

Herwig Wendt

Researcher (permanent), [National Council for Scientific Research \(CNRS\)](#), France

Associate Editor for Signal Processing (Elsevier)

EURASIP Early Career Award Recipient (European Association for Signal Processing)

IEEE Senior Member

- Multifractal models and analysis - Non Gaussian and long-memory - Multivariate Signal and Image analysis
- Bayesian methods - Machine learning - Multiscale representations and computation
- Computational Imaging - Biomedical Engineering - Biophysics - Remote Sensing

Personal Information

- Status: Born 4 September 1979 in Steyr, Austria
Austrian Nationality, Single
- Country: France (residence and professional activity)
- Languages: German (mother tongue), English (fluent), French (fluent), Spanish (basic)
- URL: www.irit.fr/~Herwig.Wendt/
ResearcherID [D-6474-2019](#), ORCID 0000-0001-6930-3083, SCOPUS [16069703800](#)

Career and Positions

- 2012-present: Researcher (tenured) Toulouse, France
[National Council for Scientific Research \(CNRS\)](#), Institute of Information Sciences
Affiliation: [Informatics Research Institute of Toulouse \(IRIT\)](#), [Univ. of Toulouse](#)
 - [Computational Imaging and Vision](#) Research Group (since 2018)
 - [Signal and Communication](#) Research Group (2012-2018)*Main research topic: Scale-free and multivariate models, Bayesian methods, Machine learning, Non Gaussian and Long-memory statistics. Biomedical signals and images.*
- 09-12/2010: Research Member Berkeley, CA, USA
[Mathematical Sciences Research Institute](#)
Inverse Problems and Applications Program ([.www](#))
Research topic: Computation of operators associated with canonical transformations
- 2008-2011: Postdoctoral Research Associate West Lafayette, IN, USA
[Department of Mathematics, Purdue University](#)
Main research topic: Multi-scale discretization & computation of Fourier integral operators

Secondary affiliations

- 2012-present: Research Associate Toulouse, France
[Telecommunications for Space and Aeronautics \(TéSA\)](#) Cooperative Research Laboratory
- 2008-2011: Research Member West Lafayette, IN, USA
[Geomathematical Imaging Group, Purdue University](#) Corporate-Public Consortium
(Funding Members: [BGP](#), [ExxonMobile](#), [PGS](#), [StatOil](#), [Total](#))

Education and Diploma

- 2008: **PhD – Ecole Normale Supérieure (ENS) de Lyon** Lyon, France
Signal Processing and Physics, with honors [Manuscript \(.pdf\)](#)
Contributions of Wavelet Leaders and Bootstrap to Multifractal Analysis. (Advisor: P. Abry)
- 2005: **Master – Vienna University of Technology** Vienna, Austria
Electrical Engineering – Signal Processing and Telecommunications, with honors
Support Vector Machines for Regression Estimation and their application to Chaotic Time Series Prediction. (Advisor: F. Hlawatsch) [Manuscript \(.pdf\)](#)
- 2003: **Master Program, Chalmers University of Technology** Gothenburg, Sweden
Digital Communication Systems and Technology

Honors and Awards

- 2017: Early Career Award of the European Association for Signal Processing (EURASIP)
received for my work on Bayesian Methods for Multifractal Analysis: “*For Significant Contributions to Statistical Inference in Multivariate Multidimensional Multifractal Analysis*”
[Diploma](#) | [www](#)

Research Timeline

From 2008 to 2011, my research focussed on Computational Imaging and the development of *multiscale algorithms* for the computation of *Fourier Integral Operators* using *dyadic parabolic decomposition*, with applications in Geophysics, Exploration Geophysics and Global Earth Imaging.

Since 2012, I am developing methodology for Multiscale Statistics and Pointwise Regularity for Signal and Image Representation, Modeling and Analysis, with major contributions (state-of-the-art) to *p-leaders multifractal analysis*, estimation of *nonconcave multifractal spectra*, *regularity based texture segmentation*, *multivariate multifractal and long-memory models* and *Bayesian methods for multivariate scale-free representations*. Main applications include Remote Sensing and Image Processing for Art Investigation (Paintings, Art Photography).

Since 2015, I moreover develop a strong methodological component steered towards Biomedical Signal and Image Processing leveraging on novel *non Gaussian multiscale expansions*, *Bayesian methods for multifractal models*, *scale-free multivariate analysis* and *Machine Learning*, with main applications to *clinical Human heart rate assessment*, *macroscopic brain activity* (fMRI, MEG) and *ultrasound imaging for cancer*.

Scientific Productions

- **Scientific Publications:** (list of publications below and as .pdf)
since 2006/last 5 years:
H-index 18/15 — i10-index 34/29 — Total Citations 1376/1057 (source [GoogleScholar](#) 27.08.2019)

- 31/22 research articles in international journals (peer reviewed)
- 7/ 4 research articles as book chapters (peer reviewed)
- 74/54 research articles in the proceedings of international conferences (peer reviewed)
- 11/ 6 research articles in the proceedings of national conferences (peer reviewed)
- 9/ 3 corporate technical reports

All publications available on my web page ([www](#)) and in open archive [OATAO](#)

Highlights: 1 Proc. IEEE (IF 9.1), 2 IEEE Sig. Proc. Mag. (IF 7.5), 1 IEEE T. Image Proc. (IF 5.1),
1 IEEE J. STSP (IF 4.4) 2 IEEE T. Biomed. Eng. (IF 4.3), 5 IEEE T. Signal Proc. (IF 4.2)

- **Patent:** *Method for automatic detection and/or correction of errors in multiplexed data stream*
French Patent Nr. 13 55645, published 19/12/2014, delivered 17/02/2017, [www](#) | .pdf
- **Software:**

- Open source Toolboxes and Codes (MATLAB) available for free anonymous download on [my web page](#)
 - [Wavelet Leader Multifractal Analysis](#) (> 2200 downloads since 2014)
Comprehensive state-of-the-art toolbox for the multifractal analysis of signals and images
Since 2017, MATLAB included our wavelet leader method in its commercial Wavelet Toolbox
 - [Bayesian Multivariate Multifractal Analysis](#) (> 1400 downloads since 2015)
Bayesian models and estimators for multifractal parameters for multivariate signals and images
 - [Fractal Connectivity Test](#)
Pairwise test for significance of Fractal Connectivity in Long Memory Networks
 - [Non Gaussian Multiscale Expansion](#)
Multiscale quantification of departures from Gaussian of different natures

Undisclosed Software (MATLAB, C) developed for projects with Industry

- *Algorithm for network traffic prediction*
Deliverables for [R&D Contract \(2018\)](#) with Thales Alenia Space and CNES
- *Classification algorithms for encrypted network traffic*
Deliverables for [R&D Contract \(2017\)](#) with Thales Alenia Space
- *Bayesian classification algorithms for satellite link traffic*
Deliverables for [R&D Contract \(2015\)](#) with CNES
- *Algorithm for detection and correction of glitches in MADRAS instrument data*
Deliverables for [R&D Contract \(2012\)](#) with CLS and CNES, [French Patent FR3007232](#)
- *Algorithm for multiscale reverse-time-migration imaging with wave packets*
[GMIG consortium](#) (2012), described in research article [\[J16\]](#)
- *Algorithm for computation of Fourier integral operators using dyadic parabolic decomposition*
[GMIG consortium](#) (2010), described in research article [\[J23\]](#)

Paper Awards

- 2016: [Best Paper Award](#), *European Signal Processing Conference* (EUSIPCO), Budapest, Hungary [www](#)
- 2014: [Top 10% Paper Award](#), *IEEE Int. Conference on Image Processing* (ICIP), Paris, France [www](#)

Commissions, Boards, Scientific Community

2018-present	<u>Member of Open Science Committee</u> (CoSO), Collège “Europe and International” <i>Consulting to French Ministry of Education, Research & Innovation on Open Science.</i> Committee of 26 experts selected out of several hundred candidates <u>Leader of Work Group</u> “Support and Infrastructure for Experts”	www
2018-present	<u>Member of Special Area Team</u> (SAT) “Theoretical and Methodological Trends in Signal Processing”, European Association for Signal Processing (EURASIP) <i>Mission: foster interaction & communication of EURASIP members in this scientific area.</i>	www
2016-present	<u>Associate Editor</u> , Signal Processing (Elsevier)	www
2013-present	<u>Affiliate Member</u> , IEEE Signal Processing Society SPTM Technical Committee	www
Reviewer:	Signal and Image Processing Major International Journals (<i>IEEE Signal Proces. Mag., IEEE Trans. Image Proces., IEEE Trans. Signal Proces., IEEE Signal Proces. Lett., Elsevier ACHA, EURASIP Signal Proces., EURASIP J. Adv. Signal Proces., ...</i>) and Conferences (<i>IEEE ICASSP, IEEE ICIP, IEEE SSP, EUSIPCO, BSI, GRETSI, ...</i>)	

Scientific Leadership, Grants and Contracts

Scientific Grants

2018-2022	MUTATION - French National Grant (ANR JCJC) <i>Multidimensional multifractal analysis: Theory and applications in ultrasound imaging of pancreatic cancer.</i> Success rate: <u>14.0%</u> (ANR-18-CE45-0007) 258k€ The leading idea of this project is to combine tools from multifractal analysis, non Gaussian multiscale expansions and Bayesian methods, empowered by Machine Learning techniques, to achieve quantitative ultrasound imaging for pancreatic cancer follow-up, including targeted treatment development monitoring (in collaboration with Toulouse Oncopole). <u>Individual Research Grant</u> (I am only partner, author & responsible for all Work Packages).	<u>Principal Investigator</u>
2016-2020	MULTIFRACS - French National Grant (ANR) <i>Multifractal theory and methods for large size multivariate systems. Applications to scale free analysis of brain dynamics.</i> Success rate: <u>11.6%</u> (ANR-16-CE33-0020) 357k€ This research programme develops scale-free and multifractal analyses for multivariate signals using novel regularity exponents and advanced Bayesian methods, for the study of scale-free temporal dynamics in macroscopic brain activity in time estimation. <u>Responsible for Partner IRT - INP Toulouse and Work Package 3</u> (Bayesian models for scale-free dynamics, non-stationarity and spatial non-homogeneity)	<u>Co-Principal Investigator</u>
2016-2018	MATCHA - French Bilateral Research Grant (PICS) <i>Multiscale analysis for clinical Heart rate variability assessment.</i> Success rate: <u>22.0%</u> (PICS CNRS 7260) <50k€ This French-Japanese research project studied the nature and role of complex and nonlinear regularity fluctuations in Human heart rhythm in sympatho-vagal dynamics, specifically for congestive heart failure patients. We proposed a combined multifractal and physiologically-inspired point process model, as well as novel non Gaussian multiscale expansion coefficients, that each individually lead to state-of-the-art results for predicting sudden mortality. <u>International partners:</u> Y. Yamamoto (U. Tokyo), K. Kiyono (U. Osaka)	<u>Principal Investigator</u>
2014-2015	Bilateral Research Grant (SMI, INP Toulouse) <i>Hankel operators and ADMM for frequency estimation.</i> We studied the use of Hankel operators for formulating rank minimization problems, resolved via ADMM, for parameter estimation for complex (oscillating and damped) exponentials. Our high-resolution algorithms are efficient (reaching the CRB) for 1D and 2D frequency and DOA estimation including for unequally spaced and missing data. <u>International partners:</u> F. Andersson, M. Carlsson (Math Dept., Lund University, Sweden)	<u>Principal Investigator</u> <50k€

- 2013-2015 **GALILEO - Young Researcher Grant (GdR-ISIS)** Principal Investigator
Segmentation of images based on local scale invariance analysis. Success rate: 30.4% <50k€
 We proposed and studied several algorithms that combined proximal operators with wavelet leader based pointwise regularity modeling for scale-free texture image segmentation. Our method yielded state-of-the-art results for segmenting images containing scale-free textures.
- 2013 **AMNISTIE - Research Grant (BQR, INP Toulouse)** Principal Investigator
Multifractal analysis tools for statistical image processing <50k€
 In this project we explored the founding ideas for the development of Bayesian methods for multifractal analysis (pursued during the Ph.D of S. Combrexelle, see below). Further, methodological tools for anisotropic texture analysis were proposed for the quantification and classification of texture in Art (paintings, photographic prints).
Individual Research Grant (I was only partner, author & responsible for all Work Packages).

Note: the grants funding my PhD students are listed separately below under “Mentoring”.

Contracts with Industry

- 2018 **R&D Contract** (Thales Alenia Space - CNES) Co-Pilot of 2 Work Packages
Development of network traffic prediction techniques to improve QoS for satellite telecommunication systems (TRL3 - Proof-of-concept)
 The proposed solutions rely on combinations of classical linear prediction models and Machine Learning techniques (Artificial Neural Networks).
- 2017 **R&D Contract** (Thales Alenia Space) Co-Pilot of 2 Work Packages
Techniques for the optimization of secured communications (TRL2 - Application Validated)
 Machine Learning (supervised and unsupervised classification) for the detection and identification of user and application activities in encrypted internet traffic.
- 2015 **R&D Contract** (CNES) Co-Pilot
Bayesian data mining for satellite communication (TRL2 - Application Validated)
 Bayesian classification & anomaly detection methods for internet traffic over satellite links.
- 2012 **R&D Contract** (CLS - CNES) Co-Pilot
Detection and correction of strobos in MADRAS instrument data (TRL4 - Lab Validated)
 Development of a Viterbi-like algorithm that enabled to recover scientific data from the **MADRAS imager instrument of the Megha-Tropics satellite mission** that have been severely damaged due to an on-board electronic failure. – **French Patent FR3007232** (Co-inventor).
- 2012 **R&D Contract** (CLS - CNES) Co-Pilot
Complementary algorithms for correction of MADRAS data (TRL5 - Real Environment)
 Complementary algorithms that enabled the actual deployment of the algorithm patented in FR3007232 in the ground station’s real-time processing chain for the MADRAS instrument.

Workshop and Special Session Co-organization

- 12/2019 “Scale-free and nonlinear, multivariate signal & image analysis” [www](#)
 IEEE Int. Workshop CAMSAP Special Session (co-organizer)
- 06/2016 “Multivariate statistical signal modeling and analysis” [www](#)
 IEEE Stat. Signal Proces. Workshop (SSP) Special Session (co-organizer)
- 09/2015 “Recent advances in multifractal analysis and applications” [www](#)
 EURASIP European Signal Proces. Conf. (EUSIPCO) Special Session (co-organizer)
- 06/2013 CIMI International *Image Processing Thematic School* [www](#)
 Saint-Lary, France (co-organizer)
- 06/2013 CIMI International *Optimization & Statistics in Image Processing* Workshop [www](#)
 Toulouse, France (member of organizing committee)

Invited Lectures and Scientific Outreach

Invited lectures

- Invited Talk: “Bayesian estimation for the multifractal analysis of multivariate images”, BASP Frontiers Workshop, Villars-sur-Ollon, Switzerland (06/02/2019) [www](#)
- Plenary: “A Bayesian estimator for the multifractal analysis of multivariate images”, Biannual French Bayesian Network Conference JFRB, Toulouse, France (31/05/2018) [www](#)

- Research School: 4 hour course “Multifractal analysis based on wavelet bases” at the CIMPA Research School “Harmonic Analysis, Geometric Measure Theory and Applications”, Buenos Aires (08/2017) [www](#) | [dedicated course site](#)
- Invited Talk: “Wavelet leaders and p-leaders multifractal analysis: theory and practice for signals and images”, Banff International Research Station, Banff, Canada (24/02/2014) [www](#)

Communications to the non-specialist audience and Media

- Giant fresco: Selected contribution to a 134 meters large fresco, conceived by CNRS and RATP (Paris public transport authority), that was exposed in the corridor of the major Paris subway stations (Montparnasse) in Fall 2015: *Multifractal analysis for Art Work authentication and dating*. Work conducted in the context of the [Image Processing for Art Investigation](#) project (see [research article \[J22\]](#)) [www](#)
- Interview: Multiscale texture quantification methods for historic photographic paper classification (Journal “Paul Sabatier”, 03/2015, technical details in research article [\[J18\]](#)) [www](#)
- Article: Press communique of the Physics Institute of CNRS on the contribution proposing the use of hyperbolic multiscale transforms to assist Art Scholars in the unsupervised and supervised classification of historic photographic paper (08/2014, see research article [\[J20\]](#)) [www](#)

Mentoring: Supervision of Graduate and Undergraduate Students

Ph.D Students: 4

- Transform Learning for Optimal Nonnegative Matrix Factorization. D. Fagot, 2016 - [\(www\)](#)
Co-Director (with C. Fevotte, U. Toulouse)
 Funding: *ERC Consolidator grant FACTORY (C. Fevotte)*
 NMF is an established method for discovering latent structures in data ((f)MRI, remote sensing, audio,...) in a fixed transform domain (typically, DFT or DCT). In this project we propose models and algorithms in which the transforms is learnt from the data, jointly with the factorization. We developed a fast quasi-Newton method for learning linear transforms and also considered convolutive factorization models and are working towards models in which structured nonlinear transforms are learnt.

- Machine Learning applied to Remote Sensing Images. M. Le Goff, 2014 - 2017 [Thesis Manuscript \(.pdf\)](#)
Co-Director (with J.-Y. Tourneret, U. Toulouse)
 Funding: *Ph.D fellowship of IRT Saint Exupery*
 Remote sensing, once confined to studying a single image, has turned to analyzing long time series of multispectral images, with annual satellite image flows soon reaching several Petabytes. This thesis proposed remote sensing algorithms for processing such massive data volumes: i) a scalable distributed detection and classification algorithm leveraging ideas from random forests and boosting was developed, implemented, tested and deployed on a dedicated cloud computing infrastructure and ii) standard hand-crafted image features were augmented and tested against learnt convolutional neural networks.
M. Le Goff is now Data Scientist / Deep learning researcher at Airbus.

- Multifractal Analysis of Multivariate Data with Applications to Remote Sensing. S. Combrexelle, 2013 - 2016 [Thesis Manuscript \(.pdf\)](#)
Thesis Project Pilot and Supervisor
 (Formal Directors: J.-Y. Tourneret, U. Toulouse and S. McLaughlin, Heriot-Watt U., Edinburgh, UK)
 Funding: *Joint scholarship of French and British Ministries of Defense*
 Multifractal analysis enables complex temporal or spatial dynamics to be studied via the pointwise regularity fluctuations of data and yields remarkable successes in many applications involving complex data. We proposed and studied methodological solutions for two main challenges: leveraging on large multivariate collections of data, and localizing the model to resolve transient non Gaussian and dependence modulations. The method builds on a Bayesian model for the statistics of non-linear multiscale quantities, spectral diagonalization, data augmentation and specific joint priors that allow for efficient estimation of model parameters by stochastic optimization. Designed for large data sets (collections of hyperspectral image or fMRI voxel cubes), it improve state-of-the-art estimation performance by an order of magnitude.
S. Combrexelle is now Deep Learning Scientist for the Startup Another Brain in Paris Region (former R&D Engineer at Leosphere).
 Winner of the [Leopold Escande Thesis Award 2016](#)

- Learning Convolutional Trees for Sparse Representations. O. Chabiron, 2012 - 2015 [Thesis Manuscript \(.pdf\)](#)
Supervisor (Directors: F. Malgouyres and J.-Y. Tourneret, U. Toulouse)
 Funding: *Scholarship of Laboratory of Excellence CIMI*
 Dictionary learning methods led to excellent results in approximation, denoising and inverse problems but are restricted to learning small patches for complexity reasons. We proposed and studied a new model

in which the learnt dictionaries are confined to convolutional tree structures. Combined with sparse coding, we show that these dictionaries yield good approximations to target atoms and operates at linear complexity, hence can learn representations from full size images rather than image patches.

O. Chabiron is now Lead Developer at Immersive Factory.

Master Students: 4

- Machine learning for anomaly detection in multivariate telemetry time series. Y. Zmarou, 2019
We study a method for the detection of anomalies in multivariate telemetry time series of mixed type (numerical and categorical components) using recurrent neural networks.
Ongoing master thesis, MSc to be defended in Fall 2019.
- Multifractal analysis for Ultrasound Imaging. E. Villain, 2018
We proposed and studied a simulation pipeline for analysing the relation between the multifractal and long-range dependence properties of tissue reflectivity and ultrasound images (RF, envelope, B-mode).
Now Ph.D student on Artificial Intelligence for Radiotherapy at LAAS Laboratory.
- Supervised and Unsupervised Classification Methods for Optimizing Secured Communications. M. Saïdi, 2017
We studied a statistical approach leveraging Machine Learning techniques for the real-time classification of applications and user activities in secured Internet traffic, to improve QoS and QoE.
Hired as a Data Scientist for booking.com after Master graduation.
- Optimizing Dictionaries Structured as Convolutional Trees for Sparse Image Representation. M. Valais, 2016
We developed and studied an algorithm for the fast (linear complexity in image size) update of learnt dictionaries for image representation, whose atoms are structured as convolutional trees (where tree depth corresponds to number of convolution layers).
Now working for Orange via SQUAD and finishing a Ph.D at IRIT, U. Toulouse.

Teaching Activity

As a CNRS researcher, I have no teaching duties, but I am responsible (design, teaching, exercises, grading) for the following courses on a voluntary basis:

- 2012-present: Master course Estimation and Detection ENSEEIH - U. Toulouse
Final year lecture and exercises covering classical estimation (maximum likelihood, method of moments, Bayesian) and detection (NP, GLR, Bayesian, χ^2 , K-S) theory. (25h)
- 2012-present: Master course Inverse Problems ENSEEIH - U. Toulouse
Final year lecture and exercises covering regularization, Bayesian and MCMC methods, and a primer on convex optimization. (25h)

Main International Collaborations

- | | | |
|--------------|---|---|
| 2013-present | Y. Yamamoto
K. Kiyono
<i>Heart rate variability, non Gaussian multiscale representations</i>
<u>Joint research grant:</u> | (U. Tokyo, Japan)
(U. Osaka, Japan)
PICS CNRS 7260 MATCHA (PI) |
| 2013-present | S. McLaughlin, Y. Altmann
<i>Bayesian methods for multifractal analysis, multivariate signal and image modeling</i>
<u>Joint Ph.D grant:</u> | (Heriot Watt U., Edinburgh, U.K.)
DGA Franco-British Ph.D (S. Combrexelle , 2013-2016) |
| 2013-present | M. Carlsson, F. Andersson
<i>Hankel operators, approximation using complex exponentials</i>
<u>Joint research grant:</u> | (Lund University, Sweden)
SMI INP Toulouse (PI) |
| 2017-present | G. Didier
<i>Multivariate scale-free and long-memory models</i> | (U. Tulane, USA) |
| 2015-present | R. Barbieri
G. Valenza
<i>Heart rate variability, multiscale representations for physiological point process models</i> | (Politecnico de Milano, Italy & MIT, Boston, USA)
(U. Pisa, Italy) |
| 2015-present | D. Veitch
<i>Internet traffic analysis and monitoring</i> | (U.T. Sydney, Australia) |
| 2012-present | M. V. de Hoop
<i>Multiscale operator discretization and approximation, computation of oscillatory integrals</i> | (Rice U., USA) |
| 2014-2016 | C. R. Johnson
<i>Image processing for Art investigation</i> | (Cornell U., USA) |
| 2010-2013 | A. Vasy
G. Uhlmann
<i>Computation of Fourier integral operators</i> | (U. Stanford, USA)
(U. Washington, USA) |

International Journals: 31

- [J1] P. Abry, H. Wendt, S. Jaffard, G. Didier, "Multivariate scale-free temporal dynamics: From spectral (Fourier) to fractal (wavelet) analysis," *Comptes Rendus de l'Académie des Sciences*, 2019. *To appear*.
- [J2] S. Jaffard, S. Seuret, H. Wendt, R. Leonarduzzi, P. Abry, "Multifractal formalisms for multivariate analysis," *Proc. Royal Society A*, 2019. *To appear*.
- [J3] R. Leonarduzzi, P. Abry, H. Wendt, S. Jaffard, H. Touchette, "A Generalized Multifractal Formalism for the Estimation of Nonconcave Multifractal Spectra," *IEEE Trans. Signal Proces.*, vol. 67, no. 1, pp. 110-119, 2019. [.pdf](#)
- [J4] H. Wendt, P. Abry, K. Kiyono, J. Hayano, E. Watanabe, Y. Yamamoto, "Wavelet p-Leader Non Gaussian Multiscale Expansions for Heart Rate Variability Analysis in Congestive Heart Failure Patients," *IEEE Trans. Biomedical Engineering*, vol. 66, no. 1, pp. 80-87, 2019. [.pdf](#)
- [J5] S. Jaffard, S. Seuret, H. Wendt, R. Leonarduzzi, S. Roux, P. Abry, "Multivariate multifractal analysis," *Applied and Computational Harmonic Analysis*, vol. 46, no. 3, pp. 653-663, 2019. [.pdf](#)
- [J6] H. Wendt, S. Combexelle, Y. Altmann, J.-Y. Tourneret, S. McLaughlin, P. Abry, "Multifractal analysis of multivariate images using gamma Markov random field priors," *SIAM J. on Imaging Sciences (SIIMS)*, vol. 11, no. 2, pp. 1294-1316, 2018. [.pdf](#)
- [J7] G. Valenza, H. Wendt, K. Kiyono, J. Hayano, E. Watanabe, Y. Yamamoto, P. Abry, R. Barbieri, "Mortality Prediction in Severe Congestive Heart Failure Patients With Multifractal Point-Process Modeling of Heartbeat Dynamics," *IEEE Trans. Biomedical Engineering*, vol. 65, no. 10, pp. 2345-2354, 2018. [www|.pdf](#)
- [J8] R. Leonarduzzi, P. Abry, H. Wendt, K. Kiyono, Y. Yamamoto, E. Watanabe, J. Hayano, "Scattering Transform of Heart Rate Variability for the Prediction of Ischemic Stroke in Patients with Atrial Fibrillation," *Methods of Information in Medicine*, vol. 57, no. 3, pp. 141-145, 2018. [.pdf](#)
- [J9] H. Wendt, G. Didier, S. Combexelle, P. Abry, "Multivariate Hadamard self-similarity: testing fractal connectivity," *Physica D*, vol. 356-357, pp. 1-36, 2017. [www|.pdf](#)
- [J10] J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, P. Abry, "Bayesian selection for the l2-Potts model regularization parameter: 1D piecewise constant signal denoising," *IEEE Trans. Signal Proces.*, 65(19):5215-5224, 2017. [.pdf](#)
- [J11] R. Leonarduzzi, H. Wendt, P. Abry, S. Jaffard, C. Melot, "Finite resolution effects in p-leader multifractal analysis," *IEEE Trans. Signal Proc.*, 65(13):3359-3368, 2017. [.pdf](#)
- [J12] R. Fontunje, P. Abry, K. Fukuda, D. Veitch, K. Cho, P. Borgnat, H. Wendt, "Scaling in Internet Traffic: a 14 year and 3 day longitudinal study, with multiscale analyses and random projections," *IEEE/ACM T. Networking*, 25(4), 2017. [.pdf](#)
- [J13] N. Pustelnik, H. Wendt, P. Abry, N. Dobigeon, "Combining local regularity estimation and total variation optimization for scale-free texture segmentation," *IEEE Trans. Comput. Imaging*, 2(4), pp. 468-479, 2016. [.pdf](#)
- [J14] T. Nakamura, K. Kiyono, H. Wendt, P. Abry, Y. Yamamoto, "Multiscale Analysis of Intensive Longitudinal Biomedical Signals and its Clinical Applications," *Proceedings of the IEEE*, 104(2):242-261, 2016. [www|.pdf](#)
- [J15] S. Jaffard, C. Melot, R. Leonarduzzi, H. Wendt, P. Abry, S. G. Roux, M. E. Torres, "p-exponent and p-leaders, Part I: Negative pointwise regularity," *Physica A*, vol. 448, pp. 300-318, 2016. [www|.pdf](#)
- [J16] R. Leonarduzzi, H. Wendt, P. Abry, S. Jaffard, C. Melot, S. G. Roux, M. E. Torres, "p-exponent and p-leaders, Part II: Multifractal Analysis. Relations to Detrended Fluctuation Analysis," *Physica A*, vol. 448, pp. 319-339, 2016. [www|.pdf](#)
- [J17] H. Wendt, N. Dobigeon, J.-Y. Tourneret, M. Albinet, C. Goldstein, N. Karouche, "Detection and Correction of Glitches in a Multiplexed Multi-channel Data Stream - Application to the MADRAS Instrument," *IEEE Trans. Geoscience and Remote Sensing*, 54(5):2803-2811, 2016. [www|.pdf](#)
- [J18] F. Andersson, M.V. de Hoop, H. Wendt, "Multi-scale reverse-time-migration type imaging using the dyadic parabolic decomposition of phase space," *SIAM J. on Imaging Sciences*, 8(4):2383-2411, 2015. [.pdf](#)
- [J19] S. Combexelle, H. Wendt, N. Dobigeon, J.-Y. Tourneret, S. McLaughlin, P. Abry, "Bayesian Estimation of the Multifractality Parameter for Image Texture Using a Whittle Approximation," *IEEE Trans. Image Proc.*, 24(8):2540-2551, 2015. [.pdf](#)
- [J20] P. Abry, S. G. Roux, H. Wendt, P. Messier, A. G. Klein, N. Tremblay, P. Borgnat, S. Jaffard, B. Vedel, J. Coddington, L. Daffner, "Multiscale Anisotropic Texture Analysis and Classification of Photographic Prints: Art scholarship meets image processing algorithms," *IEEE Signal Proc. Mag.*, 32(4):18-27, 2015. [.pdf](#)
- [J21] F. Andersson, M. Carlsson, J.-Y. Tourneret, H. Wendt, "A new frequency estimation method for equally and unequally spaced data," *IEEE Trans. Signal Proc.*, 61(21):5761-5774, 2014. [.pdf](#)
- [J22] C.R. Johnson, P. Messier, W.A. Sethares, A.G. Klein, C. Brown, A.H. Do, P. Klausmeyer, P. Abry, S. Jaffard, H. Wendt *et al*, "Pursuing automated classification of historic photographic papers from raking light photomicrographs," *Journal of the American Institute for Conservation*, 53(3), pp. 159-170, 2014. [www|.pdf](#)
- [J23] M.V. de Hoop, G. Uhlmann, A. Vasy, H. Wendt, "Multi-scale discrete approximations of Fourier integral operators associated with canonical transformations and caustics," *SIAM Multiscale Model. Simul.*, vol. 11, no. 2, pp. 566-585, 2013. [.pdf](#)
- [J24] P. Abry, S. Jaffard, H. Wendt, "When Van Gogh meets Mandelbrot: Multifractal classification of painting's texture," *Signal Proces.*, vol. 93, no. 3, pp. 554-572, 2013. [.pdf](#)
- [J25] F. Andersson, M.V. de Hoop, H. Wendt, "Multiscale discrete approximation of Fourier integral operators," *SIAM Multiscale Model. Simul.*, vol 10, no. 1, pp. 111-145, 2012. [.pdf](#)
- [J26] H. Wendt, S.G. Roux, P. Abry, S. Jaffard, "Wavelet leaders and bootstrap for multifractal analysis of images," *Signal Proces.*, vol. 89, pp. 1100-1114, 2009. [.pdf](#)
- [J27] P. Ciuciu, P. Abry, C. Rabrait H. Wendt, "Log Wavelet Leaders Cumulant based Multifractal Analysis of EVI fMRI time series: evidence of scaling in ongoing and evoked brain activity," *IEEE J. of Selected Topics in Signal Proc.*, vol. 2, no. 6, pp. 929-943, 2009. [.pdf](#)
- [J28] C. Baek, V. Pipiras, H. Wendt, P. Abry, "Second order properties of distribution tails and estimation of tail exponents in random difference equations," *Extremes*, vol. 12, no. 4, pp. 361-400, 2009. [.pdf](#)
- [J29] H. Wendt, P. Abry, S.G. Roux, S. Jaffard, B. Vedel, "Analyse multifractale d'image: l'apport des coefficients dominants," *Revue Traitement du Signal*, vol. 25, no. 4-5, 2009. [.pdf](#)
- [J30] H. Wendt, P. Abry, S. Jaffard, "Bootstrap for empirical multifractal analysis," *IEEE Signal Proc. Mag.*, vol. 24, no. 4, pp. 38-48, 2007. [.pdf](#)
- [J31] H. Wendt, P. Abry, "Multifractality tests using bootstrapped wavelet leaders," *IEEE Trans. Signal Proc.*, vol. 55, no. 10, pp. 4811-4820, 2007. [.pdf](#)

- [C1] M. Dimiccoli, H. Wendt, "Enhancing Temporal Segmentation by Nonlocal Self-Similarity," *IEEE Int. Conf. Image Proces. (ICIP)*, Taipei, Taiwan, Oct. 2019. *To appear.* [.pdf](#)
- [C2] P. Abry, Y. Malevergne, H. Wendt, M. Senneret, L. Jaffrès, B. Liaustrat, "Shuffling for Understanding Multifractality - Application to Asset Price Time Series," *European Signal Processing Conference (EUSIPCO)*, A Coruna (Spain), Sept. 2019. [.pdf](#)
- [C3] B.C. Boniece, G. Didier, H. Wendt, P. Abry, "On Multivariate non-Gaussian Scale Invariance: Fractional Lévy Processes and Wavelet Estimation," *European Signal Processing Conference (EUSIPCO)*, A Coruna (Spain), Sept. 2019. [.pdf](#)
- [C4] V. Catrambone, H. Wendt, E. P. Scilingo, R. Barbieri, P. Abry, G. Valenza, "Heartbeat Dynamics Analysis under Cold-Pressure Test using Wavelet p-Leader Non-Gaussian Multiscale Expansions," *International IEEE EMBS Conference (EMBC)*, Berlin (Germany), July 2019. [.pdf](#)
- [C5] V. Catrambone, G. Valenza, E. P. Scilingo, N. Vanello, H. Wendt, R. Barbieri, P. Abry, "Wavelet p-Leader Non-Gaussian Multiscale Expansions for EEG series: an Exploratory Study on Cold-Pressor Test," *International IEEE EMBS Conference (EMBC)*, Berlin (Germany), July 2019. [.pdf](#)
- [C6] H. Wendt, P. Abry, G. Didier, "Bootstrap-based bias reduction for the estimation of the self-similarity exponents of multivariate time series," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, 2019. [.pdf](#)
- [C7] G. Didier, H. Wendt, P. Abry, "Detection and estimation of delays in bivariate self-similarity: bootstrapped complex wavelet coherence," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, 2019. [.pdf](#)
- [C8] D. Fagot, H. Wendt, C. Fevotte, P. Smaragdís, "Majorization-minimization algorithms for convolutive NMF with the beta-divergence," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, 2019. [.pdf](#)
- [C9] P. Ablin, D. Fagot, H. Wendt, A. Gramfort, C. Fevotte, "A Quasi-Newton algorithm on the orthogonal manifold for NMF with transform learning," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, 2019. [.pdf](#)
- [C10] E. Villain, H. Wendt, A. Basarab, D. Kouame, "On multifractal tissue characterization in ultrasound imaging," *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2019. [.pdf](#)
- [C11] O. D. Domingues, P. Ciuciu, D. La Rocca, P. Abry, H. Wendt, "Multifractal analysis for cumulant-based epileptic seizure detection in EEG time series," *IEEE International Symposium on Biomedical Imaging (ISBI)*, 2019. [.pdf](#)
- [C12] K. Baset, A. Klein, P. Abry, S. G. Roux, H. Wendt, P. Messier, "Performance of two multiscale texture algorithms in classifying silver gelatine paper via k-nearest neighbors," *IEEE Int. Conf. Image Proces. (ICIP)*, Athens, Greece, Oct. 2018. [.pdf](#)
- [C13] H. Wendt, D. Fagot, C. Fevotte, "Jacobi Algorithm for Nonnegative Matrix Factorization with Transform Learning," *European Signal Processing Conference (EUSIPCO)*, Rome, Italy, Sept. 2018. [.pdf](#)
- [C14] D. La Rocca, P. Ciuciu, V. van Wassenhove, H. Wendt, P. Abry, R. Leonarduzzi, "Scale-free Functional Connectivity Analysis from Source Reconstructed MEG Data," *European Signal Processing Conference (EUSIPCO)*, Rome, Italy, Sept. 2018. [.pdf](#)
- [C15] R. Leonarduzzi, P. Abry, S. G. Roux, H. Wendt, S. Jaffard, S. Seuret, "Multifractal Characterization for Bivariate Data," *European Signal Processing Conference (EUSIPCO)*, Rome, Italy, Sept. 2018. [.pdf](#)
- [C16] H. Wendt, P. Abry, G. Didier, "Wavelet domain bootstrap for testing the equality of bivariate self-similarity exponents," *IEEE Workshop Statistical Signal Proces. (SSP)*, Freiburg, Germany, June 2018. [.pdf](#)
- [C17] P. Abry, H. Wendt, G. Didier, "Detecting and Estimating Multivariate Self-Similar Sources in High-Dimensional Noisy Mixtures," *IEEE Workshop Statistical Signal Proces. (SSP)*, Freiburg, Germany, June 2018. [.pdf](#)
- [C18] H. Wendt, R. Leonarduzzi, P. Abry, S. Roux, S. Jaffard, S. Seuret, "Assessing cross-dependencies using bivariate multifractal analysis," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, Calgary (Canada), April 2018. [.pdf](#)
- [C19] D. Fagot, H. Wendt, C. Fevotte, "Nonnegative matrix factorization with transform learning," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, Calgary (Canada), April 2018. [.pdf](#)
- [C20] H. Wendt, P. Ciuciu, P. Abry, "Spatially regularized wavelet leader scale-free analysis of fMRI Data," *IEEE International Symposium on Biomedical Imaging (ISBI)*, Washington D.C. (USA), April 2018. [.pdf](#)
- [C21] P. Ciuciu, H. Wendt, S. Combrexelle, P. Abry, "Spatially regularized multifractal analysis for fMRI Data," *Int. IEEE EMBS Conference (EMBC)*, Jeju (South Korea), July 2017. [.pdf](#)
- [C22] G. Valenza, H. Wendt, K. Kiyono, J. Hayano, E. Watanabe, Y. Yamamoto, P. Abry, R. Barbieri, "Multiscale Properties of Instantaneous Parasympathetic Activity in Severe Congestive Heart Failure: A Survivor vs Non-Survivor Study," *Int. IEEE EMBS Conference (EMBC)*, Jeju (South Korea), July 2017. [.pdf](#)
- [C23] M. Le Goff, J.-Y. Tourneret, H. Wendt, M. Ortner, M. Spigai, "Deep Learning for Cloud Detection," *International Conference on Pattern Recognition Systems (ICPRS)*, Madrid (Spain), July 2017. [.pdf](#)
- [C24] S. Combrexelle, H. Wendt, G. Didier, P. Abry, "Multivariate Scale-free dynamics: Testing Fractal Connectivity," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, New Orleans (USA), March 2017. [.pdf](#)
- [C25] R. Leonarduzzi, P. Abry, S. Jaffard, H. Wendt, L. Gournay, T. Kyriacopoulou, C. Martineau, C. Martinez, "P-Leader Multifractal Analysis for Text Type Identification," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, New Orleans (USA), March 2017. [.pdf](#)
- [C26] J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, P. Abry, "Bayesian-driven criterion to automatically select the regularization parameter in the l1-Potts model," *IEEE Int. Conf. Acoust., Speech, and Signal Proces. (ICASSP)*, New Orleans (USA), March 2017. [.pdf](#)
- [C27] P. Abry, A.G. Klein, P. Messier, S. Roux, M.H. Ellis, W.A. Sethares, D. Picard, Y. Zhai, D.L. Neuhoff, H. Wendt, S. Jaffard, C.R. Johnson Jr., "Wove Paper Analysis through Texture Similarities," *IEEE Asilomar Conf. Signals, Systems and Computers*, Pacific Grove (USA), Nov. 2016. [.pdf](#)
- [C28] R. Leonarduzzi, P. Abry, H. Wendt, K. Kiyono, Y. Yamamoto, E. Watanabe, J. Hayano, "Scattering Transform of Heart Rate Variability for the Prediction of Ischemic Stroke in Patients with Atrial Fibrillation," *Int. Workshop Biosignal Interpretation (BSI)*, Osaka (Japan), Nov. 2016. [.pdf](#)
- [C29] S. Combrexelle, H. Wendt, Y. Altmann, J.-Y. Tourneret, S. McLaughlin, P. Abry, "Bayesian joint estimation of the multifractality parameter of image patches using Gamma Markov Random Field priors," *IEEE Int. Conf. Image Proces. (ICIP)*, Phoenix (USA), Sept. 2016. [.pdf](#)

- [C30] S. G. Roux, P. Abry, B. Vedel, S. Jaffard, H. Wendt, “Hyperbolic wavelet leaders for anisotropic multifractal texture analysis,” *IEEE Int. Conf. Image Proces. (ICIP)*, Phoenix (USA), Sept. 2016. [.pdf](#)
- [C31] S. Combrexelle, H. Wendt, Y. Altmann, J.-Y. Tourneret, S. McLaughlin, P. Abry, “Bayesian estimation for the local assessment of the multifractality parameter of multivariate time series,” *Euro. Signal Proces. Conf. (EUSIPCO)*, Budapest (Hungary), Sept. 2016. [.pdf](#)
- [C32] F. Andersson, M. Carlsson, H. Wendt, “On a fixed-point algorithm for structured low-rank approximation and estimation of half-life parameters,” *Euro. Signal Proces. Conf. (EUSIPCO)*, Budapest (Hung.), 09/2016. [.pdf](#)
- [C33] J. Frecon, N. Pustelnik, H. Wendt, L. Condat, P. Abry, “Multifractal-based texture segmentation using variational procedure,” *IEEE IVMSP Workshop*, Bordeaux (France), July 2016. [.pdf](#)
- [C34] M. Le Goff, J.-Y. Tourneret, H. Wendt, M. Ortner, M. Spigai, “Distributed Boosting for Cloud Detection,” *IEEE Int. Geoscience Remote Sens. Symp. (IGARSS)*, Beijing (China), July 2016. [.pdf](#)
- [C35] S. Combrexelle, H. Wendt, J.-Y. Tourneret, P. Abry, S. McLaughlin, “Bayesian Multifractal Analysis of Multi-temporal Images Using Smooth Priors,” *IEEE Workshop Statistical Signal Proces. (SSP)*, Palma de Mallorca (Spain), June 2016. [.pdf](#)
- [C36] R. Leonarduzzi, H. Touchette, H. Wendt, P. Abry, S. Jaffard, “Generalized Legendre Transform Multifractal Formalism for Nonconcave Spectrum Estimation,” *IEEE Workshop Statistical Signal Proces. (SSP)*, Palma de Mallorca (Spain), June 2016. [.pdf](#)
- [C37] S. Combrexelle, H. Wendt, J.-Y. Tourneret, Y. Altmann, S. McLaughlin, P. Abry, “A Bayesian Approach for the Multifractal Analysis of Spatio-Temporal Data,” *Int. Conf. Systems, Signals and Image Proces. (IWSSIP)*, Bratislava (Slovakia), May 2016. [.pdf](#)
- [C38] S. Combrexelle, H. Wendt, Y. Altmann, J.-Y. Tourneret, S. McLaughlin, P. Abry, “A Bayesian framework for the multifractal analysis of images using data augmentation and a Whittle approximation,” *IEEE Int. Conf. Acoust., Speech and Signal Proces. (ICASSP)*, Shanghai (China), March 2016. [.pdf](#)
- [C39] F. Andersson, M. Carlsson, J.Y. Tourneret, H. Wendt, “A Method for 3D Direction of Arrival Estimation for General Arrays Using Multiple Frequencies,” *CAMSAP 15*, Cancun (Mexico), Dec. 2015. [.pdf](#)
- [C40] S.G. Roux, N. Tremblay, P. Borgnat, P. Abry, H. Wendt, P. Messier, “Multiscale Anisotropic Texture Unsupervised Clustering for Photographic Paper,” *IEEE Int. Workshop Information Forensics and Security (WIFS)*, Rome (Italy), Nov. 2015. [.pdf](#)
- [C41] J. Frecon, N. Pustelnik, H. Wendt, P. Abry, “Multivariate optimization for multifractal-based texture segmentation,” *IEEE Int. Conf. Image Proces. (ICIP)*, Quebec City (Canada), Sept. 2015. [.pdf](#)
- [C42] S. Combrexelle, H. Wendt, J.-Y. Tourneret, P. Abry, S. McLaughlin, “Bayesian estimation of the multifractality parameter for images via a closed-form Whittle likelihood,” *Euro. Signal Proces. Conf. (EUSIPCO)*, Nice (France), Aug. 2015. [.pdf](#)
- [C43] G. Valenza, H. Wendt, K. Kiyono, J. Hayano, E. Watanabe, Y. Yamamoto, P. Abry, R. Barbieri, “Point-Process High-Resolution Representations of Heartbeat Dynamics for Multiscale Analysis: a CHF Survivor Prediction Study,” *Int. IEEE EMBS Conference (EMBC)*, Milano (Italy), Aug. 2015. [.pdf](#)
- [C44] R. 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,” *Int. IEEE EMBS Conference (EMBC)*, Milano (Italy), Aug. 2015. [.pdf](#)
- [C45] O. Chabiron, J.-Y. Tourneret, H. Wendt, F. Malgouyres, “Convolutional Trees for Fast Transform Learning,” *Signal Proces. Adaptive Sparse Structured Represent. Workshop (SPARS)*, Cambridge (UK), July 2015. [.pdf](#)
- [C46] S. Combrexelle, H. Wendt, J.-Y. Tourneret, S. McLaughlin, P. Abry, “Hyperspectral image analysis using multifractal attributes,” *IEEE GRSS Hyperspectral Image Signal Proces. (WHISPERS)*, (Jap), June 2015. [.pdf](#)
- [C47] S. Combrexelle, H. Wendt, P. Abry, N. Dobigeon, S. McLaughlin, J.-Y. Tourneret, “A Bayesian approach for the joint estimation of the multifractality parameter and integral scale based on the Whittle approximation,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 15*, Brisbane (Australia), April 2015. [.pdf](#)
- [C48] R. Fontugne, P. Abry, K. Fukuda, P. Borgnat, J. Mazel, H. Wendt, D. Veitch, “Random Projection and Multiscale Wavelet Leader Based Anomaly Detection and Address Identification in Internet Traffic,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 15*, Brisbane (Australia), April 2015. [.pdf](#)
- [C49] S. Roux, P. Abry, H. Wendt, S. Jaffard, “Hyperbolic Wavelet Transform for Historic Photographic Paper Classification Challenge,” *IEEE Asilomar Conf. Signals, Syst. Comput.*, Pacific Grove (USA), Nov. 2014. [.pdf](#)
- [C50] R. Leonarduzzi, J. Spilka, H. Wendt, S. Jaffard, M. E. Torres, P. Abry, M. Doret, “p-leader based classification of first stage intrapartum fetal HRV,” *VI Congreso Latinoamericano de Ingeniería Biomédica (CLAIB)*, Paraná, (Argentina), Oct. 2014. [.pdf](#)
- [C51] N. Pustelnik, P. Abry, H. Wendt, N. Dobigeon, “Inverse problem formulation for regularity estimation in images,” *IEEE Int. Conf. Image Proc. (ICIP)*, Paris (France), Oct. 2014. [.pdf](#)
- [C52] J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, P. Abry, “Hybrid Bayesian Variational Scheme to Handle Parameter Selection in Total Variation Signal Denoising,” *Euro. Signal Proces. Conf. (EUSIPCO)*, Lisbon (Portugal), 2014. [.pdf](#)
- [C53] H. Wendt, K. Kiyono, P. Abry, J. Hayano, E. Watanabe, Y. Yamamoto, “MultiScale Wavelet p-Leader based Heart Rate Variability Analysis for Survival Probability Assessment in CHF Patients,” *Int. IEEE EMBS Conference (EMBC)*, Chicago (USA), 2014. [.pdf](#)
- [C54] R. Leonarduzzi, H. Wendt, S. Jaffard, S. G. Roux, M. E. Torres, P. Abry, “Extending multifractal analysis to negative regularity: p-exponents and p-leaders,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 14*, Florence (Italy), 2014. [.pdf](#)
- [C55] F. Andersson, M. Carlsson, J.Y. Tourneret, H. Wendt, “On an Iterative Method for Direction of Arrival Estimation using Multiple Frequencies,” *CAMSAP 13*, Saint-Martin (France), 2013. [.pdf](#)
- [C56] F. Andersson, M. Carlsson, J.Y. Tourneret, H. Wendt, “Frequency Estimation Based on Hankel Matrices and the Alternating Direction Method of Multipliers,” *EUSIPCO 13*, Marrakech (Maroc), 2013. [.pdf](#)
- [C57] H. Wendt, N. Dobigeon, J.Y. Tourneret, P. Abry, “Bayesian estimation for the multifractality parameter,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 13*, Vancouver (Canada), 2013. [.pdf](#)
- [C58] N. Pustelnik, H. Wendt, P. Abry, “Local regularity for texture segmentation: Combining wavelet leaders and proximal minimization,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 13*, Vancouver (Canada), 2013. [.pdf](#)

- [C59] P. Messier, R. Johnson, H. Wilhelm, W.A. Sethares, A.G. Klein, P. Abry, S. Jaffard, H. Wendt, S. Roux, N. Pustelnik, N. van Noord, L. van der Maaten, E. Postma, “Automated Surface Texture Classification of Inkjet and Photographic Media,” *NIP & Digital Fabrication Conference*, Seattle (USA), 2013. [.pdf](#)
- [C60] H. Wendt, S. Jaffard, P. Abry, “Multifractal Analysis of Self-Similar Processes,” *IEEE Workshop Statistical Signal Proc. (SSP)*, Ann Arbor (USA), 2012. [.pdf](#)
- [C61] P. Abry, S. Jaffard, H. Wendt, “Bruegel’s drawings under the multifractal microscope,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 12*, Kyoto (Japan), 2012. [.pdf](#)
- [C62] H. Wendt, M.V. de Hoop, G. Uhlmann, A. Vasy, “Universal multi-scale computations of Fourier integral operators for coherent imaging in caustics,” *Society of Exploration Geophysicists Annual Meeting (SEG)*, San Antonio, USA, Oct. 2011. [.pdf](#)
- [C63] P. Abry, H. Wendt, S. Jaffard, H. Helgason, P. Goncalves, E. Pereira, C. Gharib, P. Gaucherand, M. Doret, “Methodology for multifractal analysis of heart rate variability: from LF/HF ratio to wavelet leaders,” *32nd Annual International IEEE EMBS Conference (EMBC)*, Buenos Aires, Argentina, Sept. 2010. [.pdf](#)
- [C64] H. Wendt, M.V. de Hoop, F. Andersson, A. Duchkov, “Multiscale structured imaging using wave packets and prolate spheroidal wave functions,” *Society of Exploration Geophysicists Annual Meeting (SEG)*, Denver, USA, Oct. 2010. [.pdf](#)
- [C65] A. Duchkov, F. Andersson, H. Wendt, “Sparse wave-packet representations and seismic imaging,” *Society of Exploration Geophysicists Annual Meeting (SEG)*, Denver, USA, Oct. 2010. [.pdf](#)
- [C66] H. Wendt, P. Abry, S. Jaffard, H. Ji, Z. Shen, “Wavelet Leader Multifractal Analysis for Texture Classification,” *IEEE Int. Conf. Image Proc. (ICIP)*, Cairo (Egypt), 2009. [.pdf](#)
- [C67] H. Wendt, M.V. de Hoop, F. Andersson, “Multiscale propagation and imaging with wave packets,” *Society of Exploration Geophysicists Annual Meeting (SEG)*, Houston (US), 2009. [.pdf](#)
- [C68] H. Wendt, A. Scherrer, P. Abry, S. Achard, “Testing fractal connectivity in multivariate long memory processes,” *IEEE Int. Conf. Acoust., Speech, and Signal Proc. ICASSP 09*, Taipei (Taiwan), 2009. [.pdf](#)
- [C69] H. Wendt, P. Abry, “Bootstrap tests for the time constancy of multifractal attributes,” *IEEE Int. Conf. on Acoust., Speech and Signal Proc. ICASSP 08*, Las Vegas (US), 2008. [.pdf](#)
- [C70] H. Wendt, S. Roux, P. Abry, “Impact of data quantization on empirical multifractal analysis,” *IEEE Int. Conf. on Acoust., Speech and Signal Proc. ICASSP 07*, Honolulu (US), 2007. [.pdf](#)
- [C71] H. Wendt, P. Abry, “Time-scale block bootstrap tests for non gaussian finite variance self-similar processes with stationary increments,” *IEEE Workshop on Statist. Signal Proc. SSP 07*, Madison (US), 2007. [.pdf](#)
- [C72] P. Ciuciu, P. Abry, C. Rabrait, H. Wendt, A. Roche, “Leader-based multifractal analysis for evi fmri time series: Ongoing versus task-related brain activity,” *IEEE Int. Symp. on Biomedical Imaging ISBI 07*, Washington DC (US), 2007. [.pdf](#)
- [C73] H. Wendt, S. Roux, P. Abry, “Bootstrap for log wavelet leaders cumulant based multifractal analysis,” *EUSIPCO 06*, Firenze (I), 2006. [.pdf](#)
- [C74] H. Wendt, P. Abry, “Bootstrap for multifractal analysis,” *IEEE Int. Conf. on Acoust., Speech and Signal Proc. ICASSP 06*, Toulouse (F), 2006. [.pdf](#)

National Conferences with Selection Panels: 11

- [N1] P. Abry, S. Roux, A. Lundgren, P. Messier, A. Klein, H. Wendt, S. Jaffard, “P. Abry, S. Roux, A. Lundgren, P. Messier, A. Klein, H. Wendt, S. Jaffard,” *Coll. Traitement du Signal et des Images (GRETSI)*, Lille (F), Aug. 2019. *To appear.* [.pdf](#)
- [N2] J. Frecon, N. Pustelnik, N. Dobigeon, H. Wendt, P. Abry, “Sélection du paramètre de régularisation dans le problème l2-Potts,” *Coll. Traitement du Signal et des Images (GRETSI)*, Juan-Les-Pins (F), Sept. 2017. [.pdf](#)
- [N3] S. Combrexelle, H. Wendt, J.-Y. Tourneret, N. Dobigeon, S. McLaughlin, P. Abry, “Estimation bayésienne locale du paramètre de multifractalité à l’aide d’un algorithme de Monte Carlo Hamiltonien,” *Coll. Traitement du Signal et des Images (GRETSI)*, Lyon (F), Sept. 2015. [.pdf](#)
- [N4] R. Leonarduzzi, H. Wendt, S. Jaffard, P. Abry, “Pitfall in Multifractal Analysis of Negative Regularity,” *Coll. Traitement du Signal et des Images (GRETSI)*, Lyon (F), Sept. 2015. [.pdf](#)
- [N5] J. Frecon, N. Pustelnik, H. Wendt, P. Abry, “Variation totale multivariée pour la détection de changement du spectre multifractal,” *Coll. Traitement du Signal et des Images (GRETSI)*, Lyon (F), Sept. 2015. [.pdf](#)
- [N6] N. Tremblay, S.G. Roux, P. Borgnat, P. Abry H. Wendt, P. Messier, ” “Texture classification of photographic papers: improving spectral clustering using filterbanks on graphs,” *Coll. Traitement du Signal et des Images (GRETSI)*, Lyon (F), Sept. 2015. [.pdf](#)
- [N7] N. Pustelnik, H. Wendt, P. Abry, “Régularité locale pour l’analyse de texture : le mariage des coefficients dominants et de la minimisation proximale,” *Coll. Sur le Traitement du Signal et des Images GRETSI 13*, Brest (F), 2013. [.pdf](#)
- [N8] H. Wendt, N. Dobigeon, J.Y. Tourneret, P. Abry, “Estimation bayésienne du paramètre de multifractalité,” *Coll. Sur le Traitement du Signal et des Images GRETSI 13*, Brest (F), 2013. [.pdf](#)
- [N9] H. Wendt, P. Abry, S. Jaffard, “Analyse multifractale d’image: L’apport des coefficients dominants,” *Coll. Sur le Traitement du Signal et des Images GRETSI 07*, Troyes (F), 2007. [.pdf](#)
- [N10] P. Abry, V. Pipiras, H. Wendt, “Extreme values, heavy tails and linearization effect: A contribution to empirical multifractal analysis,” *Coll. Sur le Traitement du Signal et des Images GRETSI 07*, Troyes (F), 2007. [.pdf](#)
- [N11] H. Wendt, P. Flandrin, P. Abry, “Régressions par machines à vecteurs supports pour la prédiction de séries chaotiques,” *Coll. Sur le Traitement du Signal et des Images GRETSI 05*, Louvain-la-Neuve (B), 2005. [.pdf](#)

Book chapters: 7

- [B1] P. Abry, S. Jaffard, R. Leonarduzzi, C. Melot, H. Wendt, “New exponents for pointwise singularities classification,” in *Proc. Fractals and Related Fields III*, 19-26 September 2015, Porquerolles, France, S. Seuret and J. Barral, Eds., 2018. *In press.* [.pdf](#)
- [B2] S. Jaffard, P. Abry, C. Melot, R. Leonarduzzi, H. Wendt, “Multifractal analysis based on p-exponents and lacunarity exponents,” in *Fractal Geometry and Stochastics V*, C. Bandt et al., Eds., Series Progress in Probability, Vol. 70, pp. 279–313, Birkhäuser, 2015. [.pdf](#)

- [B3] P. Abry, S. Jaffard, H. Wendt, “A bridge between geometric measure theory and signal processing: Multifractal analysis,” in *Operator-Related Function Theory and Time-Frequency Analysis*, The Abel Symposium 2012, K. Gröchenig, Y. Lyubarskii and K. Seip, Eds., Springer Series Abel Symp., Vol. 9, pp. 1–56, Springer, 2015. [.pdf](#)
- [B4] S. Jaffard, P. Abry, H. Wendt, “Irregularities and Scaling in Signal and Image Processing: Multifractal Analysis,” in *Benoit Mandelbrot: A Life in Many Dimensions*, M. Frame and N. Cohen, Ed., pp. 31–116, World scientific publishing, Singapore, 2015. [www|.pdf](#)
- [B5] B. Vedel, H. Wendt, P. Abry, S. Jaffard, “On the impact of the number of vanishing moments on the dependence structures of compound Poisson motion and fractional Brownian motion in multifractal time,” in *Dependence in Probability and Statistics*, P. Doukhan, G. Lang, D. Surgailis, Eds., *Lecture Notes in Statistics*, Vol. 200, pp. 71–101, Springer, 2010. [.pdf](#)
- [B6] S. Jaffard, P. Abry, S.G. Roux, B. Vedel, H. Wendt, “The contribution of wavelets in multifractal analysis,” in *Wavelet Methods in Mathematical Analysis and Engineering*, A. Damlamian, S. Jaffard, Eds., *Series in contemporary applied mathematics*, vol. 14, pp. 55–98, World scientific publishing, 2010. [.pdf](#)
- [B7] P. Abry, S. Jaffard, S. Roux, B. Vedel, H. Wendt, “Wavelet decomposition of measures: Application to multifractal analysis of images,” *Proc. NATO-ASI Conf. on Unexploded Ordnance Detection and Mitigation*, J. Byrnes, Ed., pp. 1–20, Springer, 2009. [.pdf](#)

Patents: 1

- [P1] H. Wendt, N. Dobigeon, J.-Y. Tourneret, “Method for automatic detection and/or correction of errors in multiplexed data stream,” French Patent FR3007232 (A1) 19/12/2014, delivered 17/02/2017. [www](#)

Appendix: Technical reports

- [R1] J.-Y. Tourneret and H. Wendt, “Techniques d’optimisation des communications sécurisées : Lot 2 - Méthodes de classification supervisées et non supervisées,” CNES, Toulouse, France, Industrial Rep., Aug. 2017.
- [R2] H. Wendt, N. Dobigeon, J.-Y. Tourneret, M. Albinet, C. Goldstein, N. Karouche, “Detection and Correction of Glitches in a Multiplexed Multi-channel Data Stream - Application to the MADRAS Instrument - Complementary results and supporting materials,” IRIT-ENSEEIH, Toulouse, France, 24 pages, Oct. 2015.
- [R3] J.-Y. Tourneret and H. Wendt, “Data mining bayésien appliqué au contexte des satcom : état de l’art et analyse de scénarios d’usage,” CNES, Toulouse, France, Industrial Rep., Jan. 2015.
- [R4] H. Wendt, N. Dobigeon, J.-Y. Tourneret, “Complementary algorithms for detection and correction of spurious strobes in MADRAS instrument data,” CNES/CLS, Toulouse, France, Industrial Rep., Sept. 2012.
- [R5] H. Wendt, N. Dobigeon, J.-Y. Tourneret, “Algorithm for detection and correction of spurious strobes in MADRAS instrument data,” CNES/CLS, Toulouse, France, Industrial Rep., June. 2012.
- [R6] F. Andersson, M.V. de Hoop, H. Wendt, “Multi-scale reverse-time-migration based inverse scattering using the dyadic parabolic decomposition of phase space,” *Proc. GMIG Project Review*, pp. 49–68, Purdue University, West Lafayette (USA), 2012.
- [R7] H. Wendt, M.V. de Hoop, G. Uhlmann, A. Vasy, “Fourier integral operator canonical computation with wave packets,” *Proc. GMIG Project Review*, pp. 113–130, Purdue University, West Lafayette (USA), 2011.
- [R8] H. Wendt, M.V. de Hoop, F. Andersson, “Multi-scale discrete approximation of Fourier integral operators,” *Proc. GMIG Project Review*, pp. 93–134, Purdue University, West Lafayette (USA), 2010.
- [R9] H. Wendt, F. Andersson, M.V. de Hoop, “Discrete Generalized Radon Transform compression using wave packets,” *Proc. GMIG Project Review*, pp. 205–212, Purdue University, West Lafayette (USA), 2009.