Nelly PUSTELNIK

CNRS researcher
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http://perso.ens-lyon.fr/nelly.pustelnik
Nationality : French
Born: 12-11-1984
In a civil partnership, two childs (18/10/2015 and 01/01/2019).

Professionnal career

2007 – 2010	**PhD** – Laboratoire d'Informatique Gaspard Monge, UMR CNRS 8049 Université Paris-Est, France (Team: Signal and Communication, Advisors: J.-C. Pesquet and C. Chaux)
2010 – 2011	**Post-Doc position** – Laboratoire IMS, UMR CNRS 5218 Université Bordeaux, France (Team: Signal and Image processing)
2011 – now	**CNRS researcher** – CRCN – Laboratoire de Physique, UMR CNRS 5672 Ens de Lyon, France (Team: Signals, Systems and Physics)
v 09/2019	**Invited professor** – SST/ICT/INMA UCLouvain – Belgique
10/2019 - 09/2021	**Visiting professor** – SST/ICT/INMA UCLouvain – Belgique
30/09/2021	**HdR** – ENS de Lyon, France
10/2021 - 07/2022	**"Mise à disposition"** – SST/ICT/INMA UCLouvain – Belgique
2023- now	**"Prime individuelle"**

Research areas

➤ Optimization, proximal algorithms, non-smooth optimization.
➤ Image analysis: image restoration, image reconstruction, segmentation, contour detection, texture analysis.
➤ Signal analysis: Change-point detection, mode extraction.
➤ Learning: sparse classification/regression, deep unfolded schemes.

Publications summary

➤ Accepted/published international journals: 37
➤ International conferences: 50
➤ National journal: 1
➤ National conferences: 13
➤ Google Scholar h-index: 21 (1766 citations)

PhD students / Postdoctoral researchers ─────────────

➤ **PhD student** (2012-2015): **G. Chierchia**, Télécom ParisTech.
Co-advisor 50% in collaboration with Pesquet-Popescu (Télécom ParisTech).
Subject: Epigraphical decomposition to deal with non-linear convex constraints. Application to image reconstruction, supervised classification, and anomaly detection.
Associated publications: 2 international journals (IEEE TIP, SIVP), 4 international conferences (IEEE ICASSP 2012, ICASSP 2013, ICASSP 2014, SPARS'2015), 1 MATLAB toolbox.
Current position: Assistant professor at ESIEE, Marne-la-Vallée, France.

➤ **Agrégé préparateur** (2012-2015): **J. Schmitt**, LPENSL.
Subject: Empirical mode decomposition.
Associated publications: 1 international journal (IEEE TIP), 2 international conferences (ICASSP 2014, EUSIPCO 2015), 1 MATLAB toolbox.
Current position: Professor in IUT, Lyon, France.

➤ **PhD student** (2013-2016): **J. Frécon**, LPENSL.
Co-advisor 50% in collaboration with P. Abry (LPENSL).
Subject: Apport des méthodes d'optimisation dans l'estimation des param` etres de régularité locale pour des signaux multivariés.
Associated publications: 4 international journals (3 in IEEE TSP, 1 in IEEE JBHI), 4 international conferences (EUSIPCO 2014, IEEE ICIP 2015, IEEE ICASSP 2016, IEEE IVMSP 2016, IEEE ICASSP 2017, GRETSI 2017). Several MATLAB toolboxes.
Current position: Associate Professor position at Telecom Saint-Etienne and Hubert Curien Laboratory, France.

➤ **Post-doctoral student** (Feb. 2016 - Feb. 2017)): **M. Jiu**, LPENSL / TOTAL.
Subject: Sparse classification.
Associated publications: 1 international journal (J. Signal Proc. Systems), 2 international conferences (IEEE MLSP), 1 MATLAB prototype for TOTAL.
Current position: Associate professor at Zhengzhou University, China.

➤ **Post-doctoral student** (Sept. 2017 - Aug. 2018): **M. Foare**, LPENSL.
Subject: Numerical implementation of the Ambrosio-Tortorelli functional by means of proximal algorithms.
Associated publications: 1 international journal (IEEE TIP), 2 international conferences (IEEE ICIP, SIAM IS), 1 MATLAB toolbox.
Current position: Assistant professor at CPE Lyon, France.

➤ **PhD student** (2017 - 2020): **B. Pascal**, LPENSL.
Co-advisor 50% in collaboration with P. Abry (LPENSL).
Subject: Scale-free texture segmentation.
Associated publications: 3 international journals (JMIV, ACHA, Annals of Telecom), 5 national/international conferences (IEEE ICASSP, SIAM IS, IEEE ICIP, EUSIPCO, GRETSI), 2 MATLAB toolboxes.
Current position: CNRS researcher, Nantes, France.

➤ **PhD student** (2017 - 2020): **L. Denneulin**, CRAL/LPENSL.
Co-advisor 20% in collaboration with M. Langlois and E. Thiébaut (CRAL).
Subject: Advances in signal processing for ESO / VLT - SPHERE imagery.
Associated publications: Intern. journal (A& A), 3 national/international conferences (SPIE, iTwist, GRETSI).
Current position: Postdoctoral researcher at CRAL, Observatoire de Lyon, France.

➤ **PhD student** (2020 - now): **Hoang T.V. Le**, LPENSL.
Advisor 50% in collaboration with M. Foare (LIP ENSL).
Subject: Interface detection and multiscale analysis.
Associated publications: 1 intern. journal (IEEE SPL), 2 national/intern. conferences (EUSIPCO, GRETSI).

➤ **PhD student** (2021 - now): **Guillaume Lauga**, LIP, ENSL.
Co-advisor 20% in collaboration with E. Ricietti and P. Goncalves (LIP ENSL).
Subject: Multilevel optimization to solve inverse problems.
Associated publications: 1 international conference (IEEE ICASSP), 1 national conference (GRETSI).

➤ **PhD student** (2022 - now): **Leo Davy**, LPENSL.
Co-advisor 50% in collaboration with P. Abry (LP ENSL).
Subject: Texture segmentation and unfolded algorithms.
Associated publications: 1 international conference (IEEE ICASSP).

➤ **Post-doctoral researcher** (2022 - now): **Clara Lage**, LPENSL.
Co-advisor 50% in collaboration with B. Audit (LP ENSL) and (LBMC, ENSL).
Subject: Space-scale sparse coding in the presence of non-Gaussian noise. Application to the analysis of DNA replication in a single molecule.

Internship/Projects

➤ 2009 – **Adji Néné DIAO, Baptiste MAZIN**, Supélec, M1, "Parallel implementation of proximal algorithms for image restoration", in co-supervision with Caroline Chaux et Jean-Christophe Pesquet (LIGM).

➤ 2011 – **Daniela-Ecaterina CRISTEA**, ENSEIRB-MATMECA, M2, "Algorithms for tomographic reconstruction: Implementation and comparison", in co-supervision with Yannick Berthoumieu (IMS).

➤ 2012 – **Lahlou Lamiae, Liebert Lise, Lotigier Rémi, Tajouri Slim**, Télécom St-Etienne, Engineering project, "Detection of people in a crowd", in co-supervision with Denis Bartolo (LPENSL).

➤ 2015 – **Noura Baouan**, Supélec, M1, chez TOTAL SA sur le sujet "Creation of a database with the molecular distribution and the physico-chemical properties", in co-supervision with Mériam Chebre (TOTAL SA).

➤ 2017 – **Barbara Pascal**, ENS de Lyon, M, "Texture segmentation by proximal methods", in co-supervision with Patrice Abry (LPENSL). Her internship resulted in a IEEE ICASSP. Barbara Pascal continued her internship with a PhD on the same subject.

➤ 2017 – **Jules Colas**, ENS de Lyon, L, "Stick-slip signal denoising", in co-supervision with Valérie Vidal (LPENSL). His internship resulted in a journal paper in Physical Review E.

➤ 2018 – **Yacouba Kaloga**, ENSL, M2, "Discrete Mumford-Shah model on graph. Application to the estimation of transfer matrices between two élections', in co-supervision with Marion Foare (LIP ENSL) et Pablo Jensen (LPENSL). His internship resulted in a IEEE SPL.

➤ 2019 – **Vincent Paparlado**, Univ. Lyon 1, M2 "Estimating the transfer of votes between two elections using graph optimization", in co-supervision with Pablo Jensen (LPENSL).

➤ 2019 – **Loris Helmlinger**, Ecole d'Ingénieur Denis Diderot, Paris, L, "Deep learning for texture segmentation. Application to the study of multiphase flows.", in co-supervision with Barbara Pascal and Valérie Vidal (LPENSL).

➤ 2020 – **Mamadou Ngom**, Univ. Bordeaux, M2, "Minimization of the discrete Ambrosio-Tortorelli model with proximal tools", in co-supervision with Marion Foare (LIP ENSL). Located at UCLouvain but hybrid due to covid19 situation.

➤ 2020 - 2021 – **Baptiste Pirlot**, UCLouvain (Belgium), graduation project (PFE) between 09/2020 and 06/2021 (visio-conference meetings due to covid19), "Quantification of uncertainties for image processing by inverse problems", in co-supervision with Laurent Jacques.

➤ 2021 – **Hugo Artigas**, Ecole Polytechnique, L3, "Confidence interval from trajectory sampling for Covid-19 reproductive factor" in co-supervision with Gersende Fort (IMT), Barbara Pascal (Univ. Lille), and Patrice Abry (LPENSL). Located at IMT but hybrid due to collaboration between different sites.

➤ 2021 – **Benjamin Tibi**, ENSTA, L3, "Analyze river bedload transport by ℓ_1 minimization" in co-supervision with Pierre Borgnat (LPENSL) et Mathieu Cassel (EVS, Lyon). Located at LPENSL but hybrid due to collaboration between different sites. His internship resulted in a GRETSI conference paper.

➤ 2021 – **Assia Chahidi**, Univ. Paris Est Creteil, M2, "Deep learning for the reconstruction of circumstellar environments" in co-supervision with Maud Langlois (CRAL, Observatoire de Lyon). Located at CRAL, Observatoire de Lyon but hybrid due to collaboration between different sites.

➤ 2021 – **Baptiste Desnos**, Ecole Centrale Nantes, M1, "Unfolded algorithms for texture segmentation", in co-supervision with Barbara Pascal (Univ. Lille) and Patrice Abry (LPENSL). Located at LPENSL but hybrid due to collaboration between different sites.

➤ 2021 – **Federico Grillini** and **Giovanni Seraghiti**, Univ. Bologna, L3, "Proximal multi-level algorithms for image restoration", in co-supervision with Elisa Ricietti (LIP ENSL). Hybrid due to collaboration between different sites.

➤ 2022 – **Leo Davy**, LPENSL, M2, 'Proximal algorithms for anisotropic texture segmentation", in co-supervision with Patrice Abry (LPENSL). Located at LPENSL but hybrid due to collaboration between different sites (MaD UCLouvain). His internship resulted in a submitted IEEE ICASSP conference paper. Leo Davy continue his internship with a PhD on the same subject.

➤ 2022 – **Bastien Payre**, Univ. Lyon 1, M2, "Understanding the deep image prior for image reconstruction", in co-supervision with Julian Tachella (LPENSL). Located at LPENSL but hybrid due to collaboration between different sites (MaD UCLouvain).

➤ 2023 – **Edouard Chappon**, LPENSL, M2, 'Unfolded deep architectures and PnP algorithms for circumstellar image reconstruction", in co-supervision with Julian Tachella (LPENSL).

➤ 2023 – **Afsin Ozdemir**, LPENSL, M2, "Regularized Kalman filtering for modelling ocean dynamic." Antoine Venaille (LPENSL) et Bruno Deremble (IGE, Grenoble).

Tutorial/summer school

➤ June 2013: **Peyresq summer school** (6h): Monotone operators theory
(in coll. with J.-C. Pesquet).

➤ May 2014: **Tutorial IEEE ICASSP** (3h): Monotone operators theory for signal and image processing
(in coll. with J.-C. Pesquet).

➤ June 2015: **BigOptim summer school** (3h): Monotone operators and convex optimization.

➤ June 2018: **Ecole d'été ANR GRAPHSIP** (6h): Optimization and networks.

➤ Sept. 2019: **Doctoral school MUSICS, UCLouvain, Belgium** (10h): Large scale optimization for imaging. From regularized methods to learning.

➤ Jan. 2021: **Doctoral school CIRM** (8h): Optimization in signal processing and learning.

➤ Mai. 2022: **Doctoral school SMAI-MODE, Limoges** (9h): Image processing and optimization
(in coll. with A. Repetti).

➤ June 2023: **Tutorial IEEE ICASSP** (3h): Fixed point theory: From proximal algorithms to deep learning
(in coll. with A. Repetti and J.-C. Pesquet).

Teaching

➤ 2007-2010: **Signal and image processing**, 64h/year, Monitorat Université Paris-Est.

➤ 2013-2016: **Signal processing**, Ens de Lyon, M1 Science de la matiére, 24h.

➤ 2014-2018: **Optimization for large scale statistics applied to genomic**, Université Lyon 1, M2 In-génierie Mathématique, 10h.

➤ 2014-2019: **Optimization and networks**, Ens de Lyon, M2 Systéme complexes, 14h (EqTD).

➤ 2015-2018: **Introduction to convex optimization**, CPE Lyon, 4éme année ETI, 17h (EqTD).

➤ 2016-2018: **Optimization and inverse problems**, M2 SIGMA, Grenoble-INP, 8h(EqTD).

➤ 2015-2022: **Machine learning and optimization**, Univ. Lyon 1, M2 Maths en Action, 9h (EqTD).

➤ 2020-2023: **Mathematical fundations of deep neural networks**, Ens de Lyon, M2R Maths, 6h (EqTD).

➤ 2020-2023: **Machine learning**, Ens de Lyon, M2 Systéme complexes, 9h (EqTD).

➤ 2022-2023: **Optimization**, Univ. Lyon 1, M2 Maths en Action, 16h (EqTD).

Research projects (academics/industrial) ───────────────

➤ 2007-2010 **Member of ANR OPTIMED**:
Splitting algorithms for solving large size medical imagery problems.

➤ 2012-2013 **Member of PEPS Bio-Maths-Info PROMIS**:
Proximal algorithms for Structured Illumation Microscopy.

➤ 2013-2016 **Member of ANR ASTRES**:
Analysis, Synthesis and Transformations by Reassignment, EMD and Synchrosqueezing.

➤ 2013-2015 **Leader of "Projet Jeunes Chercheurs GdR ISIS" – GALILEO**:
Signal/image clustering based on scale invariant analysis and non-smooth optimization.

➤ 2014-2017 **Member of ANR GRAPHSIP**: Graph signal processing.

➤ 2015-2016 **Member of Defi IMAG'in OPTIMISME**: Large scale optimisation.

➤ 2016-2017 **Leader of TOTAL funding**: Supervised learning for special fuel manufacturing.

➤ 2016-2021 **Member of ANR MultiFracs**: Multifractal analysis.

➤ 2017 **Member of Mastodons AGADIR**: Distributed learning on networks.

➤ 2017-2018 **Leader of Defi IMAG'in SIROCCO**: Scale-free texture segmentation.

➤ 2018-2021 **Member of SBI ACADEMICS** "Machine learning Data science for complex and dynamical models"

➤ 2018 **Leader of "Equipe conseil" project with AZOTH SYSTEMS**: "Supervised classification for the detection of decompression sickness in diving".

➤ 2019-2021 **Member of Pack Ambition Recherche GREENDAM** : "Sedimentary transparency assessment of hydroelectric operational elements to promote virtuous hydraulic energy" .

➤ 2019-2023 **Member of ANR NanoPoRep,**"High-performance genomic profiling of DNA replication by nanopore sequencing".

➤ 2019-2024 **Leader of ANR JCJC Multisc'In**: Multiscale analysis and interface detection.

➤ 2023-2026 **Member of ANR GloUrb**: Floodplain urbanisation at global scale.

➤ 2023-2024 **Leader of APOLO (LPENSL) project**: Regularized Kalman filtering for modelling ocean dynamic.

➤ 2023-2024 **Leader of Tremplin@INP project**: DIAPO: Design Informé d'Architectures d'apprentissage profond pour l'Océanographie.

➤ 2023-2024 **Leader of Del Duca project**: DI2A : Design Informé d'Architectures d'Apprentissage profond.

Scientific responsibilities

➤ 2013- now **Assistant professor selection committees**
2013: LJK, CNU 26.
2013: INPT ENSEEIHT, CNU 61.
2014: Univ. Orsay, CNU 61.
2015: INSA Rouen, CNU 27/61.
2016: Univ. Dijon, CNU 26.
2018: IMB, Bordeaux, CNU 26.
2019: ENSIMAG, Grenoble, CNU 61.
2020: FIMI-CREATIS, CNU 26/27.
2020: CentraleSupélec, CNU 26/27.
2021: LAMA, Chambery, CNU 26/27.
2021: SeaTech, Toulon, CNU 61.
2023: UClouvain, Belgium.
2023: LJK, CNU 26.
2023: University of Augsburg, Germany (external report).

➤ 2015-2023 **GdR ISIS direction committee**
French research group in signal and image processing. In charge of inter-GDR and international relations. Revival of "La Gazette du GdR ISIS" in electronic form. Participation in the redesign of the GdR ISIS website. Update of expertise within the members of the GdR ISIS and associated mapping.

➤ 2015-2018 **EURASIP Signal and Data Analytics for Machine Learning Special Area Team.**

➤ 2016-2021 **IEEE MLSP Technical Commitee.**

➤ 2016-2020 **IEEE SPL Associate Editor.**

➤ Since 2021 **SMAI-MODE** committee, secretary.

➤ Since 2021 **IEEE SPL Senior Associate Editor.**

➤ Since 2021 **IEEE TIP Associate Editor.**

Expertise activity

➤ **Reviewer for international journals**: IEEE Trans. on Image Processing, IEEE Trans. on Signal Processing, SIAM Journal on Imaging Sciences, Inverse problems, IEEE Signal Processing Letters, Mathematical Prog.

➤ **Reviewer for international conf.**: IEEE ICASSP, IEEE ICIP, IEEE ISBI, NeurIPS.

➤ **Area chair**: EUSIPCO 2015 : Signal and image processing applications.

➤ **TPC**: EUSIPCO 2012-2014.

➤ **Best reviewer award**: EUSIPCO 2014.

➤ **Reviewer for ANR**: 2 projects (2015), 2 projects (2017), 1 projet (2022).

➤ **Reviewer for PhD funding**: Université de Caen, France (2014).

➤ **PhD committee ("examinatrice")**   O. Merveille (ESIEE, Paris, 2016),F. Pierucci (LJK, Grenoble, 2016), Y. Marnissi (LIGM, Paris, 2017), E. Woilez (ENS Lyon,2018), D. Q. Klopfenstein (IMB, Dijon, 2021), M. Massias (Télécom Paris & INRIA, 2019), D. Martins Antunes (Univ. Savoie, 2020), I. El Bouchairi (GREYC, Caen, 2021), Q. Klopfenstein (IMB, Dijon, 2021), J. Lefeuvre (TOTAL/Ecole Centrale Nantes, 2022).

➤ **PhD committee ("rapportrice")**   S. Guérit (UCLouvain, 2021), L. Dragoni, 2022 (Univ. Cote d'Azur), M. Shpakovych (Univ. Limoges), H. Leterme (LJK, Grenoble, 2023).

➤ **TSI History**:   Working group dedicated to TSI History (Text link).

Conferences/workshops organization ─────────────────

➤ **SIERRA** (regional meetings):   Signal and image processing meetings. Organization, webmaster (2013-2015).
➤ **GdR ISIS** (national meetings):   Responsable for "Action Optimisation". Organization of 6 meetings (2014-2015).
➤ **IEEE ICIP 2014** (Paris, France):   Organizing committee as "IEEE Student Activities chair".
➤ **IEEE IVMSP 2016**:   Organizing committee as "Publication chair".
➤ **STATOS 2016**:   Organizing committee as "Program chair".
➤ **Journées SMAI MODE 2017**:   Organizing committee as "Sponsor chair".
➤ **IEEE MLSP 2018** (Aalborg, Denmark):   Organizing committee as "Program chair".
➤ **AIP 2019** (Grenoble, France):   Minisymposium "Variational methods for inverse problems".
➤ **JDS 2022** (Lyon, France):   Organizing committee.
➤ **IEEE ICIP 2022** (Bordeaux, France):   Organizing committee as "Tutorial chair".
➤ **GrapLearn 2022** (CIRM, France):   Organizing committee.
➤ **SMAI-MODE 2024**(Lyon, France):   Organizing committee as "General chair" with F. Santambrogio.
➤ **EUSIPCO 2024** (Lyon, France):   Organizing committee as "Financial chair".

Publications ─────────────────

➤ **Accepted/published international journals**

1. L. M. Briceño-Arias and N. Pustelnik, "*Theoretical and numerical comparison of first order algorithms for cocoercive equations and smooth convex optimization,*" **Signal Processing**, vol. 206, no. C, May 2023.

2. G. Fort, B. Pascal, P. Abry, and N. Pustelnik, "*Covid19 reproduction number: Credibility intervals by blockwise proximal monte carlo samplers,*" **IEEE Transactions on Signal Processing**, vol. 71, pp. 888- 900, 2023

3. C.G. Lucas, B. Pascal, N. Pustelnik, and P. Abry, "*Hyperparameter selection for the Discrete Mumford-Shah functional,*" **Signal, Image and Video Processing**, to be published 2022.

4. L.M. Briceño-Arias and N. Pustelnik "*Convergence rate comparison of proximal algorithms for non-smooth convex optimization with an application to texture segmentation,*" **IEEE Signal Processing Letters**, vol. 29, pp. 1337 - 1341, 2022.

5. M. Jiu, N. Pustelnik "*Alternative Design of DeepPDNet in the Context of Image Restoration,*" **IEEE Signal Processing Letters**, vol. 29, pp. 932 - 936, 2022.

6. T.V. Le, M. Foare, and N. Pustelnik "*Proximal based strategies for solving Discrete Mumford-Shah with Ambrosio-Tortorelli penalization on edges,*" **IEEE Signal Processing Letters**, vol. 29, pp. 952- 956, 2022.

7. L. Denneulin, M. Langlois, E. Thiébaut, and N. Pustelnik, "*RHAPSODIE : Reconstruction of High-contrAst Polarized SOurces and Deconvolution for cIrcumstellar Environments,*" **Astronomy and Astrophysics**, vol. 653, June 2021.

8. B. Pascal, S. Vaiter, N. Pustelnik, and P. Abry, "*Automated data-driven selection of the hyperparameters for Total-Variation based texture segmentation*", **Journal of Mathematical Imaging and Vision**, vol. 63, pp. 923–952, 2021.

9. B. Pascal, N. Pustelnik, and P. Abry, "*Strongly Convex Optimization for Joint Fractal Feature Estimation and Texture Segmentation*", **Applied and Computational Harmonic Analysis**, vol. 54, pp 303-322, 2021.

10. M. Jiu and N. Pustelnik, "*A deep primal-dual proximal network for image restoration,*" accepted to **IEEE JSTSP Special Issue on Deep Learning for Image/Video Restoration and Compression**, 2021.

11. E. Horne, J. Schmitt, N. Pustelnik, S. Joubaud. P. Odier "*Variational Mode Decomposition for estimating critical reflected internal wave in stratified fluid*", **Experiments in Fluids**, vol. 62, no. 110, 2021.

12. P. Abry, N. Pustelnik, S. Roux, P. Jensen, P. Flandrin, R. Gribonval, C.-G. Lucas, E. Guichard, P. Borgnat, N. Garnier, B. Audit, "*Spatial and temporal regularization to estimate COVID-19 Reproduction Number $R(t)$: Promoting piecewise smoothness via convex optimization,*" **PLoS One**, 15(8), Aug. 2020.

13. B. Pascal, N. Pustelnik, P. Abry, J.-C. Géminard, V. Vidal, "*Parameter-free and fast non-linear piecewise filtering. Application to experimental physics,*" **Annals of Telecommunications**, 75, 655-671, Oct. 2020.

14. M. Foare, N. Pustelnik, and L. Condat, "*Semi-linearized proximal alternating minimization for a discrete Mumford-Shah model,*" **IEEE Trans. on Image Processing**, vol. 29, pp 2176-2189, Oct. 2019.

15. Y. Kaloga, M. Foare, N. Pustelnik, and P. Jensen, "*Discrete Mumford-Shah on graph for mixing matrix estimation,*" **IEEE Signal Processing Letters**, vol. 26, no. 9, pp. 1275-1279, Sept. 2019.

16. J. Colas, N. Pustelnik, C. Oliver, J.-C. Géminard, V. Vidal, "*Nonlinear denoising for solid friction dynamics characterization,*" **Physical Review E**, 100, 032803, Sept. 2019.

17. M. Jiu, N. Pustelnik, S. Janaqi, M. Chebre, P. Ricoux, "*Sparse hierarchical interaction learning with epigraphical projection,*" **Journal of Signal Processing Systems**, vol. 92, pp. 637?654, 2019.

18. J. Boulanger, N. Pustelnik, L. Condat, T. Piolot, L. Sengmanivong, "*Nonsmooth convex optimization for Structured Illumination Microscopy image reconstruction,*" **Inverse problems**, vol. 34, no. 9, 22 pp., July 2018.

19. P. Abry, J. Spilka, R. Leonarduzzi, V. Chudacek, N. Pustelnik, M. Doret, "*Sparse learning for Intrapartum fetal heart rate analysis,*" accepted to **Biomedical Physics & Engineering Express**, 2018.

20. N. Pustelnik, L. Condat, "*Proximity Operator of a Sum of Functions; Application to Depth Map Estimation,*" **IEEE Signal Processing Letters**, vol. 24, no. 12, pp. 1827 - 1831, Dec. 2017.

21. J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, and P. Abry, "*Bayesian selection for the regularization parameter in TVl0 denoising problems,*" **IEEE Trans. on Signal Processing**, vol. 65, no. 25, pp. 5215 - 5224, Jun. 2017.

22. J. Spilka, J. Frecon, R. Leonarduzzi, N. Pustelnik, P. Abry, M. Doret, "*Sparse Support Vector Machine for Intrapartum Fetal Heart Rate Classification,*" **IEEE Journal of Biomedical and Health Informatics**, vol. 21, no. 3, pp. 664 - 671, May 2017.

23. G. Michau, N. Pustelnik, P. Borgnat, P. Abry, A. Nantes, A. Bhaskar, E. Chung, "*A primal-dual algorithm for link dependent origin destination matrix estimation,*" **IEEE Transactions on Signal and Information Processing over Networks**, vol. 3, no. 1, pp. 104 - 113, Mar. 2017.

24. N. Pustelnik, H. Wendt, P. Abry, N. Dobigeon, "*Local regularity, wavelet leaders and total variation based procedures for texture segmentation,*" accepted to **IEEE Trans. on Computational Imaging**, vol. 2, no. 4, pp. 468–479, Dec. 2016.

25. J. Frecon, G. Didier, N. Pustelnik, and P. Abry, "*Non-Linear Wavelet Regression and Branch and Bound Optimization for the Full Identification of Bivariate Operator Fractional Brownian Motion,*" accepted to **IEEE Trans. on Signal Processing**, vol. 64, no. 15, pp. 4040–4049, Aug. 2016.

26. J. Frecon, N. Pustelnik, P. Abry, and L. Condat, "*Fast and On-the-fly Approximation of Multivariate Total Variation Minimization,*" **IEEE Trans. on Signal Processing**, vol. 64, no. 9, pp. 2355–2364, May 2016.

27. N. Pustelnik, A. Benazza-Benhayia, Y. Zheng, J.-C. Pesquet, "*Wavelet-based Image Deconvolution and Reconstruction*," accepted to **Wiley Encyclopedia of Electrical and Electronics Engineering**, 2016. Tutorial paper.

28. G. Chierchia, N. Pustelnik, J.-C. Pesquet, B. Pesquet-Popescu, "*Epigraphical splitting for solving constrained convex formulations of inverse problems with proximal tools*," **Signal, Image and Video Processing**, vol.9, no. 8, pp.1737–1749, Nov. 2015.

29. G. Chierchia, N. Pustelnik, B. Pesquet-Popescu, J.-C. Pesquet, "*A Non-Local Structure Tensor Based Approach for Multicomponent Image Recovery Problems*," **IEEE Trans. Image processing**, Vol. 23, no. 12, pp. 5233–5248, Oct. 2014.

30. J. Schmitt, N. Pustelnik, P. Borgnat, P. Flandrin, and L. Condat, "*A 2-D Prony-Huang Transform: A New Tool for 2-D Spectral Analysis*," **IEEE Trans. Image processing**, Vol. 23, no. 12, pp. 5531–5544, Oct. 2014.

31. C.R. Johnson, P. Messier, W.A. Sethares, A.G. Klein, C. Brown, A.H. Do, P. Klausmeyer, P. Abry, S. Jaffard, H. Wendt, S. Roux, N. Pustelnik, N. van Noord, L. van der Maaten, E. Potsma, J. Coddington, L.A. Daffner, H. Murata, H. Wilhelm, S. Wood, M. Messier, "*Pursuing automated classification of historic photographic papers from raking light photomicrographs*," **Journal of the American Institute for Conservation**, vol. 53, no. 3, pp. 159–170, 2014.

32. N. Pustelnik, P. Borgnat, P. Flandrin "*Empirical Mode Decomposition revisited by multicomponent non smooth convex optimization*," **Signal Processing**, vol. 102, pp. 313–331, Sept. 2014.

33. Y. Berthoumieu, Ch. Dossal, N. Pustelnik, F. Turcu et Ph. Ricoux, "*An evaluation of the sparsity degree for sparse recovery with deterministic measurement matrices*," **Journal of Mathematical Imaging and Vision**, Vol. 48, pp. 266–278, 2013.

34. J.-C. Pesquet and N. Pustelnik, "*A Parallel Inertial Proximal Optimization Method*," **Pacific Journal of Optimization**, Vol. 8, No. 2, pp. 273–305, Apr. 2012.

35. N. Pustelnik, J.-C. Pesquet, and C. Chaux, "*Relaxing Tight Frame Condition in Parallel Proximal Methods for Signal Restoration*," **IEEE Transactions on Signal Processing**, Vol. 60, No. 2, pp. 968–973, Feb. 2012.

36. N. Pustelnik, C. Chaux, and J.-C. Pesquet, "*Parallel ProXimal Algorithm for image restoration using hybrid regularization*," **IEEE Transactions on Image Processing**, Vol. 20, No. 9, pp. 2450-2462, Sep. 2011.

37. L. M. Briceño-Arias, P. L. Combettes, J.-C. Pesquet, and N. Pustelnik, "*Proximal algorithms for multi-component image processing*," **Journal of Mathematical Imaging and Vision**, Vol. 41, No. 1, pp. 3-22, Sep. 2011.

➤ **International conferences**

1. N. Pustelnik On the primal and dual formulations of the discrete Mumford-Shah functional, accepted to **IEEE ICASSP**, 2023.

2. L. Davy, N. Pustelnik, and P. Abry Combining dual-tree wavelet analysis and proximal optimization for anisotropic scalefree texture segmentation, accepted to **IEEE ICASSP**, 2023.

3. G. Lauga, E. Riccietti, N. Pustelnik, and P. Goncalves Multilevel FISTA for Image Restoration, accepted to **IEEE ICASSP**, 2023.

4. H.T.V. Le, N. Pustelnik, M Foare, The faster proximal algorithm, the better unfolded deep learning architecture? The study case of image denoising, **EUSIPCO**, Belgrade, Serbie, 29 Aug - 2 Sept. 2022. (Invited).

5. H.T.V. Le, N. Pustelnik, M Foare, The faster proximal algorithm, the better unfolded deep learning architecture? The study case of image denoising, **EUSIPCO**, Belgrade, Serbie, 29 Aug - 2 Sept. 2022. (Invited).

6. H. Artigas, B. Pascal, G. Fort, P. Abry, N. Pustelnik, Credibility interval design for Covid19 reproduction number from nonsmooth Langevin-type Monte Carlo sampling, **EUSIPCO**, Belgrade, Serbie, 29 Aug - 2 Sept. 2022.

7. P. Abry, G. Fort, B. Pascal, N. Pustelnik, Temporal evolution of the Covid19 pandemic reproduction number: Estimations from proximal optimization to Monte Carlo sampling, **EMBC**, Glasgow, Scotland, UK, 11-15 Jul. 2022

8. N. Pustelnik, M. Jiu, "*Proximal primal-dual algorithms to design image reconstruction neural networks*," **SIAM Conference on Imaging Science,** Berlin, Germany, Mar. 21-25, 2022.

9. B. Pascal, V. Mauduit, N. Pustelnik, P. Abry "*Scale-free Texture Segmentation: Expert Feature-based versus Deep Learning strategies*," **EUSIPCO 2020**, Amsterdam, Netherlands, Jan. 18-21, 2021.

10. L. Denneulin, M. Langlois, N. Pustelnik, I. Loris, E. Thiébaut "*Primal-dual splitting scheme with backtracking for handling with epigraphic constraint and sparse analysis regularization*," **iTwist**, Nantes, France, Dec. 2-4, 2020.

11. B. Pascal, N. Pustelnik, P. Abry, M. Serres, V. Vidal "*Joint estimation of local variance and local regularity for texture segmentation. Application to multiphase flow characterization*," **IEEE ICIP,** Athens, Greece, Oct. 7-10, 2018.

12. M. Jiu, N. Pustelnik, L. Qi "*Multiclass SVM With Hierarchical Interaction: Application To Face Classification*," **IEEE MLSP,** Aalborg, Danemark, Sept. 17-20, 2018.

13. N. Pustelnik, L. Condat, "*Proximity operator of a sum of functions: Application to image segmentation*," **SIAM Conference on Imaging Science,** Bologna, Italy June, 5-8 2018.

14. B. Pascal, N. Pustelnik, P. Abry, "*Combining Local Regularity Estimation and Total Variation Optimization for Scale-Free Texture Segmentation*," **SIAM Conference on Imaging Science,** Bologna, Italy June, 5-8 2018.

15. M. Foare, N. Pustelnik, L. Condat, "*Semi-Linearized Proximal Alternating Minimization for a Discrete Mumford-Shah Model*," **SIAM Conference on Imaging Science,** Bologna, Italy June, 5-8 2018.

16. M. Foare, N. Pustelnik, L. Condat "*A new proximal method for joint image restoration and edge detection with the Mumford-Shah model*," **IEEE ICASSP,** Calgary, Alberta, Canada, Apr. 15-20, 2018.

17. B. Pascal, N. Pustelnik, P. Abry, J.-C. Pesquet Block-coordinate proximal algorithms for scale-free texture segmentation," IEEE ICASSP, Calgary, Alberta, Canada, Apr. 15-20, 2018.

18. J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, and P. Abry "*Bayesian-driven criterion to automatically select the regularization parameter in the l1-Potts model*," **IEEE ICASSP,** New-Orleans, USA, May, 5-9 2017.

19. G. Chierchia, N. Pustelnik, J.-C. Pesquet "*Random primal-dual proximal iterations for sparse multiclass SVM*," **IEEE MLSP**, Vietri sul Mare, Salerno, Italy, Sep. 13-16, 2016

20. M. Jiu, N. Pustelnik, M. Chebre, S. Janaqi, P. Ricoux "*Multiclass SVM with graph path coding regularization for face classification*," **IEEE MLSP**, Vietri sul Mare, Salerno, Italy, Sep. 13-16, 2016.

21. J. Frecon, N. Pustelnik, H. Wendt, L. Condat, and P. Abry "*Multifractal-based texture segmentation using variational procedure*," **IEEE IVMSP**, Bordeaux, France, Jul., 11-12 2016.

22. J. Frecon, R. Fontugne, G. Didier, N. Pustelnik, K. Fukuda, and P. Abry "*Non-linear regression for bivariate self-similarity identification - Application to anomaly detection in Internet traffic based on a joint scaling analysis of packet and byte counts*," **IEEE ICASSP**, Shanghai, China, Mar, 20-25 2016.

23. P. Flandrin, N. Pustelnik, P. Borgnat, "*On Wigner-based sparse time-frequency distributions*," **IEEE CAMSAP**, Cancun, Mexico, Dec. 13-16 2015.

24. J. Frecon, N. Pustelnik, H. Wendt, and P. Abry "*Multivariate optimization for multifractal-based texture segmentation*," **IEEE ICIP**, Quebec City, Canada, Sept, 27-30 2015.

25. J. Schmitt, E. Horne, N. Pustelnik, S. Joubaud, P. Odier "*An improved variational mode decomposition method for internal waves separation*," **EUSIPCO**, Nice, France, Aug. 31- Sep. 4 2015.

26. J. Spilka, J. Frecon, R.F. Leonarduzzi, N. Pustelnik, P. Abry, M. Doret "*Intrapartum Fetal Heart Rate classification from Trajectory in Sparse SVM feature space*," **IEEE EMBC**, Milan, Italy, Aug. 25-29 2015.

27. R.F. Leonarduzzi, J. Spilka, J. Frecon, H. Wendt, N. Pustelnik, S. Jaffard, P. Abry, M. Doret "*P-leader multifractal analysis and sparse SVM for intrapartum fetal acidosis detection,*" **IEEE EMBC**, Milan, Italy, Aug. 25-29 2015.

28. G. Chierchia, N. Pustelnik, J.-C. Pesquet, and B. Pesquet-Popescu, "*An Epigraphic Splitting Technique for Sparse Multiclass SVM,*" **SPARS**, Cambridge, UK, July 6-9, 2015.

29. G. Michau, P. Borgnat, N. Pustelnik, P. Abry, A. Nantes, E. Chung, "*Estimating link-dependen origin-destination matrices from sample trajectories and traffic counts,*" **IEEE ICASSP**, Brisbane, Australia, April 19-24, 2015

30. N. Pustelnik, P. Abry, H. Wendt, and N. Dobigeon, "*Inverse problem formulation for regularity estimation in images,*" **IEEE ICIP**, La Défense, Paris, France, October 27-30, 2014. Top 10% papers.

31. J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, and P. Abry, "*Hybrid Bayesian variational scheme to handle parameter selection in total variation signal denoising,*" **EUSIPCO**, Lisbon, Portugal, Sept, 1-5 2014.

32. J. Schmitt, N. Pustelnik, P. Borgnat, and P. Flandrin, "*2D Hilbert-Huang Transform,*" **IEEE ICASSP**, Florence, Italy, May 4-9, 2014

33. G. Cherchia, N. Pustelnik, J.-C. Pesquet, and B. Pesquet-Popescu, "*Epigraphic proximal projection for sparse Multiclass SVM,*" **IEEE ICASSP**, Florence, Italy, May 4-9, 2014.

34. J. Boulanger, N. Pustelnik, L. Condat, "*Non-smooth convex optimization for an efficient reconstruction in structured illumination microscopy,*" **IEEE ISBI**, Beijing, China, April 28-May 2, 2014.

35. L. Condat, J. Boulanger, N. Pustelnik, S. Sahnoun, L. Sengmanivong "*A 2-D spectral analysis method to estimate the modulation parameters in structured illumination microscopy,*" **IEEE ISBI**, Beijing, China, April 28-May 2, 2014.

36. N. Saulig, N. Pustelnik, P. Borgnat, P. Flandrin, and V. Sucic, "*Instantaneous counting of components in nonstationary signals,*" **EUSIPCO**, Marrakech, Morocco, Sept. 9-13, 2013. Invited paper.

37. N. Pustelnik, H. Wendt, and P. Abry, "*Local regularity for texture segmentation : combining wavelet leaders and proximal minimization,*" **IEEE ICASSP**, Vancouver, Canada, May 26-31, 2013.

38. G. Cherchia, N. Pustelnik, J.-C. Pesquet, and B. Pesquet-Popescu, "*An epigraphical convex optimization approach for multicomponent image restoration using non-local structure tensor,*" **IEEE ICASSP**, Vancouver, Canada, May 26-31, 2013

39. N. Pustelnik, P. Borgnat, and P. Flandrin, "*A multicomponent proximal algorithm for Empirical Mode Decomposition,*" **EUSIPCO**, Bucharest, Romania, August, 27-31, 2012.

40. N. Pustelnik, C. Dossal, F. Turcu, Y. Berthoumieu, and Ph. Ricoux, "*A greedy algorithm to extract sparsity degree for l1/l0-equivalence in a deterministic context,*" **EUSIPCO**, Bucharest, Romania, August, 27-31, 2012.

41. G. Cherchia, N. Pustelnik, J.-C. Pesquet, and B. Pesquet-Popescu, "*A proximal approach for constrained cosparse modelling,*" **IEEE ICASSP**, Kyoto, Japan, March 25-30, 2012.

42. C. Chaux, C. Comtat, J.-C. Pesquet, and N. Pustelnik, "*Dynamic PET Reconstruction using Parallel ProXimal Algorithm,*" **SIAM Conference on Optimization**, Darmstadt, Germany, May 16-19, 2011. Invited paper.

43. N. Pustelnik, C. Chaux, J.-C. Pesquet, and C. Comtat, "*Parallel Algorithm and Hybrid Regularization for Dynamic PET Reconstruction,*" **IEEE MIC** , Knoxville, Tennessee, Oct. 30 - Nov. 6 2010.

44. L. M. Briceño-Arias, P. L. Combettes, J.-C. Pesquet, and N. Pustelnik, "*Proximal method for geometry and texture image decomposition,*" **IEEE ICIP**, Honk Kong, 26-29 Septembre 2010.

45. N. Pustelnik, J.-C. Pesquet, and C. Chaux, "*Proximal methods for image restoration using a class of non-tight frame representations,*" **EUSIPCO**, Aalborg, Danmark, 23-27 August 2010.

46. C. Chaux, J.-C. Pesquet, and N. Pustelnik, "*Frame-based proximal algorithms for Poisson data recovery,*" **SIAM Conference on Imaging Science**, Chicago, Illinois, April 12-14 2010. Invited paper.

47. N. Pustelnik, C. Chaux, J.-C. Pesquet, F. C. Sureau, E. Dusch, and C. Comtat, "*Adapted Convex Optimization Algorithm for Wavelet-Based Dynamic PET Reconstruction*," **Fully3D** , Beijing, China, September 5-10, 2009.

48. L. Chaari, N. Pustelnik, C. Chaux, and J.-C. Pesquet, "*Solving inverse problems with overcomplete transforms and convex optimization techniques*," **SPIE**, San Diego, California, USA , August 2-6, 2009. (Invited)

49. N. Pustelnik, C. Chaux, and J.-C. Pesquet, "*A wavelet-based quadratic extension method for image deconvolution in the presence of Poisson noise*," **IEEE ICASSP**, Taipei, Taiwan , April 19-24, 2009.

50. N. Pustelnik, C. Chaux, and J.-C. Pesquet, "*A constrained forward-backward algorithm for image recovery problems*," **EUSIPCO**, Lausanne, Switzerland, August 25-29, 2008.

➤ **National journals**

1. L. Chaari, E. Chouzenoux, N. Pustelnik, C. Chaux et S. Moussaoui, "*OPTIMED : Optimisation itérative pour la résolution de problèmes inverses de grande taille*," **Traitement du signal**, Vol. 28, No. 3-4, pp. 329-374, 2011.

➤ **National conferences**

1. H.T.V. Le, B. Pascal, N. Pustelnik, M. Foare, P. Abry, "*Algorithmes proximaux rapides déroulés pour l'analyse d'images fractales homogènes par morceaux*," **GRETSI**, Nancy, France, Sept. 5-9, 2022.

2. G. Lauga, E. Ricietti, N. Pustelnik, P. Goncalves, "*Méthodes proximales multi-niveaux pour la restauration d'images*," **GRETSI**, Nancy, France, Sept. 5-9, 2022.

3. B. Tibi, N. Pustelnik, P. Borgnat, M. Cassel, H. Piégay, "*Problème inverse pour la localisation de tags RFID situés en zones immergées*," **GRETSI**, Nancy, France, Sept. 5-9, 2022.

4. P. Abry, G. Fort, B. Pascal, N. Pustelnik, "*Estimation et intervalles de crédibilité pour le taux de reproduction de la Covid19 par échantillonnage Monte Carlo Langevin proximal*," **GRETSI**, Nancy, France, Sept. 5-9, 2022.

5. L. Denneulin, M. Langlois, N. Pustelnik, E. Thiébaut "*Reconstruction polarimétrique d'environnements circumstellaires à partir des données ESO/VLT-SPHERE IRDIS*," **GRETSI**, Lille, France, Aug. 26-29, 2019.

6. B. Pascal, T. Busser, N. Pustelnik, P. Abry and V. Vidal "*Segmentation d'images texturées en grande dimension. Application é l'analyse d'écoulements*," **GRETSI**, Lille, France, Aug. 26-29, 2019.

7. J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, and P. Abry, "*Sélection du paramétre de régularisation dans le probléme l2-Potts* ," **GRETSI**, Juan-les-Pins, France, September 5-8, 2017.

8. L. Condat, N. Pustelnik, "*Segmentation d'image par optimisation proximale*," **GRETSI**, Lyon, France, September 8-11, 2015.

9. J. Frecon, N. Pustelnik, H. Wendt, and P. Abry, "*Variation totale multivariée pour la détection de changement du spectre multifractal*," **GRETSI**, Lyon, France, September 8-11, 2015.

10. G. Michau, P. Borgnat, N. Pustelnik, P. Abry, A. Nantes, E. Chung "*Estimating link-dependent origin-destination matrices from sample trajectories and traffic counts*," **GRETSI**, Lyon, France, September 8-11, 2015.

11. N. Pustelnik, H. Wendt, and P. Abry, "*Régularité locale pour l'analyse de texture : le mariage des coefficients dominants et de la minimisation proximale*," **GRETSI**, Brest, France, September 3-6, 2013.

12. N. Pustelnik, J.-C. Pesquet, and C. Chaux, "*Bancs de filtres et méthodes proximales pour la restauration d'images*," **GRETSI**, Bordeaux, France, September 5-8, 2011.

13. N. Pustelnik, C. Chaux, and J.-C. Pesquet, "*Extension des algorithmes imbriqués pour la résolution de problèmes d'optimisation convexe en imagerie*," **GRETSI**, Dijon, France, September 8-11, 2009.

➤ <u>Invited talks</u>

April 2023 **MaLGa | Machine Learning Genoa Center**, (Genoa, Italy).

Feb. 2023 **MIA'23 - Mathematics and Image Analysis**, (Berlin, Germany).

July 2022 **TraDE-OPT workshop**, (UCLouvain, Belgium).

May 2022: **French German Portuguese conference**, (Porto, Portugal) as plenary speaker.

April 2022: **Team meeting UZ Leuven**, (Leuven, Belgium).

July 2021: **17éme colloque de la Société Française de Microscopie**, (Reims, France)

May 2021: **One World IMAGing and INvErse problems (IMAGINE)** (Online)

2019: **Workshop "Graph signals : learning and optimization"** (Montpellier, France)

2019: **Statlearn** (Grenoble, France)

2018: **GdR MIA, Sparsity meeting** (Bordeaux, France)

2018: **Séminaire Parisien de Mathématiques Appliquées à l'Imagerie - IHP** (Paris, France)

2018: **GdR MASCOT-NUM** (Nantes, France).

2017: **GdR Phenix/LIA MSD** (LPENSL).

2017: **Mathias 2017** (Workshop TOTAL, Paris, France).

2016: **Team meeting** (LBBE, Lyon).

2016: **Mathias 2016** (Workshop TOTAL, Paris, France).

2015: **SMILE workshop** (Paris), **GdR ISIS** (Paris).

2014 : **Workshop CNES** (Toulouse, France).

2014 : **Grenoble Optimization Day**.

2014 : **Mathias 2014** (Workshop TOTAL, Paris, France).

2014 : **Convegno Italo-Francese** (Sestri-Levante, Italy)/

2014 : **Séminaire LM2S** (Troyes, France)

2013 : **GDR Multifractales workshop** (Porquerolles, France).

2013 : **Mathias 2013** (Workshop TOTAL, Paris).

2013 : **Team meeting** (Toulouse, France).

2013 : **Worshop at Intitute for Pure & Applied Mathematics** (Los Angeles, U.S.A)

2012 : **Journées Bordelaises d'Analyse Mathématique des Images**.

2012 : **Team meeting** (Marseille).

2012 : **MIA** (Paris, France),

2011: **Mathias 2011 (Workshop TOTAL, France)**.

2011: **TOTAL Image processing meeting**.

2010: **GdR ISIS** (Paris).

2010: Team meeting (Polytechnic Institute of New York).

2009: **GdR MOA** (Paris, France).