Emanuele Sansone

emsansone.github.io | e.sansone@hotmail.it

Education

2013-2018 **PhD** in **Machine Learning** at the **University of Trento** (29/3/2018).
Advisor: Francesco G. B. De Natale.
Examiners: Paolo Frasconi, Fabio Roli, Farid Melgani.
Thesis Title: "Towards Uncovering the True Use of Unlabeled Data in Machine Learning"
Description: Dissertation on the use of unlabeled data in various areas of machine learning, including positive unlabeled and semi-supervised learning.

2011-2012 **Master degree** in **Telecommunications Engineering, 110/110 cum laude**.
University of Trento, Italy.
Thesis: "Multimodal Photo Galleries Synchronization". *Supervisor*: N. Conci, G. Boato.
Description: I devised a probabilistic graphical model to address the problem of missing data in a multimedia retrieval application. This model is used to determine the sequential order of photos taken by different users and to reconstruct the timeline of events, such as personal events like weddings or sports events like the Olympic Games.

2008-2010 **Bachelor degree** in **Telecommunications Engineering**.
University of Trento, Italy.
Thesis: "Master P-NET Protocol Implementation on PIC 32 Architecture". *Supervisor*: D. Petri, M. Corrà.
Description: Programming a master device in a network consisting of various sensors and actuators. Implementing the P-NET protocol using a PIC 32 microcontroller.

Research Experience and Visiting Period

2024-2026 **Marie-Curie Global Fellow** in **Unsupervised Statistical Relational Learning**.
MIT-KU Leuven, US-Belgium.
Description: Working on the synergies between unsupervised learning and statistical relational learning.

2023-2024 **Post-Doctoral Researcher** in **Unsupervised Deep Learning**, funded by the ERC Advanced Grant KeepOnLearning.
PSI group, KU Leuven, Belgium.
Description: Working on unsupervised learning, specifically on representation learning and deep generative models and on ways to incorporate/learn structure.

2020-2023 **Post-Doctoral Researcher** in **Neurosymbolic Learning**, funded by the European Network of Research Excellence "Trustworthy AI: Integrating Learning, Optimisation and Reasoning (TAILOR)".
DTAI group, KU Leuven, Belgium.
Description: Working on approximate probabilistic inference over discrete structures (ICML 2022, NeurIPS 2023) and on the synergies between unsupervised learning and logic, specifically on integrating generative models (NeurIPS 2022) and representation learning (ICLR NeSy-GeMs 2023) with probabilistic logic programming. I am also coordinating all scientific activities for a work package of TAILOR, which focuses on unifying different paradigms of learning (e.g. deep learning) and reasoning (e.g. logic, knowledge graphs, and constraints).

2018-2020 **Research Scientist** in **Machine Learning**.
Huawei, London, UK.

Description: Working in the area of generative models (ECAI 2020) and applications related to the company using self-supervised learning.

2015-2016 **Visiting Period**
LAMDA group, Nanjing University, China.
Description: Working in the area of positive-unlabeled learning (PAMI 2018).

Teaching and Supervision Experience in Academia

2022 Teaching Assistant, **Uncertainty in Artificial Intelligence** (B-KUL-H00H2a), *KU Leuven*.

2020-2022 Teaching Assistant, **Machine Learning and Inductive Inference** (B-KUL-H00G6a), *KU Leuven*.

2016 Teaching Assistant, **Computer Vision** (Code 140266), *University of Trento*.

2015 Teaching Assistant, **Multimedia Networking** (Code 140151), *University of Trento*.

2021-now Mentoring of **PhD Students**:
Victor Verreet, Lennert De Smet, Eleonora Misino, Tim Lebailly, Bo Wan.

2020-now Supervision of **Master Theses**:
2023-2024 Rijo (John) Zachariah: "PyPLOG: A Pytorch library for approximate inference in Probabilistic LOGic programming", *KU Leuven*.
2022-2023 Vincenzo Collura: "Neurosymbolic Learning: Challenges and Benchmarks", *University of Bologna*.
2021-2022 Rik Bossuyt: "Predicting SAT with Graph Neural Networks", *KU Leuven*.
2020-2021 Eleonora Misino: "Deep Generative Models with Probabilistic Logic Priors", *University of Bologna*.

2021-now Supervision of **Honor Students**:
2022-2023 Felix Huyghe, Sander Schildermans: "Learning to Predict the Ball Trajectory in Foosball Tables", *KU Leuven*.
2021-2022 Xander Haijen: "Comparison of Reinforcement Learning Methods Applied to Tetris", *KU Leuven*.

2018-2020 Supervision of **Intern Students** at Huawei: Yinbai Li (Bachelor student in Mathematics at *University of Cambridge*), Xingyu Jin (Master student in Computer Science at *University of Edinburgh*).

Professional Service

2022 **Organizer** of a **hybrid micro-workshop** on the "Synergies among Neuro-Symbolic, Graph Embeddings and Language Models" with attendees/speakers from different TAILOR partners, including KU Leuven, TU Darmstadt, EPFL, Fraunhofer IAIS and University of Siena.

2022 **Co-organizer** (with several TAILOR researchers) of an **online workshop** on "What are the Next Measurable Challenges in AI?"

2021 **Co-organizer** (with Luc De Raedt) of an **online workshop** dedicated to "Learning and Reasoning" with an invited talk from Richard Evans (DeepMind).

2021 **Co-organizer** (with Luc De Raedt) of an **online meeting** to kick-off the work package on "Unifying AI Paradigms and Representations".

2024-now **Action Editor** for Transactions of Machine Learning Research.

2024 **Guest Editor** for Machine Learning (Springer) - Special Issue on Learning and Reasoning.

2024 **Area Chair** for International Joint Conference on Learning & Reasoning (IJCLR).

2018-now **Reviewer (Journal)** for international journals in the area of machine learning, artificial intelligence and signal processing, such as IEEE Transactions on Neural Networks and Learning Systems, Journal of Machine Learning Research (JMLR), Machine Learning (Springer), International Journal of Approximate Reasoning and IEEE Transactions on Image Processing.

2021-now **Reviewer (PC)** for top-tier conferences in machine learning, cognitive science, including ICLR (2021-2024), NeurIPS (2021-2024), ICML (2022-2024), AISTATS (2022-2024), CVPR (2024), ECML-PKDD (2021) and CogSci (2024), and also symposiums/workshops, including The Symposium on Advances in Approximate Bayesian Inference (AABI 2023-2024), ICML Workshop on Structured Probabilistic Inference and Generative Modelling (ICML SPIGM 2023), ICLR Workshop on Neurosymbolic Generative Models (ICLR NeSy-GeMs 2023), IJCAI Workshop on Knowledge-Based Compositional Generalization (IJCAI KBCG 2023), NeurIPS Workshop on Deep Generative Models for Health (NeurIPS DGM4H 2023) and NeurIPS Workshop on Self-Supervised Learning - Theory and Practice (2023), ICML Workshop Differentiable Almost Everything (2024), ICML Workshop on Geometry-grounded Representation Learning and Generative Modeling (2024).

Journal Publications

E. Sansone, R. Manhaeve (2024). A Bayesian Unification of Self-Supervised Clustering and Energy-Based Models. Under review at *Journal of Machine Learning Research* (JMLR).

E. Sansone, F.G.B De Natale, Z.H. Zhou (2018). Efficient Training for Positive Unlabeled Learning. *IEEE Transactions on Pattern Analysis and Machine Intelligence* (TPAMI).

E. Sansone, K. Apostolidis, N. Conci, G. Boato, V. Mezaris, F. G. B. De Natale (2017). Automatic Synchronization of Multi-User Photo Galleries. *IEEE Transactions on Multimedia* (TMM).

Conference Publications

V. Verreet, L. De Smet, L. De Raedt, **E. Sansone** (2024). EXPLAIN, AGREE, LEARN: Scaling Learning for Neural Probabilistic Logic. *European Conference on Artificial Intelligence* (ECAI).

L. De Smet, **E. Sansone**, P. Z. D. Martires (2023). Differentiable Sampling of Categorical Distributions Using the CatLog-Derivative Trick. *Neural Information Processing Systems* (NeurIPS).

E. Misino, G. Marra, **E. Sansone** (2022). VAEL: Bridging Variational Autoencoders and Probabilistic Logic Programming. *Neural Information Processing Systems* (NeurIPS).

E. Sansone (2022). LSB: Local Self-Balancing MCMC in Discrete Spaces. *International Conference on Machine Learning* (ICML).

E. Sansone, H. T. Ali, J. Sun (2020). Coulomb Autoencoders. *European Conference on Artificial Intelligence* (ECAI).

E. Sansone, A. Passerini, F. G. B. De Natale (2016). Classtering: Joint Classification and Clustering with Mixture of Factor Analysers. *European Conference on Artificial Intelligence* (ECAI).

Workshop Publications

B. Kim, M. Puthawala, J. Chul Ye, **E. Sansone** (2024). (Deep) Generative Geodesics. *ICML Workshop GRaM*.

E. Sansone (2023). The Triad of Failure Modes and a Possible Way Out. *NeurIPS Workshop SSLTheoryPractice*.

L. De Smet, **E. Sansone**, P. Z. D. Martires (2023). Differentiable Sampling of Categorical Distributions Using the CatLog-Derivative Trick. *ICML Workshop DiffAE*.

V. Verreet, L. De Smet, **E. Sansone** (2023). EXPLAIN, AGREE and LEARN: A Recipe for Scalable Neurosymbolic Learning. *ICML Workshop KLR*.

E. Misino, G. Marra, **E. Sansone** (2023). VAEL: Bridging Variational Autoencoders and Probabilistic Logic Programming (Extended Abstract). *NeSy Workshop*.

E. Misino, G. Marra, **E. Sansone** (2023). VAEL: Bridging Variational Autoencoders and Probabilistic Logic Programming. *ICLR Workshop NeSy-GeMs*.

E. Sansone, R. Manhaeve (2023). Learning Symbolic Representations Through Joint GEnerative and DIscriminative Training (Extended Abstract). *IJCAI Workshop KBCG*.

E. Sansone, R. Manhaeve (2023). Learning Symbolic Representations Through Joint GEnerative and DIscriminative Training. *ICLR Workshop NeSy-GeMs*.

Miscellaneous Reports

E. Sansone, R. Manhaeve (2022). GEDI: GEnerative and DIscriminative Training for Self-Supervised Learning. *Technical Report*.

E. Sansone (2021). Leveraging Hidden Structure in Self-Supervised Learning. *Technical Report*.

E. Sansone (2018). Towards Uncovering the True Use of Unlabeled Data in ML. *PhD Thesis*.

E. Sansone, F.G.B. De Natale (2017). Training Feedforward Neural Networks with Standard Logistic Activations is Feasible. *Technical Report*.

Awards and Fellowships

2024 **MSCA Postdoctoral Global Fellowship** (177.322 €) titled "Discovering the World Through Unsupervised Statistical Relational Learning".

2024 **FWO Compute Grant Award** (32.963 €) on Flemish Supercomputer Center for proposal "Scaling Failure-Free Representation Learning".

2021-now **Outstanding Reviewer Award**: ICLR 2021 (top 12%), ICML 2022 (top 10%), NeurIPS 2022, AISTATS 2023 (top 10%), NeurIPS 2023.

2016 **Academic Hardware Grant Award**, NVIDIA.

2012 **Merit Award**, University of Trento. Monetary award to distinguished master students.

Talks, Seminars

2023 **Seminar** "Self-Supervised . . . Generative Learning: XOR, AND or IFF?". *Department of Mathematics and Statistics, South Dakota State University* (USA).

2023 **Invited Talk** "What's Past & What's Next: Learning & Learning to Acquire Knowledge". *Department of Computer Science, University of Manchester* (UK).

2023 **Lightning Talk** "GEDI: GEnerative and DIscriminative Training for Self-Supervised Learning". *Department of General and Computational Linguistics, University of Tübingen* (Germany).

2023 **Invited Talk** "Discovering the World Through Unsupervised Statistical Relational Learning". *School of Informatics, University of Edinburgh* (UK).

2023 **Seminar** "GEDI: GEnerative and DIscriminative Training for Self-Supervised Learning". *Department of Computer Science, KU Leuven* (Belgium).

2022 **Conf. Present.** "LSB: Local Self-Balancing MCMC in Discrete Spaces". *ICML, Baltimore* (US).

2020 **Conf. Present.** "Coulomb Autoencoders". *ECAI, online*.

2019 **Keynote** "Coulomb Autoencoders". Symposium on Generative Networks in Computer Vision and Machine Learning, *British Machine Vision Association, London* (UK).
2017 **Seminar** "Generative Adversarial Networks". *Fondazione Bruno Kessler, Trento* (Italy).
2016 **Conf. Present.** "Classtering: Joint Classification and Clustering with Mixture of Factor Analysers". *ECAI, The Hague* (Netherlands).

Summer Schools, Learning Certificates

2023 **International Interdisciplinary Computational Cognitive Science Summer School (IICCSSS 2023)**, *Tübingen, Germany*, in-person.
2022 **European Summer School in Logic, Computation and Information (ESSLLI 2022)**, *Galway, Ireland*, in-person.
2020 **Algorithms Specialization**, *Stanford (Coursera)*, online.
2018 **Full Stack Deep Learning Bootcamp**, *Berkeley, US*, in-person.
2017 **Neural Networks for Machine Learning**, *University of Toronto (Coursera)*, online.
2015 **Machine Learning Summer School (MLSS)**, *Austin, US*, in-person.

Languages

Italian Mothertongue
English Fluent (C2)
German Good (B1) - Stopped practicing since 2018

Teaching and Supervision Experience in Sports

2011-now **Ski Master Instructor**.
Certificate released by *Federazione Italiana Sport Invernali* (FISI), Milan (Italy).
Description: This is the highest professional degree in alpine skiing for Italy, which can be achieved by demonstrating excellent skiing capabilities as well as strong organizational, didactical and methodological skills used when coaching. (The total number of ski master instructors in Italy is around 200 (scroll "Sci Alpino" in "Disciplina" and check "Istruttori").
Responsibilities: Holding several professional education and training courses for ski instructors and candidate ski instructors. The following is a list of people I prepared to become ski instructors (all of them are now coaches and/or ski instructors): Alessandro Berlanda, Camilla Berlanda, Martina Kerschbaumer, Davide Raineri, Valentina Zampedri, Erman Baldessari, Federico Tonezzer, Martina Longobardi, Chiara Villotti, Stefano Gonzo, Francesca Cella, Samuel Piffer, Teo Valle, Martino Santoni, Emma Santoni, Thomas Corradino, Silvia Zeni, Marco Faccenda.

2007-2017 **Ski Coach (3° level)**.
Certificate released by *Federazione Italiana Sport Invernali* (FISI), Milan (Italy).
Description: This is a professional degree in alpine skiing enabling to coach racing teams at a local, regional and also national level.
Responsibilities: Coach of young athletes (6-20 years old) in several racing ski teams: Ski Team Sopramonte (2007/2008), Sci Club Padova (2008/2009), Sci Club Panarotta (2009-2011), Ski Team Paganella (2013/2014), Campiglio Ski Team (2016/2017).

2007-2017 **Ski Instructor**.
Certificate released by Autonomous Province of Trento, Trento (Italy).