Patricio Guerrero

Applied mathematics researcher
Signal Processing Systems, TU Delft
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github : github.com/patoguerrero
TU Delft staff page, scholar, researchgate

(updated : 06/2026)

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Research domains

Inverse problems in computational imaging : variational, bayesian and numerical approaches
Convex optimization applied to audio/imaging/tomographic problems

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Scientific career

[Feb. 2026 - present] **Postdoctoral position**, Signal Processing Systems, TU Delft, The Netherlands
– Bilevel optimization to audio / speech signal processing

[Feb. 2021 - Jan. 2026] **Postdoctoral position**, Manufacturing Metrology Group, KU Leuven, Belgium
– Bayesian reconstructions : Uncertainty quantification in X-ray Computed Tomography
– Automatic alignment of cone-/fan-beam projections
– Regularized reconstructions with few-view tomographic data
– Parameter estimation of regularized models via machine (bilevel) learning

[Jan. 2019 - Sept 2020] **Researcher in tomographic image reconstruction**
Scientific Computing Group, Brazilian Synchrotron Light Laboratory, LNLS/SIRIUS, Brazil
– Mathematical and algorithmic developments in synchrotron imaging problems
– Regularized iterative phase-retrieval algorithm in near-field propagation imaging
– Different tomographic reconstruction methods (FBP, FDK, EM, gradient descent, ...)

[Sept. - Dec. 2018] **Postdoctoral position**, Scientific Computing Group, LNLS, Brazil
– GPU implementation of the FDK algorithm for cone-beam tomography
– Low cost backprojection formulation in fan-beam geometry

[Sept. 2017 - July 2018] **Research and teaching assistant** (ATER French position)
Mathematics Laboratory of Versailles, UVSQ, France

[Nov. 2014 - Sept. 2018] **Ph.D. in Applied Mathematics,** University of Paris-Saclay, France
Three-dimensional reconstruction of flat heritage objects based on Compton scattering tomography
Introduction and modelling of *synchrotron Compton tomography*
Numerical developments in R/C/OpenCL of the reconstruction method
Laboratories :
– Mathematics Laboratory of Versailles LMV
Versailles Saint-Quentin-en-Yvelines University UVSQ, France
– European research platform on ancient materials IPANEMA
French National Center for Scientific Research CNRS, France
– Information Processing and System Teams ETIS
École nationale supérieure de l'électronique et de ses applications ENSEA, France
Advisors :
Prof. Laurent Dumas (LMV), Prof. Mai Nguyen (ETIS), Dr. Serge Cohen (IPANEMA)

Education

Sept. 2014 **M.Sc. in Applied Mathematics**
Jean Monnet University and Saint-Etienne School of Mines, France

– **Thesis** : Gaussian random fields to model and simulate human endothelial tessellations
Advisors : Prof. Yann Gavet and Prof. Jean-Charles Pinoli

July 2009 **Bachelor's degree in Mathematics**
Jean Monnet University and Central University of Ecuador, Quito, Ecuador

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Publications

[1] N. Khoeiniha, **P. Guerrero**, T. van Leeuwen, W. Dewulf. Bayesian Uncertainty Quantification and Regularized Reconstruction for CT-Based Dimensional Metrology, *Journal of Nondestructive Evaluation* 44(136), 1-19 (2025).

[2] M. Bahrkazemi, A. Rohde, J. Hess, S. Gondrom-Linke, **P. Guerrero**, W. Dewulf. Towards industrially relevant total variation based reconstruction of few-view computed tomography by exploiting noise level estimation, *CIRP Journal of Manufacturing Science and Technology*, 61, 336-352 (2025).

[3] N. Khoeiniha, **P. Guerrero**, W. Dewulf. Uncertainty quantification of CT regularized reconstruction within the Bayesian framework, *Proceedings of the 14th Conference on Industrial Computed Tomography (iCT)* (2025).

[4] **P. Guerrero**, S. Bellens, R. Santander, W. Dewulf. Automatic and Computationally Efficient Alignment in Fan-and Cone-beam Tomography, *IEEE Transactions on Computational Imaging*, 10, 700-712 (2024).

[5] S. Bellens, **P. Guerrero**, P. Vandewalle, W. Dewulf, Machine learning in industrial X-ray computed tomography - a review, *CIRP Journal of Manufacturing Science and Technology*, 51, 324-341 (2024).

[6] S. Bellens, **P. Guerrero**, M. Janssens, P. Vandewalle, W. Dewulf, Machine learning based sinogram interpolation for X-ray computed tomography validated on experimental data, *Precision Engineering*, 88, 449-463 (2024).

[7] S. Bellens, **P. Guerrero**, M. Janssens, P. Vandewalle, W. Dewulf, Direct voxel classification from x-ray projections for 3D pore detection applied to laser sintered parts, *Measurement Science and Technology*, 35(4), 046004 (2024).

[8] S. Bellens, **P. Guerrero**, M. Janssens, P. Vandewalle, W. Dewulf, Deep learning reconstruction of few-view X-ray CT measurements of mono-material objects with validation in additive manufacturing. *CIRP Annals*, 73(1), 381-384 (2024).

[9] **P. Guerrero**, M. Bernardi, E. Miqueles. Alternative fan-beam backprojection and adjoint operators. *Journal of inverse and ill-posed problems*, 31(6), 921-935 (2023).

[10] M. Bahrkazemi, A. Rohde, J. Fieres, J. Hess, **P. Guerrero**, S. Gondrom-Linke, W. Dewulf. The constrained split-Bregman algorithm for enhancing the quality of image reconstruction and analysis in few-view Computed Tomography *Proceedings of the 13th Conference on Industrial Computed Tomography (iCT)* (2024).

[11] M. Bahrkazemi, A. Rohde, J. Hess, **P. Guerrero**, S. Gondrom-Linke, W. Dewulf. Total Variation regularized reconstruction for enhancing the quality of few-view industrial computed tomography applied to image analysis. *Proceedings of the 12th Conference on Industrial Computed Tomography (iCT)* (2023).

[12] R. Kang, **P. Guerrero**, G. Probst, P. Slaets, W. Dewulf. Reference free method for robot CT imaging geometry estimation. *Precision Engineering* 78, 102-113 (2022).

[13] R. Kang, G. Probst, M. Vlaeyen, G. Fei, **P. Guerrero**, H. Haitjema, P. Slaets, W. Dewulf. Geometric qualification for robot CT with flexible trajectories. *Proceedings of the 11th Conference on Industrial Computed Tomography (iCT)* (2022).

[14] D. Wu, **P. Guerrero**, M. Sinico, W. Dewulf. L_0 Regularized Image Deblurring applied to Porosity Analysis in Industrial X-ray Computed Tomography. *Proceedings of the 11th Conference on Industrial Computed Tomography (iCT)* (2022).

[15] E. Miqueles, **P. Guerrero**. Automatic regularization for tomographic image reconstruction. *Results in Applied Mathematics*, 6, 100088-100108 (2020).

[16] E. Miqueles, Gilberto Martinez Jr., **P. Guerrero**. Fast image reconstruction at a synchrotron laboratory. *Proceedings of the 2020 SIAM Conference on Parallel Processing for Scientific Computing*, 24-34 (2020).

[17] **P. Guerrero**, M. K. Nguyen, L. Dumas, S. X. Cohen. Modelling of a New Compton Imaging Modality for an In-depth Characterisation of Flat Heritage Objects. *Proceedings of The 9th EUROSIM Congress on Modelling and Simulation, EUROSIM 2016*, 142 (2018), 334-340.

[18] **P. Guerrero**, M. K. Nguyen, L. Dumas, S. X. Cohen. Three dimensional imaging of flat natural and cultural heritage objects by a Compton scattering modality. *Journal of Electronic Imaging*, 26(1), 1-9 (2017).

[19] K. Rannou, E. Crouzet, C. Ronin, **P. Guerrero**, G. Thuret, P. Gain, J.C. Pinoli, Y. Gavet. Comparison of corneal endothelial mosaic according to the age : the corimmo 3D project. *IRBM*, 37(2), 124-130 (2016).

Preprints

[20] **P. Guerrero**, S. Bellens, W. Dewulf. FISTA-Condat-Vu : Automatic Differentiation for Hyperparameter Learning in Variational Models. 2024. arXiv:2412.10034

Software

`alignCT` algorithms accompanying the paper [4], 2024.

`fista_acv` algorithms accompanying the paper [20], 2024.

Communications

Conferences

June 2026 Talk : Automatic Differentiation of Proximal Algorithms in Bilevel Learning for Imaging, *as co-organizer* of the session : Bilevel Optimisation : Methods and Applications with Nonsmooth Terms
SIAM Conference on Optimization (OP26), Edinburgh, Scotland

July 2025 Talk : A Primal-Dual algorithm with Krylov Subspace projection for X-ray computed tomography, *as co-organizer* of the session : Numerical linear algebra meets nonsmooth optimization in computed tomography
Applied Inverse Problems (AIP2025), Rio de Janeiro, Brazil

June 2024 Talk : Proximal Splitting Algorithms and Langevin Monte-Carlo Methods for Few-View Tomography, *Invited* to the session : Goal-Oriented Uncertainty Quantification in Imaging Sciences
SIAM Conference on Imaging Science (IS24), Atlanta, USA

Nov. 2023 Talk : Alignment and regularized reconstructions in tomography as optimization problems
IX Conference of Ecuadorian mathematicians in Paris, Institut Henri Poincaré, Paris, France

June 2023 Talk : Fast Misalignment Correction in Cone-Beam Tomography via Variable Projection
SIAM Conference on Optimization (OP23), Seattle, USA

Feb. 2022 Talk : L_0 Regularized Image Deblurring applied to Porosity Analysis in Industrial X-ray Computed Tomography.
11th Conference on Industrial Computed Tomography (iCT) 2022, Wels, Austria

Oct. 2021 Talk : Un teorema de retroproyección tomográfica en abanico de baja complejidad
VII Conference of Ecuadorian mathematicians in Paris, Institut Henri Poincaré, Paris, France

Sept. 2021 Talk : A low-complexity fan-beam tomographic backprojection formula
IFIP TC7 Conference on System Modelling and Optimization, Quito, Ecuador

Nov. 2019 Talk : Strategies for image reconstruction at Sirius
29th RAU LNLS/CNPEM Annual Users Meeting, CNPEM, Campinas, Brazil

April 2017 Talk : X-ray tomography and the Radon transform
III Conference of Ecuadorian mathematicians in Paris, Institut Henri Poincaré, Paris, France

Sept. 2016 Talk : Modelling of a New Compton Imaging Modality for an In-Depth Characterisation of Flat Heritage Objects
The 9th EUROSIM International Congress on Modelling and Simulation, Oulu, Finland

May 2016 Talk : Backprojection of a conical Radon Transform in Compton scatter tomography
Congrès National d'Analyse Numérique 2016, Obernai, France

April 2016 Poster : Reconstruction des objets à partir de la diffusion inélastique
II Conference of Ecuadorian mathematicians in Paris, Institut Henri Poincaré, Paris, France

March 2016 Poster : In-depth imaging of flat objects through a backprojection reconstruction of a 2D conical Radon Transform
Atelier scientifique Matériaux du patrimoine et patrimoine matériel, École Polytechnique, Paris

As co-author

Feb. 2024 Talk : The constrained split Bregman algorithm for enhancing the quality of image reconstruction and analysis in few-view Computed Tomography. To be presented by M. Bahrkazemi
13th Conference on Industrial Computed Tomography (iCT) 2024, Wels, Austria

Feb. 2024 Poster : Uncertainty Quantification of CT Regularized Reconstruction within the Bayesian Framework. Presented by N. Khoeiniha
13th Conference on Industrial Computed Tomography (iCT) 2024, Wels, Austria

May 2023 Talk : The interaction between geranium lake particles and drying oil assessed by SR-μFTIR and SR-XCT. Presented by V. Beltran
TECHNART 2023, Lisbon, Portugal

Feb. 2023 Poster : Total Variation regularized reconstruction for enhancing the quality of few-view industrial computed tomography applied to image analysis. Presented by M. Bahrkazemi
12th Conference on Industrial Computed Tomography (iCT) 2023, Fürth, Germany

Feb. 2022 Talk : Geometric qualification for robot CT with flexible trajectories. Presented by R. Kang
11th Conference on Industrial Computed Tomography (iCT) 2022, Wels, Austria

Feb. 2020 Talk : Fast image reconstruction at a synchrotron laboratory. Presented by E. Miqueles
SIAM Conference on Parallel Processing for Scientific Computing (PP20), Seattle, USA

June 2016 Talk : Age de l'endothélium cornéen humain. Presented by K. Rannou
Journées stéphanoises de cytométrie et d'imagerie 2016, Saint-Etienne, France

Oct. 2014 Talk : Spatial statistical analysis of the human corneal endothelial mosaic.
Presented by K. Rannou
European Association for Vision and Eye Research Annual Meeting 2014, Nice, France

Invited seminaries

Feb. 2023 Mathematics for industrial CT, the alignment problem
Manufacturing Metrology seminar, KU Leuven, Belgium.

Dec. 2020 Low-complexity tomographic backprojections for high-resolution imaging techniques
Computational Imaging CWI seminar, CWI, The Netherlands.

March 2019 Three-dimensional imaging of flat samples from Compton Scattering
SOLEIL seminar, Synchrotron Soleil, Gif-sur-Yvette, France

May 2016 Une nouvelle modalité d'imagerie basée sur le rayonnement X diffusé
PhD seminar, LMV - UVSQ, Versailles, France

April 2016 Transformée de Radon conique. Inversion par rétroprojection filtrée
Analysis - PDE seminar , LMV - UVSQ, Versailles, France

Acquired funding

2022 FWO Research project G0C2423N, 451K euro, 1 PhD and self postdoctoral funding
Development of a hybrid data-driven/model-based regularization method for X-ray CT-metrology
Conceptualization and writing

2023 KU Leuven Industrieel Onderzoeksfonds, project C2E/23/032
Autonomous Demanufacturing of battery driven products (AUDRI)
Co-writing, edition and review

2022 1 week synchrotron beamtime. Diamond Light Source, beamline I13-2 : Manchester Imaging. Project MG33135
The heterogeneity of madder lake pigments and its influence in their degradation mechanism

2021 1 week synchrotron beamtime. SOLEIL Synchrotron, micro/nano tomography beamline ANATOMIX. Project 2021590
The presence of impurities in geranium lake pigments : morphology and influence in the degradation mechanism

2018 Postdoctoral funding, *Phase Retrieval for Cone-Beam Tomography*
Funding source : Capes/CNPEM, Brazil. Project 23038.001614/2016-52

Student supervision

2023 - 2027 (PhD co-promotor) X. Chen, KU Leuven
Hybrid data-driven/model-based regularized model for few-view X-ray computed tomography

2022 - 2026 (PhD co-promotor) N. Khoeiniha, KU Leuven
Determination of task-specific measurement uncertainty caused by geometrical misalignments in computed tomography

2021 - 2025 (PhD co-promotor, *defended*) M. Bahrkazemi, KU Leuven
A-priori-knowledge enhanced CT reconstruction for fast scanning strategies

2025 - 2026 (MSc co-supervisor) P. Deputter and K. Ulrix, KU Leuven
Structure evaluation of batteries cells using X-ray computed tomography

2024 - 2025 (MSc co-supervisor) S. Jha and T. Duijsters, KU Leuven
Metal Artefact Mitigation in Industrial X-ray Computed Tomography

2019 - 2020 (Undergraduate thesis supervisor) M. Bernardi, University of Campinas, Brazil
Development and implementation of imaging reconstruction algorithms in X-ray tomography

Member of PhD examination committee

2025 (co-promotor) M. Bahrkazemi, KU Leuven
A-priori-knowledge enhanced CT reconstruction for fast scanning strategies

2024 (invited) S. Bellens, KU Leuven, Belgium
Towards fast X-ray CT measurements of additive manufactured parts - a machine learning approach.

2023 (invited) R. Kang, KU Leuven, Belgium
Geometry Estimation of Twin Robot X-Ray Computed Tomography Systems

Teaching

2024 - 2025 Introduction to Computed Tomography, 5 hours
Part of the course 'Advanced Analytical Techniques in Heritage Science'
University of Antwerp, Belgium

2017 - 2018 Fundamental mathematics I, 54 hours
Versailles Saint-Quentin-en-Yvelines University, France

2015 - 2018 General mathematics I, 54×3 hours
Versailles Saint-Quentin-en-Yvelines University, France

2017 - 2018 General mathematics II, 54 hours
Versailles Saint-Quentin-en-Yvelines University, France

2015 - 2017 Methodology of mathematics I, 42×2 hours
Versailles Saint-Quentin-en-Yvelines University, France

Management and academic service

Event organization

2026 Co-organizer of the session *Bilevel optimization : methods and applications with nonsmooth terms*, with David Villacís
SIAM Conference on Optimization (OP26), Edinburg, UK

2025 Co-organizer of the session *Numerical linear algebra meets nonsmooth optimization in computed tomography*, with Mirjeta Pasha
Applied Inverse Problems 2025 (AIP2025), Rio de Janeiro, Brazil

2018 Co-organizer of the IV Conference of Ecuadorian mathematicians in Paris
Institut Henri Poincaré, Paris

Other services

2023 - present Journal referee for : *Physics in Medicine & Biology, Journal of Applied Mathematics and Computing, Applied Mathematics for Modern Challenges, Foundations of Data Science, Journal of Nondestructive Evaluation, Heritage*

2014 - present Active member of the scientific Ecuadorian association AMARUN,
a nonprofit organization aiming to promote sciences in Ecuador