Antoine **Wehenkel**

RESEARCH SCIENTIST · MACHINE LEARNING

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PERSONAL STATEMENT

"We know the past but cannot control it. We control the future but cannot know it." Claude Shannon

Research Scientist at Apple, specializing in generative modeling and structured inductive biases for uncertainty quantification in sensitive domains like healthcare and science. I design learning algorithms that integrate domain knowledge–equations, simulations, or independence assumptions–to perform reliably across both data-rich and data-scarce regimes. I am driven by both theoretical insight and the real-world impact of machine learning.

WORK EXPERIENCE

Machine Learning Research Scientist
Apple, Health AI Team (Zürich)

12/2023 - now

Building physics-based foundation models for the development of new wearable sensors for cardiovascular and systemic health monitoring. Industrial impact: hypertension notification feature; PPG sensor development cycle; longitudinal tracking of cardiovascular parameters.

Post-doctoral Researcher
Apple, Health AI Team (Zürich)

11/2022 - 11/2023

Extending simulation-based inference algorithms for biomarkers prediction from full-body hemodynamics simulators. Significant contributions to ML for Science (papers and workshops at top-tier ML conferences)

Research Intern
Apple, Health AI Team (Zürich)

11/2021 - 09/2022

Physics Informed Machine Learning. A publication as a first author published at TMLR.

Applied Scientist Intern
Amazon Web Services (remote)

Summer 2021

Worked within Codeguru AI team. Defined and developed a project applying deep learning (graph neural networks) to automatic program analysis. Secured an offer for a returning internship.

EDUCATION

Ph.D. in Machine Learning - *ULiège, Liège*

10/2018 - 10/2022

Advisor: Professor Gilles Louppe
Research interests: generative modeling, deep learning and simulation-based inference.
Teaching assistant: Deep Learning, Introduction to Artificial Intelligence.

Master in Computer Engineering - *ULiège, Liège*

09/2016 - 06/2018

Summa Cum Laude
Teaching assistant: Data Structures & Algorithms, Electric Measurements.

Exchange student in the Master in Data Science - *EPFL, Lausanne*

09/2017 - 06/2018

Average score: 5.8/6 - 97%
Teaching assistant: Electronic.

Bachelor in Engineering - *ULiège, Liège*

09/2013 - 06/2016

Magna Cum Laude

ACADEMIC RESEARCH PROJECTS

Automating signal processing with physical simulations

2022 - 2024

Antoine Wehenkel - Jörn-Henrik Jacobsen, Jens Behrmann, Ozan Senner, Marco Cuturi
Designing algorithms that leverage numerical simulations to enable accurate uncertainty quantification in low-data regimes. Applications to prediction of cardiovascular biomarkers from non-invasive biosignals.
Research project initiator, 2 first-author papers, organizer of SynS & ML at ICML 2023.

Deep Learning for inverse problems in Science

2018 - 2022

Antoine Wehenkel - Gilles Louppe
Advancing simulation-based inference by exploring new means for implementing more effectively inductive bias into deep generative models.
Co-authored 7 papers, 3 at top Machine Learning conferences and 4 at workshops (2 spotlights).

Parameter estimation of transmission lines from synchrophasor measurements

2017 - 2018

Antoine Wehenkel - Arpan Mukhopadhyay, Mario Paolone, Jean-Yves Le Boudec
Estimation of transmission lines parameters noisy phasors measurements with sparse non-convex optimisation.
Graded 6/6 as a master's thesis at EPFL and published in an international journal.

SELECTED PUBLICATIONS

Inferring Optical Tissue Properties from Photoplethysmography using Hybrid Amortized Inference
Behrmann J* , Cervera MR*, Wehenkel A, Miller AC, Cerussi A, Jain P, Venugopal V, Yan S, Sapiro G,Pegolotti L, Jacobsen JH

Addressing misspecification in simulation-based inference through data-driven calibration
Wehenkel A*, Gamella JL, Behrmann J, Senner O, Miller A, Sapiro G, Jacobsen JH, Cuturi M
Oral at International Conference on Machine Learning, 2025.

Leveraging Cardiovascular Simulations for In-Vivo Prediction of Cardiac Biomarkers
Manduchi L*, Wehenkel A*, Behrmann J, Senner O, Pegolotti L, Miller A, Sapiro G, Cuturi M, Jacobsen JH

Diffusion Priors In Variational Autoencoders
Wehenkel A, Louppe G
Workshop on Invertible Neural Networks, Normalizing Flows, and Explicit Likelihood Models at ICML 2021.

Graphical Normalizing Flows
Wehenkel A, Louppe G
International Conference on Artificial Intelligence and Statistics (AISTATS) 2021.

Unconstrained monotonic neural networks
Wehenkel A, Louppe G.
Neural Information Processing Systems (NeurIPS/NIPS) 2019.

SKILLS

- **Theoretical background**: Deep Learning, Machine Learning, Optimisation, and Statistics.
- **Programming**: Python, Git, Bash, PHP, Javascript, Java, Matlab, C++ and C.
- **Libraries**: PyTorch, Scikit-Learn, Numpy, Pandas, D3, Matplotlib.
- **Communication**: Technical writing, Latex, HTML/CSS, data vizualization, teaching.
- **Languages**: French (native), English (professional proficiency).

TALKS

- *Model Misspecification in Simulation-Based Inference* . BayesComp 2025, Singapore. 06/2025
- *Model Misspecification in Simulation-Based Inference* . PhyStats 2024, Munich. 05/2024
- *The Symbiosis between Deep Probabilistic and Scientific Models* . Gen U 2022, Copenhagen. 09/2022
- *Normalizing Flows and Bayesian Networks.* CogSys seminar (DTU). Remote. 10/2020
- *Normalizing Flows for Probabilistic Modeling and Inference.* Montefiore (ULiège) journal club, Liège. 04/2020
- *Neural Likelihood-Free Inference.* GRAPPA (UvA) journal club, Amsterdam. 10/2019
- *Unconstrained Monotonic Neural Networks.* Benelearn 2019, Brussels. 11/2019

ACADEMIC DUTIES

- *Reviewing*: PMAPS2020, NeurIPS (since 2020), ICLR (since 2020), AISTATS (2021-23), ICML (since 2021), ML4PS (workshop at NeurIPS, 2020-24), EBM (workshop at ICLR, 2021), INNF+ (workshop at ICML, 2021), TMLR (since 2022)
- *Workshop Organization*: SynS & ML at ICML 2023, ML4PS at NeurIPS 2024 and 2025.

AWARDS

- Best PhD Thesis award from AIM (2023) - 3500€
- Outstanding reviewer award for ICLR2021 - Awarded to the top 10% reviewers.
- FNRS Research Fellowship (2018 - 2022) - Around 100 awardees in Belgium each year.
- Best Master's thesis awards from AIM and from AILg (2018) - One award for 40 candidates - 850€
- Ranked 1st the "Kaggle in class" machine learning course competition (ULiège, 2016 and 2018) - 64 teams.
- Physics award for outstanding student (2013) - One award for more than 150 students.
- Physics award at Belgian Olympiad (2012 and 2013) - Top-5 in Belgium.

REFEREES

- Gilles Louppe (g.louppe@uliege.be) - Ph.D. advisor.
- Jörn-Henrik Jacobsen - Ex-manager at Apple.

References

[1] Jens Behrmann, Maria R Cervera, Antoine Wehenkel, Andrew C Miller, Albert Cerussi, Pranay Jain, Vivek Venugopal, Shijie Yan, Guillermo Sapiro, Luca Pegolotti, et al. Inferring optical tissue properties from photoplethysmography using hybrid amortized inference. *arXiv preprint arXiv:2510.02073*, 2025.

[2] I Benemerito, A Melis, Antoine Wehenkel, and A Marzo. Openbf: An open-source finite volume 1d blood flow solver. *Physiological Measurement*, 45(12):125002, 2024.

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[4] Arnaud Delaunoy, Joeri Hermans, François Rozet, Antoine Wehenkel, and Gilles Louppe. Towards reliable simulation-based inference with balanced neural ratio estimation. *Neural Information Processing Systems 2022*, 2022.

[5] Antoine Dubois*, Antoine Wehenkel*, Raphael Fonteneau, Frédéric Olivier, and Damien Ernst. An app-based algorithmic approach for harvesting local and renewable energy using electric vehicles. In *Proceedings of the 9th International Conference on Agents and Artificial Intelligence (ICAART 2017)*, 2017.

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[10] Laura Manduchi, Antoine Wehenkel, Jens Behrmann, Luca Pegolotti, Andy C Miller, Ozan Sener, Marco Cuturi, Guillermo Sapiro, and Jörn-Henrik Jacobsen. Leveraging cardiovascular simulations for in-vivo prediction of cardiac biomarkers. *arXiv preprint arXiv:2412.17542*, 2024.

[11] Arthur Pesah*, Antoine Wehenkel*, and Gilles Louppe. Recurrent machines for likelihood-free inference. In *MetaLearn Workshop @ NeurIPS2018*, 2018.

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[14] Thibaut Théate, Antoine Wehenkel, Adrien Bolland, Gilles Louppe, and Damien Ernst. Distributional reinforcement learning with unconstrained monotonic neural networks. *Neurocomputing*, 534:199–219, 2023.

[15] Maxime Vandegar, Michael Kagan, Antoine Wehenkel, and Gilles Louppe. Neural empirical bayes: Source distribution estimation and its applications to simulation-based inference. In *International Conference on Artificial Intelligence and Statistics 2021*, 2020.

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