Laura MANDUCHI

Ph.D. Candidate, Institute for Machine Learning, ETH Zürich.

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I am a Ph.D. student in Computer Science at the Institute for Machine Learning, ETH Zürich, under the supervision of Julia Vogt. My research lies at the interplay between probabilistic modelling and deep learning, with a focus on representation learning, deep generative models, and clustering algorithms. I am particularly interested in incorporating domain knowledge in the form of constraints and probabilistic relations to obtain preferred representations of data that are robust to biases. I am also leading CSNOW, a student association that aims to improve the representation of women in computer science.

Education

Present – February 2020 — **Ph.D. at the Istitute of Machine Learning, ETH, Zürich, Switzerland**
- **Topics :** Representation learning, probabilistic modelling, clustering, interpretability, deep learning.
- **Supervisor :** Prof. Dr. Julia Vogt.
- **Expected Graduation :** September 2024

September 2017 – August 2019 — **M.Sc. in Data Science, ETH, Zürich, Switzerland**
- **Overall Grade Point Average :** 5.7/6.
- **Advance coursework** : Deep Learning, Advanced ML, Reinforcement Learning, NLP, Probabilistic AI.
- **Thesis :** *Deep Probabilistic Self-Organizing Maps*, Supervisor : Prof. Dr. Gunnar Rätsch.

September 2014 – July 2017 — **B.Sc. in Information Engineering, Padua University, Italy**
- **Overall Grade Point Average :** 29.8/30. **Final grade :** 110/110 cum laude.
- **Thesis :** *Optimization of Fast Westfall-Young algorithm*, Supervisor : Prof. Dr. Fabio Vandin.

Experience

April 2024 – September 2024 — **Ph.D. research intern, Apple, Zurich, Switzerland**
Working on neural posterior estimation with normalizing flows for simulation-based inference under miss-specification.

June 2022 – September 2022 — **Ph.D. research intern, Microsoft, Cambridge, UK**
Implemented novel generative models to discover disentangled factors of variations in the context of T-cell receptors' repertoire.

October 2019 – February 2020 — **AI research intern, European Space Agency, Madrid, Spain**
Increased the performance of spectra fitting routines by implementing DeepSpectra, a DNN architecture to denoise and disentangle spectra components from XMM-Newton observations.

Honors and Awards

2022 **SDSC PhD fellowship :** recipient of the PhD fellowship fund from the Swiss Data Science Center.
2020 **Best Newcomer Award :** monetary prize given by the ML4H Workshop of NeurIPS to the paper "DeepHeartBeat : Latent trajectory learning of cardiac cycles using cardiac ultrasounds".
2018 **1001 cum laude :** monetary prize given to the best 3% students across all majors at the University of Padua.

Invited Talks

December 2023 **EPFL, Lausanne :** invited to present "TreeVAE" at the SDSC PhD fellows workshop at EPFL.
November 2023 **ECT, Trento :** invited to present my work at the ALPACA seminar on modern algorithms in machine learning and data analysis at the European Centre for Theoretical Studies.
February 2023 **Dagstuhl :** invited to present my work at the Dagstuhl seminar on Challenges and Perspectives in Deep Generative Modeling, organized by Kevin Murphy, Stephan Mandt, Yingzhen Li, and Vincent Fortuin.
May 2022 **Stanford University :** presented "Incorporating domain knowledge in deep generative models for weakly supervised clustering" at the medAI talk series, Stanford University.
December 2021 **TU Wien :** presented "Deep Variational Approaches for Weakly Supervised Clustering" at the Thomas Gärtner's lab, TU Wien.
May 2021 **IBM Research :** presented "A Deep Variational Approach to Clustering Survival Data" at IBM research in Zurich, Switzerland.
December 2019 **European Space Agency :** tech talk on deep learning for X-ray spectra analysis at the ESA in Madrid, Spain.

Teaching

2022/2021/2020	Supervised 13 students in collaboration with ETH, Roche, IBM and the European Space Agency.
Spring 2022/2021	Head Teaching Assistant for **Machine Learning for Healthcare** at ETH Zürich.
Fall 2021	Teaching Assistant for **Advanced Machine Learning** at ETH Zürich.
Fall 2020	Teaching Assistant for **Probabilistic AI** at ETH Zürich.
Spring 2019	Student Teaching Assistant for **Computational Intelligence Lab** at ETH Zürich.

Service and Volunteer

2022-present	Co-leader of CSNOW - Network of Women in Computer Science of ETH.
2023	Organizer of the Deep Generative Models for Health workshop at NeurIPS 2023.
2023	Organizer of the Time Series Representation Learning for Health workshop at ICLR 2023.
2022-2024	Reviewer for Nature Communication 2024, NeurIPS 2023, ICML 2023, NeurIPS 2022.
2021	Reviewer for Bridging the Gap : From ML Research to Clinical Practice workshop, NeurIPS 2021.
2018-2020	Committee member, ETH Entrepreneur Club.
2016-2019	Crew member, Italian Red Cross.

Publications

- **On the Challenges and Opportunities in Generative AI.**
  L. Manduchi, K. Pandey, R. Bamler, R. Cotterell, S. Däubener, S. Fellenz, A. Fischer, T. Gärtner, M. Kirchler, M. Kloft, Y. Li, C. Lippert, G. de Melo, E. Nalisnick, B. Ommer, R. Ranganath, M. Rudolph, K. Ullrich, G. Van den Broeck, J. E Vogt, Y. Wang, F. Wenzel, F. Wood, S. Mandt, V. Fortuin.
- **Tree Variational Autoencoders.**
  L. Manduchi, M. Vandenhirtz, A.Ryser, J. E Vogt. Accepted NeurIPS 2023. **Spotlight presentation**.
- **Deep Generative Clustering with Multimodal Diffusion Variational Autoencoders.**
  E. Palumbo, **L. Manduchi**, S. Laguna, D. Chopard, J. E Vogt. Accepted ICLR 2024.
- **Learning Group Importance using the Differentiable Hypergeometric Distribution.**
  T. Sutter, **L. Manduchi**, A.Ryser, J. E Vogt. ICLR 2023. **Oral presentation.**
- **Signal Is Harder To Learn Than Bias : Debiasing with Focal Loss.**
  M. Vandenhirtz, **L. Manduchi**, R. Marcinkevics, J. E Vogt. Domain Generalization Workshop, ICRL 2023. **Spotlight presentation.**
- **Interpretable Prediction of Pulmonary Hypertension in Newborns using Echocardiograms.**
  L. Manduchi, H. Ragnarsdottir, H. Michel, F. Laumer, S. Wellmann, E. Ozkan, J. E. Vogt. GCPR 2022.
- **Anomaly Detection in Echocardiograms with Dynamic Variational Trajectory Models.**
  A.Ryser, **L. Manduchi**, F. Laumer, H. Michel, S. Wellmann, J.E. Vogt. MLHC 2022.
- **Weakly supervised inference of personalized heart meshes based on echocardiography videos.**
  F. Laumer, M. Amrani, **L. Manduchi**, A. Beuret, A. Dubatovka, L. Rubi, C. Matter, J. M. Buhmann.
  Medical Image Analysis 2022.
- **A Deep Variational Approach to Clustering Survival Data.**
  L. Manduchi, R. Marcinkevics, M. C. Massi, T. Weikert, A. Sauter, V. Gotta, T. Müller, F. Vasella, M. C. Neidert, M. Pfister, B. Stieltjes, J. E. Vogt. ICLR 2022 & AI for Public Health Workshop, ICLR 2021. **Contributed talk.**
- **Deep Conditional Gaussian Mixture Model for Constrained Clustering.**
  L. Manduchi, K. Chin-Cheong, H. Michel, S. Wellmann, J. E. Vogt. NeurIPS 2021.
- **T-DPSOM - An Interpretable Clustering Method for Unsupervised Learning of Patient Health States.**
  L. Manduchi, M. Hueser, J. E. Vogt, G. Raetsch, V. Fortuin. ACM CHIL 2021 & ML4H Workshop, NeurIPS 2019.
- **DeepHeartBeat : Latent trajectory learning of cardiac cycles using cardiac ultrasounds.**
  F. Laumer, G. Fringeli, A. Dubatovka, **L. Manduchi**, J. Buhmann. ML4H Workshop, NeurIPS 2020. **Spotlight presentation.**

Technical Skills

Languages	English (Full Professional fluency), Italian (Native), German (A2), Spanish (A2)
Programming Languages	Python (Proficient), Java, C++, R, Matlab
Software	Tensorflow, PyTorch, Scikit-Learn, MySQL, Git, LaTeX
Coursework	Computer Vision, Probabilistic Machine Learning, Deep Learning, Advanced Machine Learning, Reinforcement Learning, Statistical Learning Theory, Computational Intelligence Lab, Big Data, Optimization for Data Science, Mathematical Statistics, Natural Language Understanding, Computational Biomedicine