

PERSONAL INFORMATION

Andrea Garzelli

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 [Google Scholar C61jjN4AAAAAJ&hl=en](https://scholar.google.com/citations?hl=en&user=C61jjN4AAAAAJ)

EDUCATION

- 1995 Ph.D. degree in Computer Science and Telecommunication Engineering – University of Florence, Italy
- 1991 “Laurea” degree (summa cum laude) in Electronic Engineering – University of Florence, Italy
- 1991 National qualification for the engineer profession

ACADEMIC POSITION

- 2023– Full Professor of Telecommunications, Department of Information Engineering and Mathematics, University of Siena
- 2001-2022 Associate Professor of Telecommunications, Department of Information Engineering and Mathematics, University of Siena
- 1995-2001 Assistant Professor of Telecommunications, Faculty of Engineering, University of Siena

RESEARCH TOPICS

- Image analysis and processing
- Image classification and detection
- Remote sensing image fusion
- Pansharpening
- SAR change detection

PUBLICATIONS

Complete lists [Google Scholar Profile](#) [Scopus Profile](#)

Bibliometrics (October 15, 2025)

	Google Scholar	Scopus
Number of publications	250	210
Citations	12479	10149
2024 citations	1240	982
Hirsch’s h-index	47	44
Egghe’s g-index	110	99

TEACHING EXPERIENCE

- 2012-present ‘Statistical Signal Processing’, M.Sc. in Electronics and Communications Engineering, University of Siena
- 2015-present ‘Fundamentals of Signal Processing and Telecommunications’, B.Sc. in Computer Science and Information Engineering, University of Siena
- 2022 ‘Remote Sensing’, M.Sc. in Geological sciences and technologies, University of Siena
- 2002-2015 Tutor of five PhD students – Information Engineering PhD course, University of Siena

1994-2017 'Digital Signal Processing', 'Signal Theory', 'Electrical Communications', 'Remote Sensing', University of Siena

SERVICE AND ORGANISATION

International

2015-present Associate Editor for the journal IEEE Transactions on Geoscience and Remote Sensing
2013-2015 Finance Chair of the IEEE International Geoscience and Remote Sensing Symposium, IGARSS 2015
2001-present Member of the Image Analysis and Data Fusion Committee (formerly Data Fusion Committee) of the IEEE Geoscience and Remote Sensing Society

National

2021-2023 Program Coordinator of the graduate course in Computer and Information Engineering at the University of Siena
2016-2021 Coordinator of the Quality Assurance Committee (PQA) of the University of Siena
2002-2009 Program Coordinator of both graduate and post-graduate courses in Telecommunication Engineering at the University of Siena
2015-present Committee Member of the PhD in "Information Engineering and Science" at the University of Siena, Italy.

AWARDS AND RECOGNITION

2004 IEEE Geoscience and Remote Sensing Society Letters Prize Paper Award for the paper "A Global Quality Measurement of Pan-Sharpener Multispectral Imagery"
2006 Senior Member of the IEEE
2014 Best Reviewer of the IEEE Transactions on Geoscience and Remote Sensing
2014-2015 Outstanding Information Research Foundation (IRF) Book publication award for the book "Remote Sensing Image Fusion" (CRC Press)
2017 Jan-Apr Hot paper awarded by ISI Web of Knowledge: G. Vivone, L. Alparone, J. Chanussot, M. Dalla Mura, A. Garzelli, G. Licciardi, R. Restaino, and L. Wald, "A Critical Comparison Among Pan-sharpening Algorithms", IEEE Transactions on Geoscience and Remote Sensing, vol. 53, no. 5, pp. 2565-2586, May 2015.
2020-2025 Listed in *career-long* World's Top 2% Scientists by Stanford University
2020-2025 Listed in *single-year 2019-2024* World's Top 2% Scientists by Stanford University

RESEARCH PROJECTS

Research unit coordinator

2025 ANN-SAR, Classification of SAR images through Artificial Neural Networks (IDS-SpA, Italian Ministry of Defense)
2019-2020 Satellite images for land-use applications (Tuscany Region Administration through Consorzio LaMMA)
2015-2018 TACTIC, Screening of high-resolution SAR images for medium and large scale scenarios (IDS-SpA, Italian Ministry of Defense)
2014-2017 SOAR-ASI 5245, COSMO-SkyMed/RADARSAT-2 Initiative, (Italian Space Agency, Canadian Space Agency)
2013-2015 CAESARIS, Cognitive Airborne multisensor System for Aerial Reconnaissance Intelligence and Surveillance, (EU-FP7-SME, 2013-2015)
2012-2013 KLEAN, Knowledge-based EFB for green flight trajectory decision aid (EU-Clean Sky Joint Technology Initiative, 2012-2013)
2012-2013 CleanSky, Test ed ottimizzazione della catena di processing per la rivelazione e la caratterizzazione di fenomeni meteorologici in radar avionici in banda X, (SELEX-Galileo S.p.A., 2013)
2009-2013 SISAR - Feasibility study of an automatic interpretation system of SAR images (IDS-SpA, Italian Ministry of Defense)

- 2010-2012 Development and validation of multitemporal image analysis methodologies for multirisk monitoring of critical structures and infrastructures (ASI COSMO/SkyMed, Announcement of Opportunity for CSK data, 2010-2012)
- 2010-2012 LOTHAR-FATT, Feasibility study of an adaptive Over-The-Horizon HF radar for the surveillance of the Mediterranean Sea (Italian Ministry of Defense, 2008-2010)
- 2006-2007 Development and validation of innovative data fusion techniques for environmental remote sensing (PRIN, MIUR, Italian Ministry of University and Research)
- 2004-2005 LOTHAR, Pre-feasibility study of an adaptive Over-The-Horizon HF radar for the surveillance of the Mediterranean Sea (Italian Ministry of Defense)
- 2003-2003 ECOSAR (ASI, Fundamental Research)
- 2001-2003 Development and validation of a sea surface fractal model (ESA-Envisat AO-161 Announcement of Opportunity for the exploitation of Envisat data)
 - 2001 ECOSAR, Processing and classification of optical and SAR data for environmental risk management (ASI, Italian Space Agency, Cosmo-Skymed Program)
- 2001-2002 Experimentation of integrated methodologies for ocean color analysis from MERIS data (ASI, Italian Space Agency, Fundamental Research)
- 1997-1999 SEEDS, Simulation Environment for the Evaluation of Distributed traffic control Systems (ES-PRIT Project EP 22691)
 - 1995 Development of integrated methods of agro-ecological classification by means of remote sensing data for natural resources management (ASI, Italian Space Agency)

Participant

- 2022-2023 TUS:CAN (ASI - Call for ideas "I4DP_PA, Innovation for Downstream Preparation for public Administrations")
- 2022-2024 CLASS - Ceci, distillato di legno, biochar e intelligenza artificiale per un sistema agrifood smart e sostenibile (Tuscany Region Administration)
- 2020-2021 Processing of remote sensing data (Tuscany Region Administration)
- 2011-2015 OPTIMA, Metodologie avanzate per l'analisi, l'integrazione e l'ottimizzazione dei prodotti di livello 1 e 2 della missione PRISMA (ASI - Studi Scientifici a Supporto della Missione PRISMA, 2011-2015)
- 2014-2015 Studio e sviluppo di algoritmi per la sorveglianza automatica (CoMETA S.p.A.)
- 2006-2007 Distributed image coding for remote sensing applications (ESA, European Space Agency)
- 2001-2002 Data Fusion (PRIN, MIUR, Italian Ministry of University and Research)
- 2001-2002 System for SAR image interpretation (ASI, Italian Space Agency, Cosmo-Skymed Program)
 - 2000 Watermarking techniques for copyright protection and authentication of remote sensing images accessible from public and private computer networks, ASI, Italian Space Agency, 2000)
 - AVANTI, Adaptive and Adaptable iNteractions for multimedia Telecommunications applications (ACTS EU Project)
 - HIPS, Hyper-Interaction within Physical Space, (ESPRIT EU Project)
 - ECHOES, Educational Hypermedia On-line System, (DGXII EU Project)

Top 45 most cited publications
concurring to H-index = 45
(Google Scholar, 21/01/2025)

- G. Vivone, L. Alparone, J. Chanussot, M. Dalla Mura, A. Garzelli, G. Licciardi, R. Restaino and L. Wald, “A critical comparison among pansharpening algorithms,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 53, no. 5, pp. 2565–2586, 2014. **(1275)**
- B. Aiazzi, L. Alparone, S. Baronti, and A. Garzelli, “Context-driven fusion of high spatial and spectral resolution images based on oversampled multiresolution analysis,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 40, no. 10, pp. 2300–2312, 2002. **(1005)**
- F. Nencini, A. Garzelli, S. Baronti, and L. Alparone, “Remote sensing image fusion using the curvelet transform,” *Information Fusion*, vol. 8, no. 2, pp. 143–156, 2007. **(934)**
- B. Aiazzi, L. Alparone, S. Baronti, A. Garzelli, and M. Selva, “MTF-tailored multiscale fusion of high-resolution MS and Pan imagery,” *Photogrammetric Engineering & Remote Sensing*, vol. 72, no. 5, pp. 591–596, 2006. **(932)**
- L. Alparone, B. Aiazzi, S. Baronti, A. Garzelli, F. Nencini, and M. Selva, “Multispectral and panchromatic data fusion assessment without reference,” *Photogrammetric Engineering & Remote Sensing*, vol. 74, no. 2, pp. 193–200, 2008. **(847)**
- L. Alparone, S. Baronti, A. Garzelli, and F. Nencini, “A global quality measurement of pansharpened multispectral imagery,” *IEEE Geoscience and Remote Sensing Letters*, vol. 1, no. 4, pp. 313–317, 2004. **(714)**
- A. Garzelli, F. Nencini, and L. Capobianco, “Optimal MMSE pan sharpening of very high resolution multispectral images,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 46, no. 1, pp. 228–236, 2007. **(586)**
- A. Garzelli and F. Nencini, “Hypercomplex quality assessment of multi/hyperspectral images,” *IEEE Geoscience and Remote Sensing Letters*, vol. 6, no. 4, pp. 662–665, 2009. **(328)**
- G. Vivone, M. Dalla Mura, A. Garzelli, R. Restaino, G. Scarpa, M.O. Ulfarsson, L. Alparone, and J. Chanussot, “A new benchmark based on recent advances in multispectral pansharpening: Revisiting pansharpening with classical and emerging pansharpening methods,” *IEEE Geoscience and Remote Sensing Magazine*, vol. 9, no. 1, pp. 53–81, 2021. **(276)**
- L. Alparone, S. Baronti, A. Garzelli, and F. Nencini, “Landsat ETM+ and SAR image fusion based on generalized intensity modulation,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 42, no. 12, pp. 2832–2839, 2004. **(201)**
- L. Alparone, B. Aiazzi, S. Baronti, and A. Garzelli, *Remote sensing image fusion*. Crc Press, 2015. **(190)**
- R. Annunziata, A. Garzelli, L. Ballerini, A. Mecocci, and E. Trucco, “Leveraging multiscale hessian-based enhancement with a novel exudate inpainting technique for retinal vessel segmentation,” *IEEE Journal of Biomedical and Health Informatics*, vol. 20, no. 4, pp. 1129–1138, 2015. **(174)**
- B. Aiazzi, L. Alparone, S. Baronti, A. Garzelli, and M. Selva, “An MTF-based spectral distortion minimizing model for pan-sharpening of very high resolution multispectral images of urban areas,” 2003 2nd GRSS/ISPRS Joint Workshop on Remote Sensing and Data Fusion over Urban Areas, 2003. **(173)**
- A. Garzelli and F. Nencini, “Interband structure modeling for pan-sharpening of very high-resolution multispectral images,” *Information Fusion*, vol. 6, no. 3, pp. 213–224, 2005. **(153)**
- S. Baronti, B. Aiazzi, M. Selva, A. Garzelli, and L. Alparone, “A theoretical analysis of the effects of aliasing and misregistration on pansharpened imagery,” *IEEE Journal of Selected Topics in Signal Processing*, vol. 5, no. 3, pp. 446–453, 2011. **(148)**
- F. Bovolo, L. Bruzzone, L. Capobianco, A. Garzelli, S. Marchesi, and F. Nencini, “Analysis of the effects of pansharpening in change detection on VHR images,” *IEEE Geoscience and Remote Sensing Letters*, vol. 7, no. 1, pp. 53–57, 2009. **(141)**
- S. Lolli, L. Alparone, A. Garzelli, and G. Vivone, “Haze correction for contrast-based multispectral pansharpening,” *IEEE Geoscience and Remote Sensing Letters* 14(12), 2017 **(136)**.
- L. Alparone, S. Baronti, B. Aiazzi, and A. Garzelli, “Spatial methods for multispectral pansharpening: Multiresolution analysis demystified,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 54, no. 5, pp. 2563–2576, 2016. **(131)**
- B. Aiazzi, L. Alparone, S. Baronti, A. Garzelli, M. Selva, and C. Chen, “Twenty-five years of pansharpening: A critical review and new developments,” *Signal and Image Processing for Remote Sensing*, pp. 533–548, 2012. **(131)**
- A. Garzelli, “Pansharpening of multispectral images based on nonlocal parameter optimization,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 53, no. 4, pp. 2096–2107, 2014. **(128)**
- G. Vivone, M. Dalla Mura, A. Garzelli, and F. Pacifici, “A benchmarking protocol for pansharpening: Dataset, preprocessing, and quality assessment,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 14, 2021. **(106)**

- A. Garzelli, “A review of image fusion algorithms based on the super-resolution paradigm,” *Remote Sensing*, vol. 8, no. 10, pp. 797–797, 2016. **(97)**
- L. Alparone, A. Garzelli, G. Vivone, “Intersensor statistical matching for pansharpening: Theoretical issues and practical solutions,” *IEEE Transactions on Geoscience and Remote Sensing*, 55(8), 2017 **(94)**.
- B. Aiazzi, L. Alparone, S. Baronti, A. Garzelli, and C. Zoppetti, “Nonparametric change detection in multitemporal SAR images based on mean-shift clustering,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 51, no. 4, pp. 2022–2031, 2013. **(91)**
- A. Garzelli, F. Nencini, L. Alparone, B. Aiazzi, and S. Baronti, “Pan-sharpening of multispectral images: A critical review and comparison,” *IGARSS 2004. 2004 IEEE International Geoscience and Remote Sensing Symposium*, vol. 1, 2004. **(90)**
- B. Aiazzi, L. Alparone, S. Baronti, R. Carlà, A. Garzelli, and L. Santurri, “Full scale assessment of pansharpening methods and data products,” in *Proc. SPIE 9244, Image and Signal Processing for Remote Sensing XX*, Amsterdam, Netherlands, p. 924402–1-12, 2014 **(88)**.
- A. Garzelli, “Wavelet-based fusion of optical and SAR image data over urban area,” *International Archives of Photogrammetry Remote Sensing and Spatial Inf. Sciences*, 2002. **(75)**
- G. Benelli and A. Garzelli, “Oil-spills detection in SAR images by fractal dimension estimation,” in *International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 218–220, 1999, **(75)**.
- L. Capobianco, A. Garzelli, and G. Camps-Valls, “Target detection with semisupervised kernel orthogonal sub-space projection,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 47, no. 11, pp. 3822–3833, 2009. **(74)**
- A. Garzelli and F. Nencini, “PAN-sharpening of very high resolution multispectral images using genetic algorithms,” *International Journal of Remote Sensing*, vol. 27, no. 15, pp. 3273–3292, 2006. **(74)**
- L. Alparone, B. Aiazzi, S. Baronti, and A. Garzelli, “Sharpening of very high resolution images with spectral distortion minimization,” *IGARSS 2003. 2003 IEEE International Geoscience and Remote Sensing Symposium*, 2003. **(73)**
- A. Garzelli, “Possibilities and limitations of the use of wavelets in image fusion,” *IEEE International Geoscience and Remote Sensing Symposium*, vol. 1, pp. 66–68, 2002. **(73)**
- L. Alparone, L. Facheris, S. Baronti, A. Garzelli, and F. Nencini, “Fusion of multispectral and SAR images by intensity modulation,” *Proceedings of the 7th International Conference on Information Fusion*, pp. 637–643, 2004. **(71)**
- G. Vivone, L. Alparone, A. Garzelli, and S. Lolli, “Fast Reproducible Pansharpening Based on Instrument and Acquisition Modeling: AWLP Revisited,” *Remote Sensing* 11, pp.2315–1-23, 2019. **(66)**
- B. Aiazzi, L. Alparone, S. Baronti, and A. Garzelli, “Coherence estimation from multilook incoherent SAR imagery,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 41, no. 11, pp. 2531–2539, 2003. **(65)**
- A. Arienzo, G. Vivone, A. Garzelli, L. Alparone, and J. Chanussot, “Full-Resolution Quality Assessment of Pansharpening: Theoretical and Hands-On Approaches,” *IEEE Geoscience and Remote Sensing letters* vol. 10, no. 3, pp.168-201, 2022. **(63)**
- A. Garzelli and F. Nencini, “PAN-sharpening of very high resolution multispectral images using genetic algorithms,” *International Journal of Remote Sensing*, vol. 27, no. 15, pp. 3273–3292, 2006. **(63)**
- L. Abady, M. Barni, A. Garzelli, and B. Tondi, “GAN generation of synthetic multispectral satellite images,” in *Image and Signal Processing for Remote Sensing XXVI*, SPIE, pp. 122–133, 2020. **(62)**
- B. Aiazzi, L. Alparone, S. Baronti, R. Carla, A. Garzelli, and L. Santurri, “Sensitivity of Pansharpening Methods to Temporal and Instrumental Changes Between Multispectral and Panchromatic Data Sets,” *IEEE Trans. Geosci. Remote Sensing*, vol. 55, no. 1, pp. 308–319, 2017. **(61)**
- A. Lapini, S. Pettinato, E. Santi, S. Paloscia, G. Fontanelli, and A. Garzelli, “Comparison of machine learning methods applied to SAR images for forest classification in Mediterranean areas,” *Remote Sensing*, vol. 12, no. 3, p. 369–1-22, 2020. **(58)**
- A. Garzelli, B. Aiazzi, L. Alparone, S. Lolli, and G. Vivone, “Multispectral pansharpening with radiative transfer-based detail-injection modeling for preserving changes in vegetation cover,” *Remote Sensing*, vol. 10, no. 8, pp. 1308–1-18, 2018. **(57)**
- A. Garzelli and F. Nencini, “Panchromatic sharpening of remote sensing images using a multiscale Kalman filter,” *Pattern Recognition*, vol. 40, no. 12, pp. 3568–3577, 2007. **(57)**

- G. Vivone, L. Alparone, J. Chanussot, M. Dalla Mura, A. Garzelli, G. Licciardi, R. Restaino and L. Wald, „A critical comparison of pansharpening algorithms,” in 2014 IEEE Geoscience and Remote Sensing Symposium, Quebec City, pp. 191–194, 2014. **(53)**
- B. Aiazzi, L. Alparone, S. Baronti, A. Garzelli, and M. Selva, “Advantages of Laplacian pyramids over ‘à trous’ wavelet transforms for pansharpening of multispectral images,” in Proc. of SPIE 8537, 853704-1–10, 2012. **(50)**
- A. Garzelli, F. Nencini, L. Alparone, and S. Baronti, “Multiresolution fusion of multispectral and panchromatic images through the curvelet transform,” in Proc. 2005 IEEE International Geoscience and Remote Sensing Symposium, Seoul, Korea: IEEE, 2005, pp. 2838–2841, 2005. **(46)**