

# T. Anderson Keller

## Machine Learning Researcher

### Address

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### Citizenship

U.S.A.

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### Git

akandykeller

### Programming

Python ★★★★★  
Matlab ★★★★★  
C/C++ ★★★★★

### Packages

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

### Interests

Rep. Learning,  
Approx. Equivariance,  
Cognitive Science

### Languages

English ★★★★★  
French ★★★★★

### Personal

Calisthenics, Cooking

## Education

'18 - (Expected) '22 **Ph.D. Machine Learning and Deep Learning** [University of Amsterdam](#)  
Supervisor: Professor Max Welling

Research Interests: Probabilistic Generative Models, Unsupervised Learned Equivariance

'15 - '17 **M.S. Computer Science** [University of California San Diego, La Jolla, CA](#)

Supervisor: Professor Garrison Cottrell

Thesis: Comparison and Fine-grained Analysis of Sequence Encoders for NLP

'11 - '15 **B.S. Computer Science w/ Honors** [California Institute of Technology, Pasadena, CA](#)

Related Coursework: Machine Learning, GPU Programming (CUDA), Stochastic Modeling

## Experience

June '16 - September '18 **Deep Learning Data Scientist** [Intel Nervana, San Diego, CA](#)

- Oversaw development and live deployment of object localization model for visual tracking of race cars – in partnership with Ferrari Challenge North America.
- Researched and developed new models using fast-weight associative memory.

Summer '15 **Data Science for Social Good Summer Fellow** [University of Chicago, IL](#)

- Built model to determine the influences of home abandonment in Mexico.
- Presented at KDD 2016 Applied Data Science Track. Project: <https://goo.gl/touSWT>

Summer '14 **Analytics Engineering Intern** [Lyve Minds Inc., Cupertino, CA](#)

- Developed supervised learning algorithm for automatic editing and summarization of user generated handheld video based on predicted level of interest.

## Publications

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

**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=WvU0FEESncx>>

**Modeling Category-Selective Cortical Regions with TVAEs** Under Review, Workshop 2021  
[T. Anderson Keller\\*](#), Qinghe Gao\* & Max Welling. Under Review. Oct 2021.

**Self Normalizing Flows** ICML 2021  
[T. Anderson Keller](#), Jorn W.T. Peters, Priyank Jaini, Emiel Hoogeboom, Patrick Forré, Max Welling. 14 Nov 2020. <<https://arxiv.org/abs/2011.07248>>

**As easy as APC** ArXiv Preprint 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>>

## 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. (In Submission)

'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.

## Patents

July '20 *Training A Function To Respond Predictably to Differences*  
EPO Application number: 20173742.6-1207

March '16 *Synopsis Video Creation Based on Relevance Score*  
<http://www.patentsencyclopedia.com/app/20160071549>

## Selected Projects

*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>
- 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*    **Ferrari Challenge Tracking and 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.
- Managed collection of a novel dataset for object tracking from drone footage.
- Trained and modified SSD model to deployment level accuracy on small objects.
- Implemented Matching Network for few-shot classification of race cars to work with SSD.
- Keynote: [https://youtu.be/pSZn\\_bYA1k?t=3990](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](https://github.com/akandykeller/fast_weights)

*May '18*    **Intel AI Lab NLP Architect**    [Intel AI Lab](#)

- Implemented end-to-end memory network for question answering and goal oriented dialog systems in nGraph. Replicated published results.
- Git: <https://goo.gl/gYcJiQ>

*Spring '16*    **Learning Text Annotations w/ Sequence-to-Sequence Networks**    [Personal](#)

- Trained a sequence to sequence network on (song-lyric, descriptive annotation) pairs scraped from genius.com. Translated ordinary language into song lyrics.
- Git: <https://github.com/akandykeller/GeNet>