Luca **Calatroni**

Associate Professor, PI of Computational Imaging & Learning (CIL) unit at MaLGa research centre

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Personal data

Birth date: 10/01/1987
Born in Broni (PV), Italy
Italian citizenship.

Positions

Associate Professor, Computer Science department (DIBRIS), Genoa, Italy. *2024 - now*
PI of the Computational Imaging & Learning (CIL) unit at the Machine Learning Genoa Center (MaLGa).

Chargé de recherche (CR) CNRS, Computer Science department (I3S), Sophia-Antipolis, France. *2019 - now*
Jr. research scientist at INS2I. Section 7 and interdisciplinary section CID 51. On leave since Nov. 2024.

Lecteur Hadamard, CMAP, École Polytechnique, Palaiseau, France. *2017 - 2019*
Post-doctoral research fellowship funded by the FMJH.

Post-doc, CMAP, École Polytechnique, Palaiseau, France. *2016 - 2017*
Supervisor: A. Chambolle.

Post-doc, MIDA group, Università degli studi di Genova, Italy. *2015 - 2016*
Marie Skłodowska-Curie ER fellowship within the *Nano2fun* ITN FP7, with Camelot Biomedical Systems.

Education

Ph.D. in Applied Mathematics, DAMTP, University of Cambridge, UK. *2015*
4-year Cambridge Centre for Analysis (CCA) Doctoral Training Centre. Subject: *New PDE models for imaging problems and applications* Supervisor: C.-B. Schönlieb.. Examiners: M. Burger, J. Aston.

M.Sc. in Applied Mathematics, Università degli studi di Pavia, Italy. *2011*
Final grade: 110/110 *cum laude*. Specialised curriculum in mathematical analysis. Final dissertation: *On the Allen-Cahn equation with singular potentials and dynamic boundary conditions*. Advisor: P. Colli.

Piano degree, National Conservatory of Music "F. Vittadini", Pavia, Italy. *2011*
Final grade: 10/10 *cum laude*.

Research interests

Inverse problems, computational imaging, convex/non-convex non-smooth optimisation, sparse regularisation, learning for imaging inverse problems, fluorescence microscopy, digital humanities.

Prizes & Awards

Prix d'excellence, for ERC StG 2023 project, Université Côte d'Azur. *2023*

ERC starting grant, 14% rate of success in PE7. *2023*

Prix d'excellence, for best paper runner-up award at IEEE ISBI 2022, Université Côte d'Azur. *2022*

Best paper runner-up award, IEEE ISBI 2022. *2022*

Young Investigator Training Program (YITP) Research prize, ACRI, SIMAI 2020+21. *2021*

Prix d'excellence, for H2020 RISE NoMADS project, Université Côte d'Azur. *2020*

Best paper award, ICISP conference 2018. *2018*

***Lecteur Hadamard* individual research fellowship,** FMJH, France. *2017*

Marie Skłodowska-Curie EU fellowship, ITN project *Nano2fun*, FP7. *2015*

Finalist, SET for Britain, House of Commons, London, UK. *2015*

TakeAIM first prize, Smith Institute for Industrial Mathematics, UK. *2014*

Smith-Knight, Knight-Rayleigh, (3rd prize), DAMTP, University of Cambridge, UK. *2013*

Cinquini-Cibrario prize, for the best M.Sc. thesis in Mathematics, Università di Pavia, Italy. *2011*

Funded research projects

ERC Starting Grant (1.5 M€), "Model-Aware Learning for imaging INverse problems in fluorescence microscopy " (MALIN) *2024-2029*
Role: **PI**.

ANR JCJC (272 k€), "TASK-Adapted BIlevel LEarning of flexible statistical models for imaging & vision " (TASKABILE) *2023-2027*
Role: **PI**. Website: click here.

ANR PRC (315 k€), "Blind inverse problems and optical microscopy" (MICROBLIND) *2022-2024*
Role: **local PI**, investigator. PI: P. Weiss (CNRS, IMT, Toulouse).

Gdr-ISIS (7 k€), "SParse & non-convex optimisation for Learning of INverse image microscopy problems" (SPLIN) *2021-2023*
Role: **PI**. Collaboration with E. Soubies (CNRS, IRIT), P. Escande and C. Chaux (CNRS, i2M).

IEA - CNRS, I3S & DIEF UniFi (12.5 k€), "Variable-Metric & inexact sparse Optimisation for Super-resolution microscopy" (VaMOS) *2021-2022*
Role: co-**PI** with S. Rebegoldi (UniFi).

PRIME CNRS, INS2I & INEE (16 k€), "Transformation and destruction processes of painted images" (Imag'In) *2021-2022*
Role: co-**PI** with R. M. Dessì (CEPAM).

IDEX UCA JEDI, "Applied mathematics and artificial intelligence potential for archaeology and art history" (Arch-AI-story) *2021*
Role: **WP leader** (Imag'IN: image transformation). PI: I. Théry-Parisot (CEPAM).

ANR JCJC (175 k€), "RedUndancy-free neuro-BIological desigN of Visual & Auditory SEnsing" (RUBIN-VASE) *2021-2023*
Role: investigator with V. Franceschi (UNIPD), L. Perrinet (INT). PI: D. Prandi (L2S).

DEP "Attractivité du territoire" (15 k€), IDEX JEDI, UCA. *2020*
Role: **PI**. Research funding for newly recruited researchers.

PEPS INS2I (10 k€). *2020*
Role: **PI**. Research funding for newly recruited researchers.

Jr. visibility program FMJH (2 k€), "Non-convex space-variant image regularisation". *2019*
Role: **PI**. Collaboration with M. Pragliola (Università di Bologna).

PEPS INSMI (3.5 k€), "Iterative regularization for inverse problems and machine learning", (EFIR). *2019*
Role: investigator. PI: G. Garrigos (LPSM).

iCODE institute funding (12 k€), "Control theoretical modelling of contrast perception ". *2019*
Role: investigator. PI: D. Prandi (L2S).

Research In Paris (3.5 k€), IHP, "Bilevel optimisation for optimal noise modelling in images ". *2019*
Role: **PI**. Collaboration with: A. Martin (UPF), F. Sciacchitano (MIDA), J. C. De Los Reyes (ModeMat).

H2020 RISE program (1.1 M€), "Nonlocal Methods for Arbitrary Data Sources" (NoMADS). *2018-2023*
Role: **local PI** and **WP leader** (Efficient & adaptive algorithms).
PI: M. Burger, D. Tenbrinck (FAU), C.-B. Schönlieb (Cambridge). Collaboration with 21 international partners.

PEPS JCJC INS2I (5 k€), "Lifting approaches for cortical-inspired methods in imaging" (LiftME). *2018*
Role: investigator with V. Franceschi (LJLL). PI: D. Prandi (L2S).

PEPS INS2I (8 k€), "Cortical Inspired Non-holonomic Control for Imaging", (CINCIN). *2017*
Role: investigator with V. Franceschi (LJLL). PI: D. Prandi (L2S).

GNCS grants (3.5 k€), "Discretisation of functionals and discrete functionals on graphs". *2016*
Role: investigator. PI: G. Naldi (UniMi).

Organisation of international conferences & program committees

Artificial intelligence & applied mathematics for history & archaeology (IAMAHA), Nice, FR. *Nov. 2023*
Website: https://iamaha.sciencesconf.org/. Co-rganisers: M. Corneli (UCA), I. Théry-Parisot (CNRS).

30 years of mathematics for optical imaging, Marseille, FR. *Sep. 2023*
Website: https://math-image.sciencesconf.org/. Co-rganisers: E. Soubies (IRIT, CNRS), P. Weiss (IMT, CNRS).

IX conference on Scale Space & Variational Methods in computer vision (SSVM), S. M. di Pula, IT. *May 2023*
Website: https://events.unibo.it/ssvm2023. Co-organisers: Gruppo UMI MIVA, G. Rodriguez (UniCa).

XI conference on Mathematics and Image Analysis (MIA), Berlin, DE. *Feb. 2023*
Website: https://www.wias-berlin.de/workshops/MIA2023/index.html. Organisers: J. Delon (Université Paris-Descartes), M. Hintermüller (WIAS), N. Papadakis (CNRS), K. Papafitsoros (WIAS), G. Steidl (TU Berlin).

Organisation of workshops, schools, seminars

Workshop "Learning and Optimization in Côte d'Azur ", Sophia-Antipolis, France. *Sept. 2024*
Website: https://optazur.github.io/loca24/. Co-organiser: S. Vaiter (CNRS).

Workshop "ℓ_0-based minimization: from continuous relaxations and non-convex algorithms to global optimization ", Paris, France. *Sept. 2024*
Website: https://gdr-iasis.cnrs.fr/reunion/522/. Co-organiser: E. Soubies (CNRS), GdR IASIS.

Erasmus+ BIP PhD school "Mathematics & machine learning for image analysis", Bologna, Italy. *June 2024*
Website: https://site.unibo.it/mathematical-ml-imaging/en. Co-organisers: Gruppo UMI MIVA.

Applied Math. & Learning Approaches for Cultural Heritage & the Arts (AMALART), Cagliari, Italy. *Apr. 2024*
Website: https://bugs.unica.it/amalart24/. Co-rganisers: G. Rodriguex (Univ. Cagliari).

Mathematics for Imaging, Vision and their Applications workshop, University of Naples, Italy. *Feb. 2024*
Website: https://sites.google.com/view/gruppomiva-workshop2024/home. Co-organisers: Gruppo UMI MIVA.

Seminar series OptAzur on optimisation, UCA, France. *Sept. 2023-*
Website: https://optazur.github.io/. Co-organisers: S. Vaiter (CNRS, LJAD).

Erasmus+ BIP PhD school "Advanced methods for mathematical image analysis", Bologna, Italy. *Jan. 2023*
Website: https://site.unibo.it/mathematical-image-analysis/en. Co-organisers: Gruppo UMI MIVA.

I French-Italian MIA-MIVA workshop on "The mathematics of imaging, vision and their applications", Laboratoire I3S, Sophia-Antipolis, France. *Sept. 12-14 2022*
Website: https://sites.google.com/view/workshop-mia-miva/home. Co-organisers: Gruppo UMI MIVA and RT MIA.

PhD school "Advanced methods for mathematical image analysis", Hybrid event @ UnInsubria, UniMoRe, UniGe, UniBo, Italy. *Jan.-Feb. 2022*
Website: https://sites.google.com/view/gruppomiva/phd-winter-school. Co-organisers: Gruppo UMI MIVA.

Workshop "Advanced optimization for inverse problems & applications to image microscopy", CDM, University of Florence, Florence. *Nov. 22-23 2021*
Website: https://sites.google.com/view/workshopvamos. Co-organiser: S. Rebegoldi (University of Florence).

Kick-off meeting of Mathematics of Imaging, Vision & Applications (MIVA) UMI group, Zoom platform. *Jan. 20 2021*
Website: https://sites.google.com/view/gruppomiva-kickoff2021.
Co-organisers: Gruppo UMI MIVA.

OneWorld Imagine & Inverse Problems (IMAGINE) SIAG-IS virtual series, Zoom platform. *2020 - 2021*
Website: https://sites.google.com/view/oneworldimagine.
Co-organisers: E. Bonnetier (UGA), R. Chan (CityU), F. Santosa (JHU), C.-B. Schönlieb (University of Cambrige), M. NG (HKU), J. Müller (CSU).

Tutorial/workshop on optimisation, imaging & machine learning, I3S, Sophia-Antipolis. *Jan. 29-31 2020*
Website: https://sites.google.com/view/imaginglearningi3s. Co-organiser: M. Santacesaria (UniGe, MaLGA).

Workshop "Regularisation for inverse problems and machine learning", LPSM, UPMC, Paris. *Nov. 19 2019*
Website: https://invprob-ml-workshop.github.io/. Co-organiser: G. Garrigos (LPSM).

Young researchers in imaging seminars, IHP, Paris. *Jan.-Apr. 2019*
Website: https://imaging-in-paris.github.io/semester2019/young/. Co-organiser: G. Garrigos (LPSM).

Workshop "Cortical methods for visual perception & imaging applications", LJLL, UPMC, Paris. *Nov. 22 2018*
Website: https://liftme.sciencesconf.org/. Co-organisers: V. Franceschi (LJLL), M. Sigalotti (INRIA), D. Prandi (L2S).

Workshop "Nonlocal Methods for Data Processing & Analysis", Politecnico di Milano. *Jun. 4 2018*
Website: https://www.uni-muenster.de/NoMADS/events/POLIMI2018/. Co-organisers: S. Villa (PoliMi), D. Tenbrinck (WWU).

Workshop "Cortical Inspired Non-holonomic Control for Imaging", IHP, Paris, France. *Nov. 28 2017*
Co-organisers: V. Franceschi (LJLL), B. Franceschiello (LINE), D. Prandi (L2S).

Organisation of mini-symposia at international conferences

2024 (2): SIAM IS, EURO.

2023 (5): ADMOS, ICIAM (2), AIP (2).

2022 (1): SIAM IS.

2021 (4): SMB, ICMNS, SIAM OP, IFIP .

2020 (1): SIAM IS.

2019 (3): AIP, ICIAM (2).

2018 (2): SIAM IS(2).

Publications

Preprints

[1] Off-the-grid regularisation for Poisson inverse problems
M. Lazzaretti, C. Estatico, A. Carrillo, L. Calatroni
arXiv preprint, (2024).

[2] Algorithmic unfolding for image reconstruction and localization problems in fluorescence microscopy
S. Bonettini, L. Calatroni, D. Pezzi, M. Prato
arXiv preprint, (2024).

[3] Exact continuous relaxations of ℓ_0-regularized criteria with non-quadratic data terms
M. Essafri, L. Calatroni, E. Soubies
arXiv preprint, (2024).

[4] A hybrid approach combining CNNs and variational modelling for blind image denoising
R. Rekik Dit Nekhili, L. Calatroni, X. Descombes
HAL preprint, (2022).

Edited series & proceedings

[1] Proceedings of the IX Scale Space and Variational Methods in Computer Vision conference
Editors: L. Calatroni, M. Donatelli, S. Morigi, M. Prato, M. Santacesaria.
Lecture Notes in Computer Science (LNCS), vol. 14009, 2023.

[2] Optimisation and Learning Methods for Inverse Problems in Microscopy
Editors: L. Calatroni, S. Rebegoldi.
Special issue of **Inverse Problems**, IOPscience, 2023.

[3] Non-Local Data Interactions: Foundations and Applications
Series Editor: L. Calatroni. **Editorial board**: M. Burger, R. Chan, E. Rapinchuk, C.-B. Schönlieb, D. Tenbrinck.
Cambridge Elements, Cambridge University Press, 2023.

[4] Color representation and cortical-inspired image processing
Editors: L. Calatroni, V. Franceschi, B. Franceschiello, D. Prandi.
Thematic collection of **Journal of Mathematical Neuroscience**, Springer, 2020.

Papers in journals

[1] Parameter-free FISTA by adaptive restart and backtracking
J.-F. Aujol, L. Calatroni, C. Dossal, H. Labarrière, A. Rondepierre
SIAM Journal on Optimization, 34 (4), (2024). DOI: 10.1137/23M158961X.

[2] Deep image prior inpainting of ancient frescoes in the Mediterranean Alpine arc
F. Merizzi, P. Saillard, O. Acquier, E. Morotti, E. Loli Piccolomini, L. Calatroni, R. M. Dessì
Heritage Science, 12 (41), (2024). DOI: 10.1186/s40494-023-01116-x .

[3] A mobility-SAV approach for a Cahn-Hilliard equation with degenerate mobilities
E. Bretin, L. Calatroni, S. Masnou
Discrete and Continuous Dynamical Systems - Series S, 17 (1), (2024). DOI: 10.3934/dcdss.2023177.

[4] Beyond ℓ_1 sparse-coding in V1
I. Rentzeperis, L. Calatroni, L. Perrinet, D. Prandi
PLOS Computational Biology, 19 (9), (2023). DOI: 10.1371/journal.pcbi.1011459.

[5] Bilevel learning of regularization models and their discretization for image deblurring and super-resolution
T. A. Bubba, L. Calatroni, A. Catozzi, S. Crisci, T. Pock, M. Pragliola, S. Rautio, D. Riccio, A. Sebastiani
Springer INδAM series, 61, 10.1007/978-981-97-6769-4$_4$, 2024.

[6] Fluorescence image deconvolution microscopy via generative adversarial learning (FluoGAN)
M. Cachia, V. Stergiopoulou, L. Calatroni, S. Schaub, L. Blanc-Féraud
Inverse Problems, 33, (2023). DOI: 10.1088/1361-6420/acc889.

[7] Fast and stable schemes for non-linear osmosis filtering
L. Calatroni, S. Morigi, S. Parisotto, G. A. Recupero
Computers and Mathematics with Applications, 133, (2023). DOI: 10.1016/j.camwa.2022.12.015.

[8] Space-variant image reconstruction via Cauchy regularisation: application to Optical Coherence Tomography
A. Achim, L. Calatroni, S. Morigi, G. Scrivanti
Signal Processing, 205, (2023). DOI: 10.1016/j.sigpro.2022.108866.

[9] Modular-proximal gradient algorithms in variable exponent Lebesgue spaces
M. Lazzaretti L. Calatroni, C. Estatico
SIAM journal on Scientific Computing, 44 (6), (2022). DOI: 10.1137/21M1464336.

[10] ADMM-based residual whiteness principle for automatic parameter selection in super-resolution problems
M. Pragliola, L. Calatroni, A. Lanza, F. Sgallari.
Journal of Mathematical Imaging and Vision (invited paper), (2022). DOI: 10.1007/s10851-022-01110-1

[11] Scaled, inexact and adaptive generalized FISTA for strongly convex optimization
S. Rebegoldi, L. Calatroni.
SIAM Journal on Optimization, 32 (3), (2022). DOI: 10.1137/21M1391699

[12] A unified surface geometric framework for feature-aware denoising, hole filling and context-aware completion
L. Calatroni, M. Huska, S. Morigi, G. Recupero.
Journal of Mathematical Imaging and Vision (invited paper), (2022). DOI: 10.1007/s10851-022-01107-w

[13] On and beyond Total Variation in imaging: the role of space variance
M. Pragliola, L. Calatroni, A. Lanza, F. Sgallari.
SIAM Review, 65 (3), (2023), 10.1137/21M141068.

[14] Constrained and unconstrained inverse Potts modelling for joint image super-resolution and segmentation
D. Mylonopoulos, P. Cascarano, L. Calatroni, E. Loli Piccolomini.
Image Processing On Line, Paper, code, demo, (2022). DOI: 10.5201/ipol.2022.393.

[15] COL0RME: Super-resolution microscopy based on sparse blinking fluorophore localization & intensity estimation
V. Stergiopoulou, L. Calatroni, H. Goulart, S. Schaub, L. Blanc-Féraud.
Biological Imaging, 2 (1), (2022). DOI: doi.org/10.1017/S2633903X22000010.

[16] Efficient ℓ_0 gradient-based super resolution for simplified image segmentation
P. Cascarano, L. Calatroni, E. L. Piccolomini.
IEEE Transactions on Computational Imaging, (2021). DOI: 10.1109/TCI.2021.3070720

[17] A cortical-inspired sub-Riemannian model for Poggendorff-type visual illusions.
E. Baspinar, L. Calatroni. V. Franceschi, D. Prandi.
Journal of Imaging, 7 (3), (2021). DOI: doi.org/10.3390/jimaging7030041

[18] Accelerated iterative regularization via dual diagonal descent
L. Calatroni, G. Garrigos, L. Rosasco, S. Villa.
SIAM Journal on Optimization, 31 (1), (2021). DOI: 10.1137/19M1308888

[19] Cortical-inspired Wilson-Cowan-type equations for orientation-dependent contrast perception modelling
M. Bertalmío, L. Calatroni, V. Franceschi, B. Franceschiello, D. Prandi.
Journal of Mathematical Imaging and Vision (invited paper), 63, (2020). DOI: 10.1007/s10851-020-00960-x

[20] Variational osmosis for non-linear image fusion
S. Parisotto, L. Calatroni, A. Bugeau, N. Papadakis, C.-B. Schönlieb.
IEEE Transactions on Image Processing, 29, (2020). DOI: 10.1109/TIP.2020.2983537

[21] Visual illusions via neural dynamics: Wilson-Cowan-type models and the efficient representation principle
M. Bertalmío, L. Calatroni, V. Franceschi, B. Franceschiello, A. Gomez-Villa, D. Prandi.
Journal of Neurophysiology, (2020). DOI: 10.1152/jn.00488.2019

[22] Analysis and automatic parameter selection of a variational model for mixed Gaussian and Salt & Pepper noise removal
L. Calatroni, K. Papafitsoros.
Inverse Problems, 35 (11), (2019). DOI: 10.1088/1361-6420/ab291a

[23] Backtracking strategies for accelerated descent methods with smooth composite objectives
L. Calatroni, A. Chambolle.
SIAM Journal on Optimization, 29 (3), (2019). DOI: 10.1137/17M1149390

[24] A flexible space-variant anisotropic regularisation for image restoration with automated parameter selection
L. Calatroni, A. Lanza, M. Pragliola, F. Sgallari.
SIAM Journal on Imaging Sciences, 12 (2), (2019). DOI: 10.1137/18M1227937

[25] Anisotropic osmosis filtering for shadow removal in images
S. Parisotto, L. Calatroni, M. Caliari, C.-B. Schönlieb, J. Weickert.
Inverse Problems, 35 (5), (2019). DOI: 10.1088/1361-6420/ab08d2

[26] Unveiling the invisible - mathematical methods for restoring and interpreting illuminated manuscripts
L. Calatroni, M. d'Autume, R. Hocking, S. Panayotova, S. Parisotto, P. Ricciardi, C.-B. Schönlieb.
Heritage Science, 6:56 (2018). DOI: 10.1186/s40494-018-0216-z

[27] Infimal convolution of data discrepancies for mixed noise removal
L. Calatroni, J. C. De Los Reyes, C.-B. Schönlieb.
SIAM Journal on Imaging Sciences, 10 (3), (2017). DOI: 10.1137/16M1101684

[28] Graph clustering, variational image segmentation methods and Hough transform scale detection for object measurement in images
L. Calatroni, Y. van Gennip, C.-B. Schönlieb, H. Rowland, A. Flenner.
Journal of Mathematical Imaging and Vision, 57 (2), (2016). DOI: 10.1007/s10851-016-0678-0

[29] Bilevel approaches for learning of variational imaging models
L. Calatroni, C. Cao, J. C. De Los Reyes, C.-B. Schönlieb, T. Valkonen.
RADON book series, Variational methods, vol. 18, (2016). DOI: 10.1515/9783110430394-008

[30] ADI splitting schemes for a fourth-order nonlinear PDE from image processing
L. Calatroni, B. Düring, C.-B. Schönlieb.
Discrete and Continuous Dynamical Systems Series A, 34 (3), 931-957, (2014). DOI: 10.3934/dcds.2014.34.931

[31] Global solution of the Allen–Cahn equation with singular potentials and dynamic boundary conditions
L. Calatroni, P. Colli.
Nonlinear Analysis, 9, 12-27, (2013). DOI: 10.1016/j.na.2012.11.010

Papers in peer-reviewed conference proceedings

[1] On ℓ_0 Bregman relaxations for Kullback-Leibler sparse regression
M. Essafri, L. Calatroni, E. Soubies
IEEE 34th Workshop on Machine Learning for Signal Processing (MLSP) , (2024). DOI: 10.1109/MLSP58920.2024.10734806.

[2] Whiteness-based bilevel learning of regularization parameters in imaging
C. Santambrogio, M. Pragliola, A. Lanza, M. Donatelli, L. Calatroni
to appear in **European Signal Processing Conference (EUSIPCO)**, (2024). Published version.

[3] Physics-inspired generative adversarial modelling for fluctuation-based super-resolution microscopy
H. Mentagui, L. Calatroni, S. Schaub, L. Blanc-Féraud
2024 IEEE International Symposium on Biomedical Imaging (ISBI), (2024). DOI: 10.1109/ISBI56570.2024.10635791.

[4] Fluctuation-based deconvolution in fluorescence microscopy using plug-and-play denoisers
V. Stergiopoulou, S. Mukherjee, L. Calatroni, L. Blanc-Féraud
Lecture Notes in Computer Science, SSVM 2023, Springer, (2023). DOI: 10.1007/978-3-031-31975-4_38.

[5] Stochastic gradient descent for linear inverse problems in variable exponent Lebesgue spaces
M. Lazzaretti, Z. Kereta, L. Calatroni, C. Estatico
Lecture Notes in Computer Science, SSVM 2023, Springer, (2023). DOI: 10.1007/978-3-031-31975-4_35.

[6] 3D Image Super-Resolution by fluorophore fluctuations and MA-TIRF Microscopy reconstruction (3D-COL0RME)
V. Stergiopoulou, L. Calatroni, S. Schaub, L. Blanc-Féraud
2022 IEEE 19th International Symposium on Biomedical Imaging (ISBI), (2022), (best paper runner-up award).
DOI: 10.1109/ISBI52829.2022.9761572.

[7] A continuous, non-convex sparse super-resolution approach for fluorescence microscopy data with Poisson noise
M. Lazzaretti, L. Calatroni, C. Estatico.
ICCSA 2021 conference proceedings, IEEE Xplore, (2022). DOI: 10.1109/ICCSA54496.2021.00021.

[8] A scaled, inexact & adaptive Fast Iterative Soft-Thresholding Algorithm for convex image restoration
L. Calatroni, S. Rebegoldi.
ICCSA 2021 conference proceedings, IEEE Xplore, (2022). DOI: 10.1109/ICCSA54496.2021.00017.

[9] A scaled and adaptive FISTA algorithm for signal-dependent sparse image super-resolution problems
L. Calatroni, C. Estatico, M. Lazzaretti, S. Rebegoldi
Lecture Notes in Computer Science, SSVM 2021, Springer, (2021). DOI: 10.1007/978-3-030-75549-2_20

[10] Residual whiteness principle for automatic parameter selection in $\ell_2 - \ell_2$ image super-resolution problems
L. Calatroni, A. Lanza, M. Pragliola, F. Sgallari
Lecture Notes in Computer Science, SSVM 2021, Springer, (2021). DOI: 10.1007/978-3-030-75549-2_38

[11] Weighted-CEL0 sparse regularisation for molecule localisation in super-resolution microscopy with Poisson data
M. Lazzaretti, L. Calatroni, C. Estatico.
2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI), (2021), DOI: 10.1109/ISBI48211.2021.9434014

[12] COL0RME: COvariance-based ℓ_0 super-Resolution Microscopy with intensity Estimation
V. Stergiopoulou, H. Goulart, S. Schaub, L. Calatroni and L. Blanc-Féraud.
2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI), (2021), DOI: 10.1109/ISBI48211.2021.9433976

[13] Non-convex super-resolution of OCT images via sparse representation
G. Scrivanti, L. Calatroni, S. Morigi, L. Nicholson, A. Achim.
2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI), (2021), DOI: 10.1109/ISBI48211.2021.9434013

[14] Space-adaptive anisotropic bivariate Laplacian regularization for image restoration
L. Calatroni, A. Lanza, M. Pragliola, F. Sgallari.
Lecture Notes in Computational Vision & Biomechanics, VipIMAGE 2019, Springer, (2019). DOI: 10.1007/978-3-030-32040-9_8

[15] Adaptive parameter selection for weighted-TV image reconstruction problems
L. Calatroni, A. Lanza, M. Pragliola, F. Sgallari.
Journal of Physics: conference series 1476, NCMIP 2019, IOP, (2020). DOI: /10.1088/1742-6596/1476/1/012003

[16] A cortical-inspired model for orientation-dependent contrast perception: a link with Wilson-Cowan equations
M. Bertalmío, L. Calatroni, V. Franceschi, B. Franceschiello, D. Prandi.
Lecture Notes in Computer Science, SSVM 2019, Springer, (2019). DOI: 10.1007/978-3-030-22368-7_37

[17] Digital Cultural Heritage Imaging via Osmosis Filtering
L. Calatroni, S. Parisotto, C. Daffara.
Lecture Notes in Computer Science, 10884, ICISP 2018, Springer, (2018), (best paper). DOI: 10.1007/978-3-319-94211-7_44

[18] Alternating Direction Implicit (ADI) schemes for image osmosis models
L. Calatroni, C. Estatico, N. Garibaldi, S. Parisotto.
Journal of Physics: conference series, NCMIP 2017, IOP, (2017). DOI: 10.1088/1742-6596/904/1/012014

[19] A primal-dual approach for a total variation Wasserstein flow
M. Benning, L. Calatroni, B. Düring, C.-B. Schönlieb.
Lecture Notes in Computer Science, 8085, GSI 2013, Springer, (2013). DOI: 10.1007/978-3-642-40020-9_45

[20] Dynamic sampling schemes for optimal noise learning under multiple nonsmooth constraints
L. Calatroni, J. C. De Los Reyes, C.-B. Schönlieb.
System Modelling and Optimization, IFIP TC7-2013, Springer, (2014). DOI: 10.1007/978-3-662-45504-3_8

Popular science

[1] Unveiling the invisible - mathematical methods for restoring and interpreting illuminated manuscripts
L. Calatroni, M. d'Autume, R. Hocking, S. Panayotova, S. Parisotto, P. Ricciardi, C.-B. Schönlieb.
SpringerOpen blog, (2018).

[2] Learning to denoise
L. Calatroni.
Eureka, University of Cambridge magazine, issue 64, (2016).

[3] MatemaGica e Image processing: istruzioni per l'uso
L. Calatroni.
AIRInforma, Associazione Internazionale Ricercatori Italiani, (2014).

Editorial activity

Editorial boards

Journal of Mathematical Imaging and Vision, Springer *2023-*

Inverse Problems, IOPscience *2023-*

Image Processing On Line (IPOL) *2022-*

Guest editor

Journal of Cultural Heritage, IOPscience, special issue on *Advances in artificial intelligence and quantitative methods for archaeology and art history for Journal of Cultural Heritage* *2024-*

Inverse Problems, IOPscience, special issue on *Optimisation and Learning Methods for Inverse Problems in Microscopy* *2021-2023*

Cambridge University Press Elements, CUP, series on *The mathematics of large-scale data interactions: foundations and applications* *2021-*

Journal of Mathematical Neuroscience, Springer, special issue on Color representation and cortical-inspired image processing *2019-2020*

Reviewer

Journals: SIAM Journal on Imaging Sciences - SIAM Journal on Optimization - Journal of Mathematical Imaging and Vision - IEEE Signal Processing Magazine - IEEE Transactions on Computational Imaging - IEEE Transactions on Image Processing - IEEE Signal Processing Letters - IEEE Transactions on Signal Processing - Journal of Machine Learning Research - Inverse Problems - IMA Journal of Numerical Analysis - IMA Journal of Applied Mathematics - Medical Image Analysis - Inverse problems & imaging - Computers and Mathematics with Applications - Journal of Visual Communication and Image Representation - The Visual Computer - Applied Mathematical Modelling - Journal of Nonlinear Science - Inverse Problems in Science & Engineering - Frontiers in Applied-Mathematics and Statistics - Eletronic Transactions on Numerical Analysis - Signal processing: Image communication - Applied Mathematics and Computation - Heritage - Journal of Imaging.

Conferences: ICLR (2025), ICML (2024), GRETSI (2023), ICASSP (2023-2024-2025), SSVM (2021, 2023, 2025), IEEE MLSP (2020), SPARS (2019).

Invited research visits

Department of Telecommunications and Information Processing, Universtiy of Ghent, BE. Host: A. Pizurica. *Jun. 2024*

Isaac Newton Institute, Program *Rich and nonlinear tomography*, Cambridge, UK. *Apr. 2023*

Machine Learning Genoa Centre (MaLGa), Università degli studi di Genova, IT. Host: S. Villa. *2022-2023*

Department of Applied Mathematics & Theoretical Physics, Cambridge, UK. Host: C.-B. Schönlieb. *2022-2023*

Department of Mathematics, University of Modena and Reggio Emilia, IT. Host: M. Prato. *Sept. & Nov. 2021*

Computational and Statistical Learning Lab. (LCSL), University of Genoa, IT. Host: S. Villa. *Jun. & Oct. 2019*

ICERM, Trimester on *Computer Vision*, Brown University, Providence, USA. *Mar. 2019*

TSIMF, Special week on *Efficient Operator Splitting Techniques for Complex System & Large Scale Data Analysis*, Sanya, CN. *Jan. 2019*

Dipartimento di Matematica, Università degli studi di Bologna, IT. Host. F. Sgallari. *Apr. 2019*

Isaac Newton Institute, Program *Variational methods and effective algorithms for imaging and vision*, Cambridge, UK. *Dec. 2017*

Department of Applied Mathematics & Theoretical Physics, Cambridge, UK. *Apr. 2017*

ModeMat, Escuela Politecnica Nacional (EPN), Quito, EC. Host: J. C. De Los Reyes. *Feb. 2015, Jan.-Mar. 2014*

Plenary talks at international conferences

2025: XII Mathematical Image Analysis (MIA) conference.

2022: III IMA conference on Inverse Problems.

Invited seminars

2024 (2): CNR-IMATI seminars, GAIM seminars.

2023 (6): SPOT seminars, MLSP seminars, Applied Mathematics Seminars (UniPv), ModeMat-CIMAT seminars, IIT molecular microscopy and spectroscopy seminars; 3IA student seminars.

2022 (1): MaLGa seminar.

2021 (8): OneWorld IMAGINE webinars, IRIT SC seminars, SNAP seminars, ModeMat seminars, FIM seminars, Numerical Analysis Seminars, Numerical Analysis Seminars, McTAO seminars.

2020 (1): PRIMO seminars.

2019 (3): Seminar of Statistical and Computational learning (LCSL), Numerical Analysis Seminars (UniBo), Imaging seminars (MAP5).

2018 (10): S^3 seminars (L2S), PDE and Numerical Analysis seminars (LJAD), Imaging & learning seminars (I2M), Signal, Image and Systems seminars (I3S), Analysis & Probability seminars (UniBo), ACA seminras (DAMTP), CalVa seminars (LJLL), Imaging in Paris (IHP), IOP seminars (IMB), ANEDP seminars (LMO).

2016 (3): WIAS seminars (WIAS), Analysis seminars (UniGraz), Applied Mathematics Seminars (UniMi).

2015 (1): Algebra and Analysis seminars (University of Nottingham).

2014 (3): MIDA seminars (Unige), Applied Mathematics Seminars (UniPv), ModeMat (EPN).

2013 (1): Theory of Computing and AI seminars (Middlesex).

2012 (2): CAKE seminars (DAMTP), Differential Equations and Numerical Analysis Seminars (UBA).

Invited talks at international workshops

2025 (1): Workshop ”Low-Rank Models and Applications”, Mons, BE.

2024 (3): Workshop ”Big Data Inverse Problems” ICMS, Edinburgh, UK; workshop ”Advanced Numerical Analysis for Imaging: from theory to industry”, Naples, IT; workshop ”Optimization techniques for inverse problems” (OIP), Modena, IT.

2023 (3): Workshop ”Learning for Inverse Problems” (LIP), Rome, IT; workshop “Mathematical modeling and Analysis of degradation and restoration in Cultural Heritage” (MACH), Rome, IT; Workshop ”Super-resolution of fluctuation-based fluorescence data via GANs” at MiFoBio 2023, Hyeres, FR.

2022: Workshop ”Advanced Techniques in Optimization for Machine learning & Imaging” (ATOMI), Roma, IT.

2021: Workshop ”Optimization techniques for inverse problems” (OIP), Modena, IT.

2018: Workshop “Computational Methods for Inverse Problems in Imaging” (CMIPI), Como, IT.

2017: Mir@W days ”Partial Differential Equations for Large Data”, Warwick, UK.

2015 (2): ICMS workshop “Gradient flows: from theory to applications”, Edinburgh, UK; Biomedical and Astronomical Signal Processing (BASP) International Workshop, Villars-sur-Ollon, CH.

Invited talks at international conferences minisymposia

2024 (3): SIAM IS, EURO, EMS.

2023 (2): UMI, ICIAM.

2022 (2): SIAM IS, IPMS.

2021 (6): SIAM LA, ICSSA 2021, IFIP TC7 (2), SIMAI 2021 (2).

2020 (2): ALGORITMY, Inverse Days.

2019 (7): FGS, UMI, ICIAM (2), AIP (2), SSVM.

2018 (2): ICISP, SIAM IS.

2017 (2): SciCade, AIP.

2016 (2): SIMAI, IPMS.

2015 (3): ICIAM, GAMM, ELAVIO.

2014 (2): SIAM IS, SIAM OP.

2013 (2): IFIP TC7, GSI.

Teaching activity

Lecturer, PhD course on "Advanced mathematical methods for image analysis". *2023*
Smooth and non-smooth optimisation for imaging (8h).

Lecturer, PhD course on "Advanced mathematical methods for image analysis". *2022*
Convex non-smooth optimisation algorithms in imaging (4h).

Lecturer, MSc on Data Science and Artificial Intelligence, UCA, France. *2022-2024*
Inverse problems in image processing (30h).

Lecturer, Peyresq summer school, France. *2021*
Bilevel optimisation for hyperparameter estimation in imaging inverse problems (2 h).

Lecturer, Master Program (ECUE) in History of art history, UCA, France. *2021-now*
Where art & mathematics meet (6h).

Lecturer, PhD degree in Mathematics, Università degli studi di Bologna, Italy. *2019*
Variational and PDE methods for mathematical image processing (15h).

Teaching assistant, Bachelor of Science, École Polytechnique, France. *2018-2019*
Mathematical modelling (20h).

Teaching assistant, Bachelor of Science, École Polytechnique, France. *2018-2019*
Discrete mathematics (45h).

Lecturer, M.Sc. in Applied Mathematics, Università degli studi di Genova, Italy. *2016*
Mathematical methods for image and data analysis (4h).

Teaching assistant, M.Sc. in Applied Mathematics, Università degli studi di Genova, Italy. *2016*
Inverse problems and applications (20h).

Teaching supervisor, Part II of the Mathematical Tripos, University of Cambridge, UK. *2014*
Topics in Analysis (10h).

Teaching supervisor, Part IB of the Mathematical Tripos, University of Cambridge, UK. *2013-2014*
Topics in Analysis (20h).

Teaching assistant, Bachelor in Mathematics, Università degli studi di Pavia, Italy. *2011*
Geometry 1 (20h).

Teaching assistant, Bachelor in Natural Sciences, Università degli studi di Pavia, Italy. *2009-2010*
Calculus and elementary probability (24h).

Supervision activities

Post-docs

Gabriele Scrivanti, IPVF, CNRS, Palaiseau, France. *2024-*
Learning approaches for image reconstruction of FLIM perovskite data. Co-supervision with S. Cacovich (CNRS, IPVF).

Ilias Rentzeperis, L2S Laboratory, CentraleSupélec and INT, Marseille, France. *2021-2022*
Sparse coding of visual stimuli and efficient representation principles. Co-supervision with D. Prandi (CNRS, L2S) and L. Perrinet (CNRS, INT). Now: Post-doc at Spanish Centre of Research (CSIC).

PhD students

Hamza Mentagui, UniCA, I3S, France. *2023-*
Generative and optimisation approaches for super-resolution in fluorescence microscopy.. Co-supervision with L. Blanc-Féraud (CNRS) and S. Schaub (CNRS, LBDV).

M'hamed Essafri, ENSEEHIT, IRIT & UniCa, I3S France. *2023-*
Exact relaxations for sparse optimization. Co-supervision with E. Soubies (CNRS, IRIT).

Perrine Saillard, UCA, CEPAM, France. *2022-*
Artificial intelligence and mathematical imaging for reconstruction of ancient frescoes and mural paintings in the Alpine arc. Co-supervision with R. M. Dessì (UCA, CEPAM).

Marta Lazzaretti, Universitá degli studi di Genova, DIMA, Italy & UniCA, I3S, France. *2020-2024*
Optimisation algorithms in non-standard Banach spaces for inverse problems in imaging (link). Co-supervision with C. Estatico (UniGe). EDSTIC best PhD thesis award. Now: PostDoc at MIDA group of University of Genoa, IT.

Vasiliki Stergiopoulou, UniCA, I3S, 3IA, France. *2020-2023*
Learning and optimization for 3D+T super-resolution in fluorescent microscopy (link). Co-supervision with L. Blanc-Féraud (CNRS) and S. Schaub (CNRS, LBDV). Now: PostDoc at Imaging Centre at EPFL, CH.

Research engineers

Wessim Omezzine, I3S, Sophia-Antipolis, France. *2024*
Stochastic fluorescence fluctuations modelling via Markov models.. Co-supervisors: L. Blanc-Féraud (CNRS), S. Schaub (LBDV).

Master students

Christian Daniele, I3S, France. *2024*
Deep equilibrium models for imaging inverse problems.. Co-supervisors: S. Vaiter (CNRS), S. Villa (UniGe).

Anran Xu, I3S, France. *2024*
Neural fields modelling of fluorescence microscopy inverse problems. Co-supervisor: L. Blanc-Féraud (CNRS).

Claudio Fantasia, I3S, France. *2024*
Patch-based learning of space-variant hyperparameters for image restoration. Co-supervisor: X. Descombes (CNRS).

Sarah M'Nasri, I3S, France. *2024*
Generative approaches for super-resolution in MA-TIRF microscopy. Co-supervisor: L. Blanc-Féraud (CNRS).

Hamza Mentagui, I3S, France. *2023*
Generative approaches for super-resolution in fluorescence microscopy. Co-supervisor: L. Blanc-Féraud (CNRS).

M'hammed Essafri, IRIT, France. *2023*
Exact continuous relaxation for ℓ_0 optimisation with general fidelities. Co-supervisor: E. Soubies (CNRS).

Carlo Santambrogio, I3S, France. *2023*
Bilevel optimisation for parameter selection via residual whiteness. Co-supervisors: M. Donatelli (UnInsubria), A. Lanza (UniBo).

Fabio Merizzi, I3S, France. *2022*
Deep image prior inpainting of ancient frescoes. Co-supervisors: R. M. Dessì (UCA), E. L. Piccolomini (UniBo).

Sai Muttavarapu, I3S, France. *2022*
Super-resolution fluorescent microscopy using VAEs. Co-supervisor: L. Blanc-Féraud (CNRS).

Mayeul Cachia, I3S, France. *2021*
Super-resolution fluorescent microscopy using GANs. Co-supervisor: L. Blanc-Féraud (CNRS).

Giuseppe Recupero, I3S, France. *2021*
Non-linear diffusion models for image and mesh processing. Co-supervisors: S. Morigi (UniBo), S. Parisotto (University of Cambridge, Fitzwilliam museum, UK).

Rim Rekik Dit Nekhili, I3S, France. *2021*
Space-variant hyperparameter selection in imaging inverse problems via CNNs. Co-supervisor: X. Descombes (Inria).

Marta Lazzaretti, I3S, France. *2020*
Non-convex super-resolution for fluorescence microscopy with Poisson statistics. Co-supervisor: C. Estatico (UniGe).

Gabriele Scrivanti, I3S, France. *2020*
Non-convex sparse representation for OCT image super-resolution. Co-supervisors: A. Achim (UOB), S. Morigi (UniBo).

Theo Jolivet, CMAP, École Polytechnique, Palaiseau, France. *2019*
Continuous optimisation methods for imaging: proximal and forward-backward algorithms.

Alessia Manenti, DIMA, Universitá degli studi di Genova, Italy. *2017*
Variational and PDE models for image inpainting. Co-supervisor: C. Estatico (UniGe).

Nicola Garibaldi, DIMA, Universitá degli studi di Genova, Italy. *2017*
Alternating Direction Implicit (ADI) splitting methods for image osmosis models. Co-supervisor: C. Estatico (UniGe).

PhD examination committees

University La Sapienza, IT Department of Basic and Applied Sciences for Engineering *2024*
Examiner of the PhD theses of G. Monteverde and G. Dominijanni.

University of Genoa, IT Department of Mathematics *2024*
Referee of the PhD thesis of J. Chirinos Rodriguez.

Haute Ecole d'Ingénierie de Sion, CH Institute of Systems Engineering *2024*
Examiner of mid-term evaluation of G. Giacchi.

Mid Sweden University, SE Computer and Elecrital Engeneering Department *2024*
Opponent for the half-time seminar of S. Willingham (joint PhD with Inria, Rennes).

University of Bologna, IT Department of Mathematics *2023*
Referee of the PhD thesis of F. Bevilacqua.

ENS Lyon, FR Laboratoire de Physique *2023*
Examiner of the PhD thesis of H. T. V. Le.

CEA Cadarache, FR Laboratoire de mesures nucléaires *2022*
Examiner of the PhD thesis of M. Maulin.

University of Bologna, IT Department of mathematics *2022*
Examiner of the PhD thesis of P. Cascarano.

University of Modena and Reggio Emilia, IT Department of physics, informatics and mathematics *2020*
Referee of the PhD thesis of M. E. Galinier.

University of Genoa, IT Department of Mathematics *2018*
Referee of the PhD thesis of G. Ricca.

Scientific expertise

Jury member, Best poster award committee *2024*
Journées SMAI-MODE, Lyon, 2024.

Expert reviewer, Progetti di Ricerca d'Interesse Nazionale (PRIN), Italy *2021*
Evaluation of research grant proposals.

Expert reviewer, Research Foundation Flanders (FWO), Belgium *2021*
Evaluation of postdoctoral fellowship applications.

Expert reviewer, Conventions Industrielles de Formation par la REcherche (CIFRE), France *2020*
Evaluation of PhD thesis proposals.

Expert reviewer, German Research Association (DFG), Germany. *2020*
Evaluation of research grant proposals.

Selection of incoming students, École Polytechnique, Palaiseau, France. *2018-2019*
Bachelor of Science international program.

Expert reviewer, Research Grants Council (RGC), Hong-Kong. *2018*
Evaluation of research grant proposals.

Services for the community

Elected member of technical committee, IEEE Bio Imaging and Signal Processing Technical Committee (BISP) *2024 -*

Member of the direction committee, Italian Mathematical Union (UMI) Group on the Mathematics of Imaging, Vision and Applications (MIVA) *2023 - 2026*

Director, Italian Mathematical Union (UMI) Group on the Mathematics of Imaging, Vision and Applications (MIVA) *2020 - 2023*

Member of direction committee, Laboratoire I3S, France *2020 - 2021*

Affiliations & memberships

Inverse Problems International Association (IPIA), DE *2023 -*

Institute of Electrical and Electronics Engineers (IEEE), US *2021 -*

Society of Industrial and Applied Mathematics (SIAM), US *2019 -*

Société de Mathématique de France (SMF), France *2019 -*

Unione Matematica Italiana (UMI), Italy *2018 -*

Société de Mathématiques Appliquées et Industrielles (SMAI), France *2018 -*

Gruppo Nazionale di Calcolo Scientifico (GNCS), Istituto Nazionale di Alta Matematica (INdAM). *2017 - 2021*

CANTAB Capital Institute for Mathematics of Information (CCIMI), University of Cambridge, UK. *2017 -*

Habilitations

Ministero dell'Università e della ricerca (Italy), Habilitation to Associate Professor positions (II fascia) in Numerical Analysis. *2022 - 2032*

Conseil National des Universités (France), Qualification aux fonctions de Maître de conférences, Section 25 (Mathematics), Section 26 (Applied Mathematics), Section 61 (Computer science and engineering). *2018 -*

Languages

Mother tongue: Italian

Other languages: English (fluent), French (fluent), Spanish (intermediate).