Rob Brekelmans

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Research Interests

Information theory, variational inference, information geometry
representation learning (disentanglement, fairness, invariance)

Education

University of Southern California, Los Angeles, CA, USA
Information Sciences Institute / Department of Computer Science

Ph.D. Candidate, Computer Science — Aug 2016 - Present
Advisors: Greg Ver Steeg, Aram Galstyan
GPA: 3.87 / 4.0

Imperial College London, London, UK

M.Sc Computing Science (with Distinction) — Oct 2014 - Oct 2015
Thesis Advisor: Björn Schuller

University of Pennsylvania, Philadelphia, PA, USA

B.A. Mathematics — 2006 - 2010
GPA: 3.81 / 4.0, Summa Cum Laude

Publications

Rob Brekelmans, Vaden Masrani, Thang Bui, Frank Wood, Aram Galstyan, Greg Ver Steeg, Frank Nielsen. "Annealed Importance Sampling using q-Paths". *NeurIPS Workshop on Deep Learning through Information Geometry*, 2020.

- Best Paper Award
- Accepted for 15-Minute Oral Presentation

Rob Brekelmans, Frank Nielsen, Alireza Makhzani, Aram Galstyan, Greg Ver Steeg. "Likelihood Ratio Exponential Families". *NeurIPS Workshop on Deep Learning through Information Geometry*, 2020.

Vu Nguyen, Vaden Masrani, Rob Brekelmans, Michael Osborne, Frank Wood. "Gaussian Process Optimization of the Thermodynamic Variational Objective." *Neural Information Processing Systems*, 2020.

Rob Brekelmans, Vaden Masrani, Frank Wood, Greg Ver Steeg, Aram Galstyan. "All in the Exponential Family: Bregman Duality in Thermodynamic Variational Inference." *International Conference on Machine Learning*, 2020.

Rob Brekelmans, Daniel Moyer, Aram Galstyan, Greg Ver Steeg. "Exact Rate-Distortion in Autoencoders via Echo Noise." *Neural Information Processing Systems*, 2019.

Rob Brekelmans, Aram Galstyan, Greg Ver Steeg. "Understanding Thermodynamic Variational Inference." *NeurIPS Workshop on Information Theory in Machine Learning*, 2019.

- Accepted for 15-Minute Oral Presentation

Ayush Jaiswal, Rob Brekelmans, et al. "Discovery and Separation of Features for Invariant Representation Learning." *Under review*, 2019.

Daniel Moyer, Shuyang Gao, Rob Brekelmans, Greg Ver Steeg, Aram Galstyan. "Invariant Representations without Adversarial Training", *Neural Information Processing Systems*, 2018.

Shuyang Gao, Rob Brekelmans, Greg Ver Steeg, and Aram Galstyan. "Auto-encoding Total Correlation Explanation". *AIStats*, 2018.

Yolanda Gil, et al. "P4ML: A Phased Performance-based Pipeline Planner for Automated Machine Learning." *ICML AutoML Workshop*. 2018.

Greg Ver Steeg, Rob Brekelmans, Hrayr Harutyunyan, Aram Galstyan. "Disentangled Representations Via Synergy Minimization", *55th Annual Allerton Conference on Communication, Control, and Computing*, 2017.

Rob Brekelmans. "Analyzing the Relationship Between Neural Activity and Facial Movements in Emotional Response". *MSc Thesis*, Imperial College London, 2015.

Academic Experience

Los Alamos National Laboratory, Los Alamos, NM
Applied Machine Learning Fellowship Summer 2018
- Investigated learning tree structured graphical models with latent variables
- Mentors: Marc Vuffray, Andrey Lokhov, Sidhant Misra

Information Sciences Institute, Los Angeles, CA
DARPA Data Driven Discovery Project
Graduate Research Assistant May 2017 - Present
- Project automating the search over machine learning pipelines for prediction tasks across diverse data settings (AutoML)
- Implemented 'primitives' to be used by the planning system, including semi-supervised dimensionality reduction and graph convolutional networks

University of Southern California, Los Angeles, CA
Teaching Assistant August 2016 - May 2017
- CSCI109: Introduction to Computer Science

Additional Experience

Susquehanna International Group, Philadelphia, PA
Stock Options Trader August 2010 - March 2014
- Education program involving probability, behavioral economics, poker training
- Responsible for firm's trading in natural gas, treasury ETF and futures options
- Initiated proprietary positions, tuned trading scripts, managed distributional risk

Coursework

Advanced Topics in Statistical Machine Learning, Advanced Analysis of Algorithms, Information Theory, Convex & Combinatorial Optimization,
Algebraic Combinatorics, High Dimensional Statistics & Big Data Problems,
Intelligent Data & Probabilistic Inference, Logic-Based Learning

Best Project Award: "Backpropagating Importance of Training Examples"
Advanced Topics in Statistical Machine Learning Nov 2018

Deep Reinforcement Learning Bootcamp, *UC Berkeley* Aug 2017

Reviewing

IEEE Transactions on Communications 2020

Programming

Python, TensorFlow, Keras, MATLAB, Julia, C++, SQL

Nationality

USA, Netherlands