Michal Balcerak

Machine Learning Scientist | Generative Modeling | Scientific AI

Website: michalbalcerak.ai | Papers: Scholar | Email: m1balcerak@gmail.com
Location: Zurich, Switzerland | Nationality: Polish (EU citizen)

Research Focus: Developing optimization-based and energy-based machine learning methods for generative modeling and scientific inverse problems, combining learnable priors, optimal transport, and physics-informed constraints for composable generation, medical imaging, and AI for science.

EDUCATION

PhD, Computer Science 10/2022 – 07/2026
University of Zurich & ETH AI Center, Switzerland
Thesis: "Optimization-Based Composable Generation with Learnable and Scientific Priors"

Master of Science, Physics 2020 – 2022
University of Goettingen, Germany
Thesis: "Dynamical System Modeling via Koopman Learning"

Bachelor of Science, Physics 2014 – 2017
Jagiellonian University, Poland;
Top 10%, Thesis: "Algebraic Approach to the Supersymmetric Calogero-Sutherland Model"

SELECTED FIRST-AUTHOR PUBLICATIONS

Submitted to *NeurIPS (2026, under review)*
"Graph Energy Matching: Transport-Aligned Energy-Based Modeling for Graph Generation" [paper] [code] [project page]
Learnable Discrete Priors — Optim. Transport — Controlled Generation

NeurIPS (2025)
"Energy Matching: Unifying Flow Matching and Energy-Based Models for Generative Modeling" [paper] [code, 200+ GitHub stars]
Learnable Priors — Optimal Transport — Controlled Generation

Nature Communications (2025)
"Individualizing Glioma Radiotherapy Planning by Optimization of a Data- and Physics-Informed Discrete Loss" [paper] [code]
PDE-based Priors — Multi-modal Imaging — Cancer Application

NeurIPS (2024)
"Physics-Regularized Multi-Modal Image Assimilation for Brain Tumor Localization" [paper] [code]
Elasticity Priors — Graph-based Structures — Data-scarce Settings

SELECTED TALKS

Featured Speaker & Closing Panelist, Frontiers of Flows for Generative AI, Mathematical Foundations of AI Workshop, Carnegie Mellon University, Pittsburgh, PA [event website] 03/2026

EXPERIENCE

Graduate Researcher 2022 – 2026
University of Zurich / ETH AI Center, Switzerland

- Developed optimization-based generative modeling and scientific inverse-problem methods using energy-based models, optimal transport, and physics-informed priors.
- Led model design, PyTorch/JAX implementation, training, evaluation, and open-source code release for first-author NeurIPS / Nature Communications projects.

Visiting Research Fellow 2023 – 2024
Harvard University, Cambridge, MA, USA

- Developed hybrid neural networks and classical methods to estimate cancer cell locations on discrete, graph-like representations of brain soft tissues, incorporating biomechanical elasticity and PDE-based priors in Prof. Petros Koumoutsakos' lab. Supported by a GRC Travel Grant for a six-month research stay.

Founder & CTO 2018 – 2020
Acai Analytics sp. z o.o., Cracow, Poland

- Led the development of large-scale supervised learning pipelines for constructing trading strategies, leveraging MCMC simulations on Google Cloud for probabilistic forecasting and risk analysis; managed technical hiring and mentored a small team of data scientists and software engineers.

Student Researcher 2015 – 2018
CERN, Geneva, Switzerland

- Developed a machine learning framework to identify collision topologies at the Large Hadron Collider within the ATLAS experiment, focusing on anomaly detection. Worked on-site for four months and continued the project remotely thereafter.

SKILLS

Languages:	English (C2), German (B1), Polish (Native)
Programming:	Python, C++, JAX, MATLAB, PyTorch, TensorFlow, TeX/Tikz
Systems:	Linux, Git, Docker, GPU clusters/HPC, cloud computing
Cooperation:	Led large-scale, multi-institutional research collaborations; contributed to the ATLAS experiment at CERN involving hundreds of researchers.
Review:	NeurIPS, CVPR, Medical Image Analysis

AWARDS & SCHOLARSHIPS

GRC Travel Grant (2023): Supporting research stay at Harvard University.

DAAD Study Scholarship (2019): Awarded to 15 out of 80 applicants, covering full MSc expenses in Germany.

Minister of Science and Higher Education Scholarship (2015, 2016): Awarded annually to top ∼500 students in Poland.

REFERENCES

- **Prof. Dr. Bjoern Menze**, bjoern.menze@uzh.ch
  University of Zurich & ETH AI Center
  (Main PhD Supervisor, Co-author)
- **Prof. Dr. Benedikt Wiestler**, b.wiestler@tum.de
  Technical University of Munich
  (PhD Co-supervisor, Co-author)
- **Prof. Dr. Yilun Du**, ydu@seas.harvard.edu
  Kempner Institute, Harvard University
  (Research Co-supervisor, Co-author)