

## SERFA 2019: Remote Sensing Applications for Defense and the 5<sup>th</sup> ISPRS Student Consortium Summer School & IEEE GRSS Young Professionals

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The Remote Sensing in Defense Applications (Portuguese: Simpósio de Sensoriamento Remoto de Aplicações em Defesa, SERFA) (Fig. 1a) was organized by the Institute for Advanced Studies (IEAv) from November 10 – 14, 2019 in the city of Sorocaba, Sao Paulo State, Brazil with the theme “Space Technology, Markets and Building the New Brazilian Space Age.” This was the ninth edition of the event that started in 1996 and, for the first time, occurred outside of Sao Jose dos Campos city, where it had always taken place. The SERFA symposium was hosted at the Sorocaba Technological Park (Fig. 1b) from November 10 to 14, 2019. Both local and international participants attended the event.



**Figure 1.** The flyer of the SERFA event (left) and the podium in the auditorium of Sorocaba Technological Park, where the main event was hosted (right).

The fifth edition of the ISPRS Student Consortium (ISPRS SC) Summer School (SS) and IEEE Geosciences and Remote Sensing Society - Young Professionals (IEEE-GRSS YP) led by members of the GRSS’ Brazil Chapter (<https://r9.ieee.org/brazil-grss/>) was hosted for the first time within the SERFA Symposium. Members of the organizing committee from IEAv have been active members of the GRSS’ Brazil Chapter, which resulted in a successful joint event and the proposal of additional activities.

The Summer School was divided into the basic and advanced modules on Synthetic Aperture Radar (SAR). The first module focused on the fundamentals and concepts of SAR and was led by both Dr. Rafael Rosa (Visiona Space Technology) and Dr. João Alberto Moreira (Bradar, Embraer Defense & Security). The lectures included discussions based on SAR geometry and data acquisition, existing sensors, and missions, payloads, and data processing techniques, including polarimetric interferometry. Several examples and images were used to show the attendants

the benefits and possible applications of SAR data. Sixty participants from different backgrounds and different regions of the country attended this module.



**Figure 2.** The lectures by Dr. Timo Balz of Wuhan University (left) and Dr. Alejandro Frery of the Federal University of Alagoas (right).

The second module concentrated on the advanced topics and applications of SAR remote sensing. Dr. Timo Balz from Wuhan University (China) started the lectures with a comprehensive review of the fundamental concepts of Interferometry, Differential Interferometry, and Persistent Scatterer Interferometry. Dr. Alejandro Frery of the Federal University of Alagoas (Brazil) introduced the statistical information theory and geometry for analyzing and processing SAR images. Dr. Andrea Buono from the University of Naples “Parthenope” (Italy) explained the current trends on ocean SAR polarimetry and future applications and perspectives for research. A total of forty participants attended the second module.



**Figure 3.** Dr. Veraldo Liesenberg of Santa Catarina Ste University delivering a lecture on forest remote sensing (left) and Ms. Sheryl Rose Reyes, Chair of the ISPRS Student Consortium, presenting about ISPRS and the ISPRS SC (right). Succeeding lectures were held during the symposium proper. These included Dr. Veraldo Liesenberg's (Fig.3a) lecture on "Forest Remote Sensing" (Santa Catarina State University, Brazil) and Dr. Andrea Buono's "SAR Polarimetric Data Physical Processing to Generate Value-Added Products." Dr. Timo Balz presented another application of radar imagery in the lecture on "Surface Motion Estimation of Synthetic Aperture Radar (SAR)." An important topic delivered by Dr. Alejandro Frery was on scientific publication and "Repeatability and Reproducibility." Ms. Sheryl Rose Reyes (Fig.3b), Chair of the ISPRS SC, presented the "Importance of International Organizations: Lessons Learned from ISPRS and the ISPRS Student Consortium," which included an introduction of ISPRS and ISPRS SC as well as the organizations' activities and contributions in the fields of remote sensing, photogrammetry, and spatial information science.



**Figure 4.** Dr. Darcton Damião, Director of INPE, delivering his keynote speech during the official opening of SERFA (left) and Mr. Jon "Maddog" Hall of the Linux Professional Institute on the Internet of Things (right).

Keynote presentations in the symposium included the current research and trends in science, technology, and innovation for Brazil delivered by Dr. Darcton Policarpo Damião (Fig.4a), current Director of the Brazilian National Institute for Space Research (INPE). Additionally, a lecture from Jon "Maddog" Hall (Fig.4b), Board Chair of the Linux Professional Institute, focused on the topic "Internet of Things" and, more specifically, on "Security, Privacy and Longevity". The symposium showcased the current work by the Institute of Advanced Studies (IEAv) and research and development from various organizations and academia. The industry and business sectors also presented state-of-the-art technology for data and image acquisition, image processing and analysis, and optimization algorithms. A total of forty-five speeches and talks were presented. The webpage of the event containing the program of activities is available at [www.serfa.com.br](http://www.serfa.com.br).



**Figure 5.** (Upper Left) The opening of the Hackathon; (Upper Right) Participants of the Hackathon during the brainstorming session; (Lower Left) Participants of the Pitch Battle were mentored by key persons from IEAv, and (Lower Right) One of the representatives of the start-up companies presenting their innovative ideas for “The Amazon 4.0 Challenge.”

The event also hosted a Pitch Battle and Hackathon titled “The Amazon 4.0 Challenge.” These events (Fig. 5) were challenges to think beyond the current trends in technology and focus on creating a “Smart Forest” – protecting, monitoring, and defending the world’s biggest tropical rainforest and its biodiversity. Participants in these events included both students and start-up companies offering innovative and creative solutions.



**Figure 6.** The round table discussions.

Round table discussions featured leadership initiatives in science and technology and advances in the agribusiness sector. These discussions provided a more dynamic interaction with the speakers and welcomed questions from the audience and moderator to give insights to issues and potential solutions for this vital sector in Brazil.



**Figure 7.** A group photo of the organizers on the last day of the event and the closing ceremony conducted by Dr. Rafael Paes (right).

The symposium was a great success, enabling the gathering of three important stakeholders in research and development – the government, academia, and the industry. The event was an incredible opportunity to learn more about the current trends and status of remote sensing as applied to the various issues and innovations in Brazil. It was also a big event for many of the students who attended the summer school because it provided additional opportunities to engage through the Hackathon and the Pitch Battle. SERFA will be hosted in other cities in Brazil in the coming years and will continue to share the development, applications, and advancements of remote sensing in the country.

*(Photos taken from the official SERFA photo gallery and courtesy of Dr. Veraldo Liesenberg and Ms. Sheryl Rose Reyes)*