amsterdam,
Netherlands

Academic Background

'18 - (Expected) '23 **Ph.D. Machine Learning** University of Amsterdam
Supervisor: Professor Max Welling
Thesis: Structured Representation Learning with Probabilistic Generative Models

'15 - '17 **M.S. Computer Science** University of California San Diego
Supervisor: Professor 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

Neural Waves Machines: Learning Spatiotemporally Structured Representations
T. Anderson Keller & Max Welling. Jan. 2023. *Under Review @ ICML 2023*
<https://akandykeller.github.io/papers/Waves.pdf>

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

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

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>

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>

Publications

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

DUET: 2D Structured and Equivariant Representations *Under Review @ 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>

Designing Policy Recommendations to Reduce Home Abandonment in Mexico *KDD '16*
K. Ackermann, E. Reyes, S. He, T. Anderson Keller, P. van der Boor, R. Kahn. *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*. 13 Aug 2016. (**Oral**)
<http://www.kdd.org/kdd2016/papers/files/adf0913-ackermannA.pdf>

Experimental Realization of a Nonlinear Acoustic Lens with a Tunable Focus *APL '14*
C. Donahue, P. Anzel, L. Bonanomi, T. Anderson Keller, C. Daraio. *Appl. Phys. Lett.*. 9 Jan 2014. <https://arxiv.org/abs/1308.1483>

Invited Talks

05 Jan '23	**Kanwisher Lab**	Massachusetts Institute of Technology
11 Nov '22	**Geometric Deep Learning Reading Group (link)**	University of Amsterdam
03 Mar '22	**Seminar on Advances in Probabilistic Machine Learning**	Aalto University
19 Nov '21	**Debora Marks Lab, Journal Club**	Harvard Med. (Online)
12 Oct '21	**Intel Labs, Deep Learning CoP**	Santa Clara, CA (Online)

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.

Selected Projects

Summer '22 **Traveling Waves in Deep Generative Models** University of Amsterdam

- Developed a recurrent generative model biased towards latent codes with complex spatio-temporal synchrony. Demonstrated the model learned to use traveling waves as a mechanism to efficiently represent observed physics dynamics.
- Videos of Waves & Dynamics: https://github.com/q2w4/LocoRNN

Summer '21 **Topographic Variational Autoencoders** University of Amsterdam

- Developed a method for training deep generative models with topographically organized latent variables, yielding a nonlinear version of Topographic ICA. Demonstrated how topographic organization could be leveraged to learn approximate equivariance to sequence transformations without supervision.
- Git: https://github.com/akandykeller/TopographicVAE
- Video: https://www.youtube.com/watch?v=8QJmO6u0SwM
- Media Coverage: https://www.youtube.com/watch?v=pBau7umFhjQ

Fall '20 **Self Normalizing Flows** University of Amsterdam

- Derived a novel method for training unconstrained normalizing flow architectures using learned approximate gradients. Demonstrated significantly faster training while reaching the same likelihood as the corresponding exact gradient.
- Video: https://www.youtube.com/watch?v=6Q3b3MergqI
- Blog: http://keller.org/research/2020-10-21-self-normalizing-flows/

Summer '17 - Summer '18 **Live Tracking and Few-Shot Classification** Intel AI Lab

- Closely collaborated with diverse teams across Intel to deliver live-inference pipeline for tracking and fine-grained classification of race cars from few labeled examples.
- Keynote: https://youtu.be/pSZn__bYA1k?t=3990
- Blog: https://goo.gl/PmQss8
- TWiML Podcast: https://goo.gl/6NeMNp

Winter '17 **Fast Weight Long Short-Term Memory** Intel AI Lab / Personal

- Developed and experimented with multiple novel Fast-Weight LSTM architectures to characterize synergistic effects between gated RNNs and fast weight associative memory. Showed faster learning and increased accuracy on associative recall tasks. Showed near equivalence with Memory Network attention mechanism on bAbI QA tasks.
- Git: https://github.com/akandykeller/fast_weights

References

Professor Max Welling

Professor of Computer Science
Institute of Informatics
University of Amsterdam
Science Park 904
1098 XH Amsterdam, The Netherlands
☎ +31 (0)652824913
✉ Welling.Max@Gmail.com

Assistant Professor Eric Nalisnick

Assistant Professor of Computer Science
Institute of Informatics
University of Amsterdam
Science Park 904
1098 XH Amsterdam, The Netherlands
✉ E.T.Nalisnick@UVA.nl

Assistant Professor Patrick Forré

Assistant Professor Computer Science & AI4Science Lab manager
Institute of Informatics
University of Amsterdam
Science Park 904
1098 XH Amsterdam, The Netherlands
✉ P.D.Forre@UVA.nl