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**IEEE Distinguished Lecturer Program (DLP)**  
**An Event at IEEE GRSS Bangalore Section on December 09, 2023**

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**Speaker: Dr. Carlos Lopez-Martinez, UPC, Spain ([ORCID](#))**

**Time: 3:00 pm IST, December 09, 2023 IST**

**Venue: IIIT Bangalore**

**(<https://maps.app.goo.gl/WqcfFcEL8dzwguCv8>)**

**Registration Link (open until 11:59 pm IST, December 05, 2023)**

**<https://forms.gle/jMc55stfjbbQEWP7>**



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**Talk Title: “SAR, SAR Polarimetry & Multitemporal SAR Statistical Description”**

**Abstract:** Nowadays, several spaceborne Polarimetric Synthetic Aperture Radar (PolSAR) systems are in operation: TerraSAR-X (X-Band), RADARSAT-2 (C-Band), Sentinel-1a&b (C-band dual polarimetric), ALOS-2 (L-band), SAOCOM (L-band), RCM (C-band) and Gaofen-3. Also, future missions as BIOMASS (P-band) or NISAR (L&S-bands) are designed to have polarimetric sensitivity.

An accurate Polarimetric SAR (PolSAR) data interpretation and understanding, as well as the process of quantitative and qualitative bio- and geophysical information extraction, need, on the one hand, from a physical knowledge of the polarimetric scattering process and, on the other hand, the statistics and the elements of information theory that apply to PolSAR data. After an introduction to the description and the physical interpretation of PolSAR data, this presentation will introduce a detailed description PolSAR and multidimensional SAR data, as well as the description of the relevant elements of information theory for a complete understanding of PolSAR data.

SAR and PolSAR systems are based on the use of coherent microwaves. This coherent nature is at the origin of the Speckle phenomena. Despite being a complete physical phenomena, the complexity of the scattering process in man-made and natural targets makes necessary to describe PolSAR data statistically, and then, to consider Speckle as a noise component. The first objective of this presentation is to establish the connection between the physics and the statistics, and then, to introduce the concept of Speckle noise under the Gaussian scattering assumption. Following it, the statistical distributions that characterize SAR, PolSAR and multidimensional SAR data will be presented. At the same time, the state-of-the-art in Speckle noise filtering shall be also presented. Finally, advanced statistical concepts for the description of data texture and highly heterogeneous PolSAR data shall be also considered.

### Presentation Objectives:

- What is polarimetry?
- To know the concept of scattering polarimetry and the PolSAR data descriptors
- To know the physical interpretation of PolSAR data
- Description of the concept of deterministic and distributed targets
- Description of speckle noise and the concept of Gaussian scattering
- To know the statistical description of SAR data
- To know the statistical description of PolSAR data
- Describe the state-of-the-art of Speckle noise filtering
- To know the statistical description of target decomposition theorems
- Description of the concept of data texture
- To know the statistical description of SAR and PolSAR texture data
- Information extraction based on the use of higher order statistical moments and log-cumulants

### Speaker Biography:

Dr. Carlos Lopez-Martinez received the MSc degree in Electrical Engineering and the PhD degree from the Universitat Politècnica de Catalunya UPC, Barcelona, Spain, in 1999 and 2003, respectively, as well as the Postgraduate Diploma in Data Science and Big Data from the Universitat de Barcelona UB, Barcelona, Spain in 2021.

Dr. Lopez-Martínez is Associate Professor in the area of remote sensing and microwave technology in the Universitat Politècnica de Catalunya, Barcelona, Spain. He has a large professional international experience at DLR (Germany), at the University of Rennes 1 (France), and as a group leader of the Remote Sensing and Natural Resources Modelling team in the Luxembourg Institute of Science and Technology (Luxembourg). His research interests include Synthetic Aperture Radar (SAR) theory, statistics and applications, multidimensional SAR, radar polarimetry, physical parameter inversion, advanced digital signal processing, estimation theory, and harmonic analysis.

Dr. López-Martínez has authored more than 200 articles in journals, books, and conference proceedings, and received the EUSAR 2002 Conference Student Prize Paper Award, co-authored the paper awarded with the EUSAR 2012 Conference First Place Student Paper Award, and received the IEEE-GRSS 2013 GOLD Early Career Award. Dr. López-Martínez has broad academic teaching experience from bachelor, master, and PhD levels to advanced technical tutorials presented at international conferences and space and research institutions worldwide. He is an associate editor of the IEEE-JSTARS journal and the MDPI Remote Sensing, acting also as invited guest editor for several special issues. He has collaborated in the Spanish PAZ and the ESA's SAOCOM-CS missions, in the proposal of the Parsifal mission and he is member of the ESA's Sentinel ROSE-L Mission Advisory Group. He was appointed vice-president of the IEEE-GRSS Spanish chapter, and in 2016 he became its secretary and treasurer. From 2011 Dr. López-Martínez collaborates with the IEEE-GRSS Globalization initiative in Latin America, contributing to the creation of the IEEE-GRSS Chilean chapter and the organization of the 2020 LAGIRSS conference, being appointed as Latin America liaison in 2019. He is also co-chair of the Tutorial Technical Committee of the Indian 2020 and 2021 InGARSS conferences.