Tomasz Kacprzak

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Employment

2025 - present	**Humboldt Experienced Researcher**, Ludwig's Maximilian University of Munich
2021 - 2025	**Senior Data Scientist**, Swiss Data Science Center, Paul Scherrer Institute
2018 - 2021	**Senior Scientist**, Institute for Particle Physics and Astrophysics, ETH Zurich
2014 - 2018	**Post-Doctoral Research Associate**, Institute for Astronomy, ETH Zurich

Education

2010 - 2014	**PhD in Physics and Astronomy**, University College London, UK Advisors: Prof Sarah Bridle, Prof John Shawe-Taylor
2009 - 2010	**MSc Machine Learning**, First Class, University College London, UK
2004 - 2009	**MSc Computer Science**, First Class, Wroclaw University of Technology, PL

Awards

2025	**Humboldt Research Fellowship for Experienced Researchers** Host: Ludwig's Maximilian University of Munich, Germany Fully-funded grant for independent research, 18 months, can be started from 06/2025
2024 - 2025	NERSC Generative AI for Science Project: *DES+DESC Generative AI for Cosmology* **Principal Investigator**, 7k A100 GPU Perlmutter Node Hours, ≈40k USD Awarded by the National Energy Research Scientific Computing Center, USA
2023 - 2025	NERSC Exascale Science Applications Program, Project: *DESLearning* **Principal Investigator**, 0.5 NERSC FTE algorithmic scaling and technical support
2020 - 2021	Computational Production Project: *Measuring Dark Energy with Deep Learning* **Principal Investigator**, 750k GPU-node hours, ≈500k CHF Awarded by the Swiss National Supercomputing Center
2017 - 2019	Collaborative Grant: *Deep Learning for Observational Cosmology* **Principal Investigator**, hired staff: N. Perraudin (postdoc), J. Fluri (PhD) Awarded by Swiss Data Science Center, ≈750k CHF
2019	Workshop: *Artificial Intelligence Methods in Cosmology*, June 9-12 Main applicant and lead organizer, ≈5k CHF Awarded by ETHZ Congressi Stefano Franscini

Major Achievements in AI for Physics and Cosmology

- Delivered first deep learning cosmology measurements from map-level data, greatly increasing the information content extracted from the survey data

- Introduced first generative AI models for cosmic web simulations, including large-scale 3D volumetric training data and spherical tomographic maps, using GANs, DDPMs and flow matching

- Coordinating the project on generative AI for Dark Energy Survey and the Dark Energy Science Collaboration (LSST/Rubin), in the area of "painting" gas fields onto the cosmic web

- Produced CosmoGridV1, the first massive simulations set for simulations-based inference and AI training, 750TB of data public at www.cosmogrid.ai, ran on Piz Daint, large production project

Leadership and Service

2025-   **Euclid Collaboration: Co-Lead of Work Package *Field Level Inference***
- Organizing projects for field-level inference in multiprobe cosmology
- Design of SBI simulations for Cosmological Simulations Working Group
- Internal reviewer for papers in the area of SBI and higher-order statistics

2023-   **Member of the SKA Switzerland Consortium**
- NCCR *D+Cosmos* grant submission: coordinated pillar for Data Science and AI *Digital Frontier* (14 PIs, budget $\approx$15m CHF)
- Developing multiprobe SBI projects for combining SKA and LSST/Euclid

2022-   **Simulations Working Group Coordinator in the Dark Energy Survey**
- Leading a group of 30 DES members, 10 cosmology projects with SBI
- Providing simulated theory prediction for multiprobe SBI projects
- Coordinating submissions for competitive computing resources grants
- Organizing bi-weekly calls for project updates, planning and invited talks

2012-   **Member of the Science Committee and Builder of the Dark Energy Survey**
- Coordinating new innovation-oriented projects, designing publication policy
- Permanent *Builder* status awarded after 2 years FTE of DES infrastructure work
- In-person participation in 15 collaboration meetings (USA, Europe, South America)
- Co-wrote IM3SHAPE, a weak lensing measurement code for DES SV and Y1
- Performed simulations-based shear calibration in DES SV (NERSC Cori)
- Chair of the Early Career Scientist Committee, organizing career events (2016-2017)

2022-   **Student Supervision and Mentoring**
- Idea originator and lead advisor for 4 post-doc, 8 PhD, and 13 MSc projects
- 9/13 MSc projects resulted in articles published in peer-reviewed journals

2018-   **Service in Astrophysics and Computer Science**
- Science Organizing Committee Member *UniverseAI*, Athens 2-6 June 2025
- Reviewer for the *Application Track* at *Supercomputing* conference 2024 and 2025
- Paper reviewer for Nature Astronomy, PNAS, Physical Review, JCAP, MNRAS.
- External examiner for PhD thesis Justine Zeghal (APC, Paris, FR)
- Proposal reviewer for Swiss Data Science Center calls for collaborative projects
- Proposal reviewer for UKRI Future leaders programme

2019   **Lead Organizer of Workshop *Artificial Intelligence Methods in Cosmology***
- Monte Verita, Ascona, June 2019, 46 participants, 6 invited speakers
- Lead grant writer, speaker invitations, program development, logistics

Recent presentations (selected)

2024/10	*X Meeting on Fundamental Cosmology*, Sevilla, ES,	**invited review talk**
2023/11	*Debating the Potential of ML in Astro. Surveys*, IAP Paris, FR,	**invited review talk**
2023/11	*Mathematics and Informatics Colloquium*, Uni Basel, CH,	invited seminar
2023/05	*ML X Astrophysics Symposium*, Flatiron Institute, New York, USA,	invited talk
2023/03	*University Observatory Munich Colloquium*, DE,	invited talk + 2-day tutorials
2022/07	*Key Challenges in Galaxy and CMB lensing*, Cambridge, UK,	invited guest talk
2022/06	*Bayesian Deep Learning in Cosmology*, Paris, FR,	**invited keynote talk** ⬈
2022/06	*Space Science Data Center Seminar*, Rome, IT,	invited seminar talk
2022/04	*Berkeley ML and Science Forum*, Berkeley, USA,	invited seminar talk
2021/10	*Cosmology seminar*, University of Geneva, CH,	invited seminar talk
2019/09	*Cosmology seminar*, SLAC, Stanford, USA,	invited talk

Supervision

I was the **idea originator and lead advisor for 3 post-doc projects, 8 PhD projects, 14 MSc projects.** 9/14 MSc projects resulted in articles in peer-reviewed journals, marked with ⬈.

2024 - present	Jozef Bucko, post-doc, *Generative AI for cosmology*
2022 - present	Arne Thomsen, PhD, *Cosmology with deep learning of combined probes in DES*
2025	Silvan Fischbacher, PhD, *Optimal transport for subhalo abundance matching* ⬈
2024	Silvan Fischbacher, PhD, *GalSBI: galaxy population evolution modelling with SBI* ⬈
2023	Beatrice Moser, PhD, *Evolution of galaxy samples with ABC modelling in DES* ⬈
2023	Virginia Ajani, post-doc, *Peak statistics of combined probes in DES*
2023	Mila Luescher, MSc, *Convergence Maps With Denoising Diffusion Probabilistic Models*
2022	Silvan Fischbacher, MSc, *Redshift requirements for shear with intrinsic alignment* ⬈
2022	Gaspard Aymerich, MSc, *Interpretability of deep-learning methods in weak lensing* ⬈
2022	Ting Tan, MSc, *Assessing theoretical uncertainties for cosmology from weak lensing* ⬈
2022	Dominik Zürcher, PhD, *Dark energy survey year 3 results: cosmology with peaks* ⬈
2022	Janis Fluri, PhD, *Full wCDM analysis of KiDS-1000 lensing using deep learning* ⬈
2018	Nathanael Perraudin, post-doc data scientist, *Deep learning on the sphere* ⬈
2020	Timothy Wing Hei Yiu, MSc, *A tomographic mass map emulator of KiDS-1000* ⬈
2020	Benjamin Suter, MSc, *Cosmology with machine learning and human-designed statistics*
2019	Dominik Zürcher, PhD, *Forecast for non-Gaussian statistics in large-scale surveys* ⬈
2019	Janis Fluri, PhD, *Constraints with deep learning from KiDS-450 weak lensing maps* ⬈
2019	Conrad Schwanitz, MSc, *Interpretability measures for deep learning on lensing maps*
2019	Sajanth Subramaniam, MSc, *Systematics-invariant constraints with deep learning*
2018	Jörg Herbel, PhD, *Fast point spread function modeling with deep learning* ⬈
2018	Sandro Marcon, MSc, *Emulation of cosmological mass maps with conditional GANs* ⬈
2018	Ankit Srivastava, MSc, *N-body simulations: a challenge for scalable GANs* ⬈
2018	Janis Fluri, PhD, *Constraints from noisy convergence maps through deep learning* ⬈
2018	Alex Stauffer, MSc, *Approximate Bayesian computation in cosmology with ABCpy*
2018	Jonathan Rosenthal, MSc, *Generative temporal models for cosmology*
2017	Janis Fluri, MSc, *Lensing peak statistics in the era of large cosmological surveys* ⬈
2017	Andres Rodrigues, MSc, *Fast cosmic web with generative adversarial networks* ⬈
2017	Jorit Schmelzle, MSc, *Cosmological model discrimination with deep learning*

Teaching

2019 - 2020	Lecturer for UG course *Statistical Methods and Analysis in Experimental Physics* Topical block: Bayesian methods, machine learning, simulations-based inference Tasks: lectures, preparing assignments, leading the tutorials for approx. 50 students
2019	Lecturer for the UG course *Astrophysics 1*, topical block: *Introduction to Cosmology*
2019 - 2020	Guest lecturer for UG course *Introduction to Data Science* at University of Zurich Topics: deep learning, convolutional neural networks, generative models
2017 - 2018	Course coordinator for undergraduate module *Physics 1 and 2*, approx. 300 students Tasks: creation of exercises, preparation of exams and coordination of marking
2016 - 2017	Teaching assistant for MSc course *Advanced Statistical Methods in Cosmology* Tasks: curriculum development, creating assignments, leading tutorials
2017	Leader of the tutorial sessions, masters-level module *Cosmological Probes*