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presents

Machine Learning for Object Recognition from High Volume Radio Frequency Data

by

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Time: 11:30 a.m. to 1:00 p.m. -- 11:30 Pizza/Networking, 12:00 (Noon) Presentation
Location: RIT Campus, Golisano Hall - Bldg 70, Room 1435
Computer Society announcements and venue information:
   http://ewh.ieee.org/r1/rochester/computer
Cost: Free. Open to IEEE members and non-members.
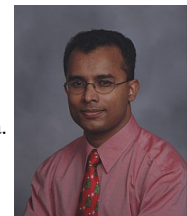**Registration requested** for food/pizza count: https://events.vtools.ieee.org/m/44454

Abstract

Much research efforts have been devoted to applying machine learning algorithms in video imagery for object recognition. However, very limited open literatures can be found on machine learning in radio frequency data. Hence, this research explores application of deep learning algorithms to the task of Automatic Target Recognition (ATR) in synthetic aperture radar (SAR) imagery. Radar enables imaging ground objects at far greater standoff distances. However, the false-alarm rate of both human and machine-based radar image recognition is unacceptably high. Existing ATR algorithms also require impractically large computing resources for airborne applications. The goal of our research is to advance the state-of-the-art ATR capability by developing a more accurate, real-time, and low-power object recognition system. We implemented Convolution Neural Network (CNN) based SAR object recognition algorithms in GPU and energy efficient computing systems. We received acceptable classification accuracy on relevant SAR data. We will discuss technical challenges and future research on radio frequency object recognition.

Speaker's Biography

Dr. Uttam K. Majumder is a senior electronics engineer at Air Force Research Laboratory (AFRL) and has been working there since August 2003. His research interests include Machine Learning for object recognition, High Performance Computing, Synthetic Aperture Radar (SAR) algorithm development for surveillance applications, Radar Waveforms Design and Digital Image Processing. Among various awards, Dr. Majumder has received Air Force Distinguished Civilian Award and AFRL Science and Technology achievement award for radar systems development.

Dr. Majumder received Bachelor of Science (BS) degree from the Department of Computer Science, The City College of New York (CCNY) in June 2003 graduating Summa Cum Laude. He earned an MS degree from Air Force Institute of Technology (2007) and a Ph.D. degree (in Electrical Engineering) from Purdue University (2014), West Lafayette, Indiana. He also earned an MBA degree from the Wright State University (2009). He was an adjunct faculty member at Wright State University, Dayton, Ohio. He developed a graduate level course on SAR Signal and Image Processing. He lectured a short course on "SAR Signal Processing" at IEEE International Radar Conference 2010, Washington D.C. Dr. Majumder published more than 30 technical papers (journal and conference) in various technical proceedings and submitted a patent application on "Orthogonal Waveforms Design". Dr. Majumder is a senior member of IEEE.

His website is at http://www.majumderfoundation.org/ .