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| Metadata template for Training Action  We ask you to complete this document by replacing the red text with the required content. If a particular item does not apply to your action or is still to be defined, please write NA (Not Applicable).  Collector: Carlos López-Martínez  Revision Date: 04/10/2024  Version: v1.0 |
| Title  International School on SAR Polarimetry: From Theory to Applications |
| Subject  Earth Observation. Synthetic Aperture Radar Polarimetry |
| Description  Polarimetric Synthetic Aperture Radar (PolSAR) has emerged as a valuable asset in enhancing the capabilities of traditional Synthetic Aperture Radar (SAR) applications. The distinctive polarization characteristics inherent in PolSAR data contribute significantly to its superiority over conventional SAR images in identifying and characterizing the Earth surface, offering a wealth of information for diverse applications. The utilization of PolSAR data extends beyond quad-pol or full polarimetry, encompassing coherent dual-pol and compact-pol, presenting a notable advantage by incorporating polarimetric information without compromising other essential image parameters such as resolution, swath, and signal-to-noise ratio (SNR). In agriculture, for instance, PolSAR images prove indispensable for precisely monitoring crop conditions and types. By analyzing the polarization responses of various crops, farmers and agricultural experts can gain valuable insights into crop health and growth stages and even identify diseases or pest infestations. Environmental monitoring and management benefit significantly from PolSAR data, which is crucial in mapping and assessing natural resources. It enables accurate land cover classification, distinguishing diverse surfaces such as forests, wetlands, and urban areas. PolSAR's applications extend into forestry, aiding in forest structure assessment, biomass estimation, and deforestation monitoring. Moreover, PolSAR images find extensive use in disaster management, particularly for evaluating areas impacted by floods, earthquakes, or landslides. The polarimetric information facilitates the differentiation of various terrain types and the identification of areas prone to natural disasters, thereby enabling timely and targeted response efforts. The versatility of PolSAR data continues to unveil new possibilities across multiple domains, enhancing our ability to observe and understand the Earth's dynamic processes.  Recognizing the paramount importance of PolSAR data, dedicated satellite sensors such as SAOCOM (CONAE), RCM (CSA&MDA), RISAT2 (ISRO), ALOS-2 (JAXA), BIOMASS & ROSE-L (ESA), and NISAR (NASA&ISRO) have been meticulously designed. Notably, the upcoming BIOMASS mission is poised to mark a ground-breaking milestone as the first operational use of quad-pol-only data from space. Despite the myriad benefits offered by PolSAR over single-pol SAR, harnessing its information requires robust statistical, physical, and machine-learning methodologies. Ongoing research endeavors worldwide are focused on developing innovative retrieval algorithms for PolSAR. It is crucial to note that misapplication of PolSAR can yield erroneous results, causing concerns among users needing a strong foundation in polarimetric theory.  The proposed 'International School on SAR Polarimetry: From Theory to Applications' in Scotland aims to introduce remote sensing concepts and algorithms related to PolSAR to address this challenge. Unfortunately, there is a notable absence of dedicated schools specifically focused on SAR polarimetry theory and its applications. This initiative provides a comprehensive overview of physics and statistics to young postgraduates and Ph.D. students. The school seeks to foster meaningful interactions between participants and resource persons, laying the groundwork for potential collaborations. Furthermore, it aims to acquaint participants with the Geoscience and Remote Sensing Society (GRSS) activities, integrating them into the growing GRSS community. We plan to organize this school annually, rotating it through different locations across the globe, with local and regional experts from diverse fields of application using PolSAR data. This approach ensures a dynamic and inclusive platform for continuous learning and collaboration in the field of PolSAR.  The 'International School on SAR Polarimetry: From Theory to Applications' is dedicated to engaging students and young professionals, providing them with vital knowledge to harness data from current and upcoming PolSAR missions for scientific research and societal applications. To ensure a focused and interactive learning environment, a committee will be formed to follow stringent selection criteria to limit participation to a maximum of 30 individuals. This approach ensures a high-quality experience for participants, facilitating effective learning, networking, and collaboration within the PolSAR community. |
| Start / End dates  10th-12th Dec. 2024 |
| Language  English |
| Relation/s (BoK)  Earth Observation, Radar, Synthetic Aperture Radar |
| Abstract  The proposed 'International School on SAR Polarimetry: From Theory to Applications' in Scotland aims to introduce remote sensing concepts and algorithms related to PolSAR to address this challenge. This initiative provides a comprehensive overview of physics and statistics to young postgraduates and PhD students. The school seeks to foster meaningful interactions between participants and resource persons, laying the groundwork for potential collaborations. Furthermore, it aims to acquaint participants with the Geoscience and Remote Sensing Society (GRSS) activities, integrating them into the growing GRSS community. |
| Target audience  PhD scholars, postdocs, JRFs, and young scientists |
| EQF level  EQF 7 & 8 |
| Structure   * Tuesday 10th   Opening ceremony  Basics of SAR, Wave Polarimetry, Scattering Polarimetry   * Wednesday 11th   Coherent Target Decomposition Theorems, Incoherent Target Decomposition Theorems & Classification   * Thursday 12th   Time Series & Change Detection, Polarimetric SAR Interferometry (PolInSAR) for Forestry & Agriculture Monitoring |
| Duration  3 days |
| Location  The University of Stirling, Scotland, UK |
| Prerequisites  Some mathematics background is required (Linear Algebra) Registration process |
| Workload (in ECTS if possible)  NA |
| BoK Links  NA |
| Learning Outcomes  After the training, the participant should be able to:  • Understands basic principles of SAR Polarimetry (knowledge of terminology)  • Understand basic applications of SAR Polarimetry  • Understand how to interpret polarimetric SAR data to extract bio- and geophysical parameters |
| Certification  At present the participants have only received a certification of attendance to the training. |
| Title of the micro-credential  NA |
| Microcredential awarding body  NA |
| Type of assessment  Exercises were posed during the training action. It was required to be able to do them to continue with the PolSAR data analysis. Students not able to follow such instructions, could always follow instructor’s computer screen displayed on the white board. |
| Delivery Mode  In-person |
| Organizer  Universitat Politècnica de Catalunya |
| Maximum number of participants  30 |
| Price  The participation fee is 10 euros |
| Registration process  Submission of an applications (CV + Motivation Letter) and selection by a committee based on the submitted information |
| Instructor(s)  Carlos López-Martínez, PhD |
| Learning methodologies  Lectures, laboratory sessions, group discussion, problem-analysing activities, motivational speeches from reputed speakers |
| Contact information  Carlos López-Martínez, carlos.lopezmartinez@upc.edu |