The IEEE GRSS Distinguished Lecturer Program provides GRSS Chapters with talks by experts on topics of interest and importance to the Geoscience and Remote Sensing community. The purpose of the program is to provide our members with an opportunity to learn about the work being done in our discipline and to meet some of the prominent members of our Society.

IEEE Geoscience and Remote Sensing Society (GRSS) Distinguished Lecture

on

Advanced Neural Adaptive Processing in Interferometric and Polarimetric Radar Imaging

by

Professor Akira HIROSE

Department of Electrical Engineering and Information Systems,
The University of Tokyo, Japan
http://www.eis.t.u-tokyo.ac.jp/~ahirose
ahirose@ee.t.u-tokyo.ac.jp

on
08 December 2014
at
15:30 hrs
Venue: Platinum Jubilee Auditorium, Indian Statistical Institute-Bangalore Centre

Jointly Organized by
The Bangalore Section IEEE Geoscience and Remote Sensing Society (GRSS) Chapter,
The Systems Science and Informatics Unit (SSIU), Indian Statistical Institute-Bangalore Centre, India,
International Association for Mathematical Geosciences, Bangalore Students Chapter
Contact: bsdsagar@isibang.ac.in, ssiu@isibang.ac.in, saroj.meher@isibang.ac.in. Ph:+91-(080)-28483002-Ext:535.
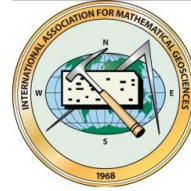
Abstract: This Talk presents and discusses advanced neural networks by focusing on complex-valued neural networks (CVNNs) and their applications in the remote sensing and imaging fields. CVNNs are suitable for adaptive processing of complex-amplitude information. Since active remote sensing deals with coherent electromagnetic wave, we can expect CVNNs to work more effectively than conventional neural networks or other adaptive methods in real-number space. Quaternion (or Hypercomplex-valued) neural networks are also discussed in relation to polarization information processing. The beginning half of the Talk is devoted to presentation of the basic idea, overall framework, and fundamental treatment in the CVNNs. We discuss the processing dynamics of Hebbian rule, back-propagation learning, and self-organizing map in the complex domain. The latter half shows some examples of CVNN processing in the geoscience and remote sensing society (GRSS) fields. Namely, we present distortion reduction in phase unwrapping to generate digital elevation model (DEM) from the data obtained by interferometric synthetic aperture radar (InSAR). In polarization SAR (PolSAR), we apply quaternion networks for adaptive classification. Another example is ground penetrating radar (GPR) to visualize underground objects to distinguish specific targets in high-clutter situation. Finally we discuss the prospect of the CVNNs in the GRSS fields.

IEEE GRSS Distinguished Lecturer's Bio: Akira Hirose (F '13) received the Ph.D. degree in electronic engineering from the University of Tokyo in 1991. In 1987, he joined the Research Center for Advanced Science and Technology (RCAST), the University of Tokyo, as a Research Associate. In 1991, he was appointed as an Instructor at the RCAST. From 1993 to 1995, on leave of absence from The University of Tokyo, he joined the Institute for Neuroinformatics, University of Bonn, Bonn, Germany. He is currently a Professor with the Department of Electrical Engineering and Information Systems, the University of Tokyo. The main fields of his research interests are wireless electronics and neural networks. In the fields, he published several books such as Complex-Valued Neural Networks, 2nd Edition (Springer 2012). Dr. Hirose is a Fellow of the IEEE, Senior Member of the Institute of Electronics, Information and Communication Engineers (IEICE) and a member of the Japanese Neural Network Society (JNNS). He is the recipient of a number of awards such as IEEE/INNS WCCI-IJCNN Runner-up Best Paper Award (IEEE Computational Intelligence Society (CIS) 2010), Excellent Service Award (IEICE Electronics Society ES), 2008, on ES General Secretary), IEEE/INNS WCCIIJCNN Best Session Presentation Award (IEEE, INNS 2006), Excellent Service Award (IEICE Electronics Society (ES), 2006, on Electromagnetic Theory (EMT) Technical Group), and ICONIP Best Paper Award (Asia-Pacific Neural Network Assembly (APNNA), 2004). He served as the Editor-in-Chief of the IEICE Transactions on Electronics (2011-2012), an Associate Editor of journals such as the IEEE TRANSACTIONS ON NEURAL NETWORKS (2009-2011), the IEEE GEOSCIENCE AND REMOTE SENSING NEWSLETTER (2009-2012), the Chair of the Neurocomputing Technical Group in the IEICE, and the General Chair of the 2013 Asia-Pacific Conference on Synthetic Aperture Radar (APSAR 2013) in Tsukuba. He currently serves as a member of the IEEE Computational Intelligence Society (CIS) Neural Networks Technical Committee (NNTC), the Founding Chair of the NNTC Complex-Valued Neural Network Task Force, the Governing Board Member of the Asia-Pacific Neural Network Assembly, Vice President of the IEICE Electronics Society, President of the JNNS, and the IEEE GRSS Tokyo Chapter Chair.

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Contact: bsdsagar@isibang.ac.in, ssiu@isibang.ac.in, saroj.meher@isibang.ac.in. Ph:+91-(080)-28483002-Ext:535.