

Bernardin TAMO AMOUGOU

Dual PhD Researcher in Machine Learning, Bayesian Imaging and Uncertainty Quantification

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Research profile

Mathematically grounded machine-learning researcher developing uncertainty-aware methods for reconstructing images from noisy, incomplete and indirect measurements. Research spans Bayesian inverse problems, self-supervised conformal prediction, posterior sampling and generative priors, with peer-reviewed work in Gaussian and Poisson imaging. Combines statistical modelling and optimisation with PyTorch/JAX implementation and GPU/HPC experimentation for scientific and medical imaging.

Core areas: Bayesian inverse problems ▪ Computational and quantitative imaging ▪ Uncertainty quantification ▪ Conformal prediction ▪ Posterior inference and sampling ▪ Self-supervised learning ▪ Diffusion, flow and variational generative models ▪ Learned and data-driven priors ▪ Medical and scientific imaging ▪ Optimisation, stochastic algorithms and kernel methods

Education

2023–present	Dual PhD candidate Statistics and applied mathematics - Heriot-Watt University and Université Paris Cité - Edinburgh, United Kingdom and Paris, France Thesis: Stochastic quantitative imaging methods with data-driven priors encoded by neural networks; Supervisors: Andrés Almansa, Julie Delon and Marcelo Pereyra.
2021–2022	Master 2 Mathematics, Modelling and Machine Learning - Université Paris Cité - Paris, France Distinction (16/20); dissertation 19/20; Dissertation: Correspondence Between Physics-Informed Neural Networks and Kernel Methods: A Neural Tangent Kernel Perspective.
2020–2021	Structured Master's Degree Mathematical Sciences (Data Science stream) - African Institute for Mathematical Sciences (AIMS) Cameroon - Cameroon Valedictorian with distinction; GPA 3.55/4; Research essay on neural networks, reproducing kernel Hilbert spaces and neural tangent kernels for PDE solvers.
2018–2020	Master 1 and Master 2 studies Mathematical Modelling in Economics and Finance; Computational Finance - African Centre of Excellence in Information and Communication Technologies (CETIC), National Advanced School of Engineering, University of Yaoundé I - Yaoundé, Cameroon Best student in Mathematical Modelling in Economics and Finance (2019); Dissertation: Analysis of a Brownian Motion Functional.
2013–2018	Bachelor's Degree and Secondary/High-School Teacher's Diplomas Mathematics and mathematics education - Higher Teacher Training College (ENS Yaoundé), University of Yaoundé I - Yaoundé, Cameroon Completed the first- and second-level professional teaching diplomas in mathematics alongside the bachelor's degree.

Research and professional experience

2023–present	Dual PhD Researcher Heriot-Watt University and Université Paris Cité - Edinburgh, United Kingdom and Paris, France Research in machine learning and Bayesian computation for uncertainty-aware imaging inverse problems. ▪ Developing self-supervised uncertainty-quantification methods for ill-posed imaging problems where reliable ground truth is scarce or unavailable. ▪ Co-developed SURE- and PURE-based conformal methods and currently studies symmetry-aware latent-variable models for scalable posterior sampling. ▪ Implements and evaluates methods in Python with PyTorch/JAX, GPU acceleration and SLURM-based HPC workflows across denoising, deblurring, CT and MRI settings.
2022–2023	Research Engineer MAP5, Université Paris Cité - Paris, France Research engineering for computational imaging with learned priors. ▪ Developed stochastic and optimal-transport-inspired algorithms for image deblurring and colourisation with data-driven neural-network priors. ▪ Implemented numerical experiments for inverse-problem reconstruction and analysis in Python.
2022	Junior Researcher (Master's research internship) Hausdorff Center for Mathematics - Bonn, Germany Deep learning, kernel learning and neural PDE solvers. ▪ Investigated links between physics-informed neural networks, neural tangent kernels and reproducing kernel Hilbert spaces. ▪ Combined mathematical analysis with numerical experiments; the resulting dissertation was awarded 19/20.

Peer-reviewed publications

2025	Self-supervised conformal prediction for uncertainty quantification in Poisson imaging problems Bernardin Tamo Amougou , Marcelo Pereyra, and Barbara Pascal. <i>2025 IEEE Statistical Signal Processing Workshop (SSP)</i> , pp. 76–80. DOI arXiv
2025	Self-supervised Conformal Prediction for Uncertainty Quantification in Imaging Problems Jasper M. Everink, Bernardin Tamo Amougou , and Marcelo Pereyra. <i>Scale Space and Variational Methods in Computer Vision (SSVM 2025)</i> , pp. 108–118. DOI arXiv

Current and selected research projects

Manuscript in preparation	Equivariant Self-Supervised VAE for Bayesian Imaging A symmetry-aware latent-variable approach to posterior sampling and uncertainty quantification from noisy measurements. Designing and implementing an equivariant self-supervised model that uses measurement-space latent variables and Tweedie-based moment relationships.
Peer-reviewed conference paper	Self-Supervised Conformal Prediction for Poisson Imaging Ground-truth-free conformal calibration for Poisson inverse problems using the Poisson unbiased risk estimator (PURE). Developed a self-calibrating conformal framework for Poisson linear imaging problems.

Peer-reviewed
conference paper

Self-Supervised Conformal Prediction for Gaussian Imaging

Conformal uncertainty quantification calibrated directly from noisy measurements through Stein's unbiased risk estimator (SURE).
Co-developed a self-supervised calibration strategy for ill-conditioned linear imaging problems without ground-truth calibration data.

Teaching and supervision

2023–present	Teaching Assistant Heriot-Watt University - Edinburgh, United Kingdom Taught Statistical Models B (2025-2026) and Introduction to University Mathematics (2024-2025). Led tutorials and laboratories across Bayesian inference, stochastic processes, probability and statistics, data science, numerical analysis, optimisation and scientific programming.
2022–2023	Teaching Assistant Neuromatch Academy - Worldwide (online) Taught machine-learning and deep-learning methods to groups of 8-12 students in computational biology, finance and neuroscience. Supervised two student research projects.
2018–2020	Certified Mathematics Teacher Government Technical and Bilingual High School of Bonaberi - Douala, Cameroon Taught secondary-school mathematics full-time across multiple year groups.

Selected talks, posters and presentations

May 2026	An Equivariant Self-Supervised VAE for Uncertainty Quantification in Bayesian Imaging Problems Poster presentation - ICMS Workshop on Imaging Inverse Problems and Generative Models, Bayes Centre, Edinburgh, United Kingdom
2025	Self-Supervised Conformal Prediction for Uncertainty Quantification in Poisson Imaging Problems Paper and poster presentation - IEEE Statistical Signal Processing Workshop (SSP), Edinburgh, United Kingdom
Feb 2025	Self-Supervised Conformal Prediction for Uncertainty Quantification in Imaging Problems Short oral presentation - UCL Workshop, London, United Kingdom
Dec 2024	Self-Supervised Sampling for Uncertainty Quantification in Imaging Webinar talk - Mathematical Collaborative Forum Webinar

Awards, scholarships and distinctions

2024	France Excellence EIFFEL Scholarship French Ministry for Europe and Foreign Affairs - Doctoral scholarship supporting research at Université Paris Cité.
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2024 **First Prize, Hackathon Workshop on Generative Modeling**

Edinburgh Futures Institute - Team award.

2023 **James Watt Studentship**

Heriot-Watt University - Doctoral studentship.

2021 **SMARTS-UP Scholarship**

Université Paris Cité - International master's mobility scholarship.

2021 **Valedictorian, AIMS Cameroon Cohort 2021**

AIMS Cameroon - Highest-ranked graduate in the 2021 cohort.

2021 **Gender Balance Prize, Three Minute Thesis**

AIMS Cameroon - Prize for the AIMS Cameroon 3MT competition.

Scientific service and leadership

2020–2021 **Class Delegate and Co-Student Representative**

AIMS Cameroon

Represented the 2021 cohort and supported peer collaboration across the academic year.

Technical and mathematical skills

Programming (Primary and research use)	Python - MATLAB - Working knowledge of R, C/C++ and SQL
Machine learning (Research use)	PyTorch - JAX - Automatic differentiation - Working knowledge of TensorFlow and Keras
Imaging and scientific computing (Research use)	DeepInv - OpenCV - Image restoration - CT and MRI reconstruction - Inverse-problem simulation and evaluation
Generative modelling (Research use)	Diffusion and score-based models - Flow-based models - Variational autoencoders - Learned priors
Bayesian computation and UQ (Research use)	MCMC - ULA and MYULA - Posterior sampling - Monte Carlo methods - Conformal prediction
Research infrastructure (Daily and research use)	Linux - Git and GitHub - LaTeX - SLURM - CUDA-enabled HPC (Jean Zay and DMOG) - Docker
Mathematical methods (Research use)	Optimisation and stochastic algorithms - Bayesian inverse problems - Kernel and RKHS methods - Optimal transport - Statistical modelling

Advanced training and languages

2025 **Machine Learning Summer School (MLSS Senegal)**

AIMS Senegal - Dakar, Senegal

2021 **The Theory and Practice of Deep Learning**

11th Gene Golub SIAM Summer School - AIMS South Africa

French: Native ▪ **English:** Advanced professional proficiency ▪ **German:** Basic

References available upon request.