

Full professor in Electrical Engineering at University of Lyon
Research activities in CREATIS UMR CNRS 5220 Laboratory, Lyon, France

Adrian BASARAB

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Research Topic: Signal and image processing for computational biomedical imaging

Positions

2021 *Full professor*, University of Lyon
2016 *Associate professor*, University of Toulouse
2009 *Assistant Professor*, University of Toulouse
2008 *Postdoctoral position*, Catholic University of Leuven, Belgium
2008 *Assistant Professor*, University of Lyon, France

Qualifications

2016 *Habilitation to conduct researches*, A few inverse problems in ultrasound imaging, University of Toulouse
2008 *PhD Thesis*, Motion estimation in ultrasound imaging, INSA-Lyon
2005 *Post-graduate degree* in computer science and signal and image processing, INSA-Lyon

Editorial experience

Since 2025 Associate editor for IEEE Trans. on Medical Imaging
Since 2024 Senior Editor for Signal Processing (Elsevier)
2017 Guest editor (with Y. Eldar - Technion and H. Liebgott - University of Lyon) for IEEE TUFFC special issue on "Sparsity driven methods in medical ultrasound",
2015-2020 Associate Editor of Digital Signal Processing (Elsevier)

Publications

60 journal publications with peer review, 5 book chapters, more than >140 communications at international conferences (including >10 invited talks), 2 French patents

Full list of publications: <https://www.creatis.insa-lyon.fr/~basarab/publicationsBibBase.html#>

Google scholar profile: <https://scholar.google.fr/citations?hl=fr&user=I2CCHb0AAAAJ>

Co-supervisor of junior researchers

4 ongoing PhD thesis
20 PhD thesis in signal and image processing applied to medical imaging **defended** (2013-2026)
3 Postdocs
More than 30 Post-graduate students (Image and signal processing)

Honors

2015, 2025, 2026 Best student paper finalist (joint work with Z. Chen, J. Timana, M. Dodel), IEEE Ultrasonics Symposium
2019 IEEE Senior Member
2016 Among the winners (joint work with T. Szasz) of "Plane wave imaging challenge in ultrasound imaging", IEEE Ultrasonics Symposium, Tours, 2016
2016 Paul Calas award (joint work with J. Michetti), French Society of Endodontics, 2016
2016 Best PhD thesis in biomedical imaging, research section, awarded by EMBS IEEE France Section, Z. Chen, compressed deconvolution in ultrasound imaging, 2016

Scientific responsibilities

Local

Since 2024 Representative of the EEA Doctoral School on PhD thesis monitoring committees.

2017–2021 Head of the MINDS research team (Computational Imaging and Vision) at IRIT lab (6 permanent staff, 3 associate researchers, 15 PhD students). I led the proposal to create this team in 2017.

2015–2021 Member of the IRIT lab Scientific Council.

2010–2021 Head of the Medical Imaging theme within IRIT's strategic application area Health, Autonomy and Well-being

2015–2021 Member (elected by the members of IRIT's Signals and Images Department) of the selection committee interviewing candidates for doctoral fellowships at the Toulouse Doctoral School of Mathematics, Computer Science and Telecommunications (MITT).

National

Since 2024	Member of the Board of Directors of GRETSI.
2017–2020	Member of the award committee for the PhD Thesis Prize in Signal, Image and Vision, jointly awarded by the Club EEA, GdR ISIS and GRETSI.
2012–2015	Appointed member of the CNU, Section 61 (French National Council of Universities).

International

2024–2027	Chair of the Technical Program Committee of the IEEE International Ultrasonics Symposium (2026 and 2027 editions); Vice-Chair for the 2024 and 2025 editions.
Since 2024	EURASIP Academy Mentor (https://academy.eurasip.org/academy-mentors/).
2023–2024	Member of the Organizing Committee of the international conference EUSIPCO 2024, Lyon; Publicity & Sponsorship Co-Chair.
2022–2023	Member of the Organizing Committee of the international conference EUSIPCO 2023, Helsinki; Special Sessions Co-Chair.
Since 2020	Elected member of the Technical Program Committee of the IEEE International Ultrasonics Symposium, the leading international conference in ultrasound imaging. From 2021 to 2025, I was co-leader of the Medical Image and Signal Processing track of this TPC. I am currently Chair of this TPC.
2019–2025	Elected member of the EURASIP Technical Area Committee on Biomedical Image & Signal Analytics.

Committees

Member of **31 PhD committees between 2012 et 2026**

21 in France (13 times reviewer, 7 times president)

10 abroad (Angleterre, Suisse, Italie, Pays-Bas, Colombie, Finlande, Inde, Pakistan)

Reviewer of an HDR in 2026

Funding

PI

2024-2025	Occitanie maturation project (400 k€) - build a real-time augmented reality device for interventional radiology
2024-2025	FIL (10 k€) - 3D reconstruction of deformable tissues
2022-2026	NIH project (250k€ for CREATIS) – partners: Cornell University, USA (J. Mamou, PI), University of Bristol, UK (A. Achim) - image reconstruction in quantitative acoustic microscopy
2024-2025	Stic AmSud project with PUCP (Lima) and UIS (Bucaramanga) (20k€) - computational imaging
2021-2023	Occitanie pre-maturation project (100 k€) - build a real-time augmented reality device for ultrasound imaging
2020-2021	Cancéropôle Grand Sud-Ouest (13k€) - augmented reality for breast cancer surgery
2020	Toulouse Tech Transfer (15k€) - augmented reality for breast cancer surgery
2020-2022	1 Ecos Nord Colombia project (30k€) - medical and hyperspectral computational imaging
2019-2020	1 project funded by French government space agency (CNES) (50k€) - modeling and inverse problems for point spread function estimation
2018-2020	1 Stic AmSud grant with PUCP (Lima) and UIS (Bucaramanga) (20k€) - inverse problems in ultrasound imaging
2016-2017	1 national grant (30k€) - cardiac motion estimation in echocardiography
2011-2018	6 local grants (70k€), founded by the University of Toulouse

Partner

2024-2028	French national funding (600 k€), PI: F. Varray, CREATIS - tissue anisotropy estimation
2024-2027	1 industrial grant from Metacognitia (150 k€)
2022-2026	French national funding (596 kEuros), PI: B. Gilles, University of Lyon - image reconstruction in passive cavitation imaging
2018-2022	French national funding (257 kEuros), PI: H. Wendt, University of Toulouse - tissue characterization in ultrasound imaging using multifractals
2017-2018	1 industrial grant from Airbus (150k€)
2011-2014	1 national grant (205k€), PI: H. Liebgott, University of Lyon - transverse oscillations in ultrasound imaging
2011-2014	1 regional grant (110k€), PI: D. Kouamé, University of Toulouse - inverse problems in ultrasound imaging

Contribution to Science

1. **Quantum mechanics-inspired signal and image processing** algorithms.
2. **Image fusion** methods for magnetic resonance (MR) and ultrasound (US) images, aiming at combining the advantages of each modality, i.e., good contrast and signal to noise ratio for the MR image and good spatial resolution for the US image, with application to endometriosis detection.
3. Artifact quantification in **lung ultrasound imaging**.
4. The limited bandwidth of ultrasound transducers and the physical phenomena related to ultrasound wave propagation through human tissues affect the quality of ultrasound images in terms of spatial resolution and contrast. Under the first order Born approximation and the assumption of weak scattering classically assumed for soft tissues, these degradations can be expressed a linear image formation model relating the tissue reflectivity function to the RF acquired data. Recently, our group proposed several methods to invert this model and to successfully **recover high quality images better reflecting the tissues** than native ultrasound images.
5. Recent developments in ultrasound technologies have led to novel acquisition modes such as ultrafast or 3D imaging. While the first, based on plane wave emissions, suffers from lower image quality than standard imaging using focused beams, the second leads to huge amounts of data to be collected and processed. In 2010, our group was among the first to use **compressed sensing** as an alternative to existing technologies to decrease the data volume in ultrasound imaging. These pioneer studies have been pursued by several research groups, imposing the concept of sparsity in ultrasound imaging as an important alternative to the well-established Gaussian signal processing.
6. **Ultrasound beamforming** is the art of combining the RF raw signals acquired by multi-element transducers. While delay-ad-sum still remains the most used method due to its real-time capabilities, techniques aiming at improving the quality of beamformed images have received a considerable attention in the literature. During the last three years, I have contributed significantly to this field by introducing a novel beamforming framework in ultrasound imaging, based on solving regularized inverse problems.
7. **Tissue motion estimation** has several medical imaging applications, such as cardiac function assessment or elastography. Since my PhD thesis, I have developed several motion estimation methods. For many years, the main originality of the methods proposed by our group was the use of spatial phase images instead of native ultrasound images. More recently, I have contributed in showing the interest of dictionary learning methods in cardiac motion estimation.
8. **Super-resolution** in 3D dental computed tomography using deep learning and 3D image segmentation for endodontics.