



BY JAMES L. GARRISON

FROM THE EDITOR

Introducing the June Issue

Welcome to the June 2021 issue of *IEEE Geoscience and Remote Sensing Magazine*! This is a special issue on artificial intelligence (AI) innovation in geoscience and remote sensing. As the volume of geoscience data generated from remote sensing continues to grow at an enormous rate, it becomes more and more important to find better methods for extracting knowledge from these data and using this knowledge to make important decisions. The feature articles in this special issue provide a snapshot of the current state of the art in applying AI in the geoscience and remote sensing fields.

To start off, I wish to thank the four guest editors, who defined the scope of this issue, solicited white papers and manuscripts, conducted the reviews, and selected the best articles for inclusion. Dr. Sabah Mohamed is a full professor in the Department of Computer Science at Lakehead University (Ontario, Canada). Dr. Tai-hoon Kim is a professor at Beijing Jiaotong University (China) and a visiting scholar with the University of Tasmania (Hobart, Australia). Dr. Pedram Ghamisi is head of the Machine Learning Group at Helmholtz-Zentrum Dresden-Rossendorf, Helmholtz Institute Freiberg for Resource Technology (Germany); cofounder of VasoGnosis Inc. (San Jose, California, USA); and a visiting professor with the Institute of Advanced Research in Artificial Intelligence (Vienna, Austria). Dr. Ruay-Shiung Chang is president of National Taipei University of Business (Taipei City, Taiwan). Please see their guest editorial on page 7 for a description of the theme for this special issue and a summary of the selected articles.

Three feature articles and one “Perspectives” column form this special issue. The first feature is a comprehensive review of AI in solving the phase unwrapping

problem in interferometric synthetic aperture radar (InSAR). The second feature addresses a different aspect of SAR: applying deep learning methods to image despeckling, including a review of the factors that have limited the success of these approaches in the past. Hyperspectral remote sensing is the subject of the third feature, which addresses the use of nonconvex modeling for such problems as image restoration, dimensionality reduction, and spectral unmixing. The “Perspectives” column rounds out the special issue by presenting a position on future research directions.

Additional content in this issue includes three “Education” columns, two “Technical Committees” columns, and one “Chapters” column. Our first “Education” column describes the progress that has been made in conducting remote sensing training in the Spanish language. The NASA-funded Applied Remote Sensing Training (ARSET) program has delivered live and online educational programs in Spanish since 2009, reaching over 12,000 participants in 19 countries. The column reviews ARSET’s 10 best practices for successful multilingual remote sensing training and concludes with the results of a recent case study in Bolivia, a nation where fewer than 5% of technical experts are fluent in English. Continuing on the important theme of expanding access to remote sensing capabilities and knowledge, our second “Education” column describes a successful program to develop a low-cost camera lidar system through a collaboration between Central Connecticut State University, the National Oceanic and Atmospheric Administration, and the University of the Bahamas. The authors describe their model of sharing institutional expertise and maintaining a single data analysis chain. Student testimonials support the value of this kind of hands-on experience working with hardware and learning proper research methodology to complement

Digital Object Identifier 10.1109/MGRS.2021.3078586
Date of current version: 17 June 2021

textbook theory. Summer school programs remain an important GRSS activity, which continued in an entirely online format during 2020. Our final “Education” column reports on the three online schools offered last year under GRSS support. Whereas online courses have limited opportunities for individual meetings and networking, this forum did allow for broad participation from all around the world.

The first “Technical Committees” column aligns with the issue’s AI theme (although it was not solicited as part of the special issue). The IEEE Geoscience and Remote Sensing Society’s (GRRS’s) Earth Science Informatics Technical Committee (TC) cosponsored the workshop Advancing Machine Learning Tools for Earth Science on 21–23 January 2020 in Washington, D.C., with two goals: 1) define scientific requirements for training data catalogs and 2) develop guidelines for tools and practices for generating, cataloging, and disseminating benchmark training datasets. In defining the workshop goals, it was recognized that large-scale, benchmarked, standardized, and well curated training datasets need to be constructed before the Earth science community can reap the full benefits of AI. In

those prepandemic days, 51 participants representing government, academia, and industry participated in person. A final report was generated, documenting the recommendations from this workshop. Some recommendations from this report are already being acted upon, including a data science competition.

Our second “Technical Committees” column features the Instrumentation and Future Technologies TC (IFT-TC) of the GRSS. The IFT-TC has seven working groups organized by sensing modality (e.g., microwave radiometry, active optical, and so on) and platform (e.g., small satellites and unmanned aerial vehicles). The objectives of this TC are to provide a forum for the coordination and engagement of those interested in new instrumentation technology, both within the GRSS and in the broader community; assess the state of the art of instrumentation technology; and identify new instrument concepts, research trends, and enabling technologies. Members of each working group organize and conduct their own activities, which can include invited IGARSS sessions, webinars, and panel discussions. The column reports on the recent reorganization of the IFT-TC and the election of a new chair.

Finally, the GRSS Malaysia Chapter, formed in 2012, is featured in this issue’s “Chapters” column. This Chapter is quite active, hosting the annual IEEE Workshop on Geoscience and Remote Sensing, along with technical tours, workshops, and seminars. The Malaysia Chapter will be taking the international stage next year when it hosts the IEEE International Geoscience and Remote Sensing Symposium in Kuala Lumpur on 17–22 July 2022. Save the date: I hope to see many of you there!

As I have mentioned previously, we are moving toward implementing a two-stage review process as a way to give more timely feedback to potential feature authors. Short (five pages or fewer) white papers will be submitted first. These will then be reviewed by associate editors or members of the editorial board. Following a positive review of the white paper, authors may be invited to submit a full manuscript, which will then undergo a complete peer review.

Contributions to our regular columns—“Chapters,” “Technical Committees,” “Space Agencies,” “Women in Geoscience and Remote Sensing,” “Education,” “Software and Data Sets,” and “Conference Reports”—are always welcome. White papers, columns, and invited manuscripts should be submitted through ScholarOne at <http://mc.manuscriptcentral.com/grsm>. Proposals for special issues should be sent to me directly at jlj@ieee.org.

Please continue to stay safe.

GRS



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