



## Personal information

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## About the Author

Fabrizio Lombardini received the Italian Laurea degree, with honors, in electronic engineering and the Ph.D. degree in telecommunication engineering from the University of Pisa, Italy, in 1993 and 1997, respectively. He was then granted by the EU a Marie Curie Fellowship of the Training and Mobility of Researchers (TMR) Program, which he spent as Postdoctoral Researcher at the Department of Electronic and Electrical Engineering of University College London, U.K., from 1998 to 1999. Then, he joined the Department of "Ingegneria dell'Informazione" of University of Pisa, where he currently holds the position of Assistant Professor. He is IEEE Member since 1993 and Senior Member since January 2003. He has given lectures at universities and institutions in Italy and abroad, has chaired special sessions on SAR multibaseline/multichannel interferometry/three-dimensional techniques at international conferences, and has been guest co-editor of the EURASIP Journal of Applied Signal Processing special issue on Advances in Interferometric SAR Processing. He is co-author of a tutorial entitled Multibaseline Post-processing for SAR Interferometry presented at the IEEE Sensor Array and Multichannel Workshop in July 2004.

## Research interest

His general interests are in the areas of statistical signal processing, estimation and detection theory, adaptive and super-resolution spectral analysis, array processing, and performance bounds evaluation, with application to radar systems. In particular, his research interests include multibaseline and multifrequency interferometric SAR algorithms and systems, both cross- and along-track, three-dimensional SAR tomography, differential SAR interferometry, multisensor data fusion, and radar detection in non-Gaussian clutter.

## Summary

### Multidimensional SAR imaging

The number of SAR images relative to a same scene available for interferometric processing is expected to exponentially grow in the future: archives associated to SAR spaceborne sensors are filled by data collected with time and observation angle diversity (multipass-multibaseline data); moreover, current system planning trends in the SAR field involve clusters of cooperative formation-flying satellites with capability of multiple simultaneous acquisitions, and airborne systems with multibaseline acquisition capability in a single pass are also experimented. In parallel, developments are underway of innovative processing techniques, stemming from SAR interferometry, aimed at jointly using the multidimensional information lying in multipass-multibaseline data, to produce new and/or more accurate measures.

The tutorial focus is on signal processing methods that, by coherently combining at the complex data level multiple SAR images in an array signal processing or spatial spectral estimation framework, allow improved or extended imaging capabilities. The tutorial will cover the interrelated techniques of Multibaseline layover scatterers Separation, Multibaseline Tomographic three-dimensional imaging of volumetric scatterers, and the new technique of Multipass Differential-Tomographic four-dimensional imaging of multiple scatterers with deformation motions, crossing differential interferometry with multibaseline tomography.

Advanced processing techniques of coherent SAR data combination for multidimensional SAR imaging will be described and discussed, non-model based adaptive and model-based. A number of experimental results obtained with real data, multibaseline single-pass and multipass airborne, and multipass spaceborne, will be presented to show current and potential future achievements in this emerging branch of radar imaging.