BIOGRAPHICAL SKETCH

Lily L. Li started her Ph.D program study in 2012 at Tennessee Technological University. Her research interests include: statistics, machine learning, big data and wireless communications. She is a member of the Institute of Electrical and Electronics Engineering (IEEE) and has reviewed several peer-reviewed IEEE journals.

EDUCATION

University of Electronic Science and Technology of China
China
BS, Computer Science, 1992

New York University
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Tennessee Technological University
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College of Engineering

TENNESSEE TECH

The Department of
Electrical & Computer Engineering
Announces the Dissertation Defense
Of

Lily L. Li

In Partial Fulfillment of the Requirements
For the degree of
Doctorate of Philosophy

October 28, 2019
Held in
208 Brown Hall at 11:00 a.m.
115 West 10th Street
Tennessee Tech University

FIELD OF STUDY

Signal Detection in Wireless Communications

DISSERTATION TOPIC

" Spectrum Sensing for Cognitive Radio Networks in Low SNR Environments: Algorithms, Analysis and Data Processing"

EXAMINING COMMITTEE

Dr. Adam L. Anderson, Committee Chair
Joint Faculty with the Oak Ridge National Laboratory

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Abstract

Cognitive radio is an evolution of the well-studied wireless communications, offers the promise of being a disruptive technological innovation that will strengthen the future of more intelligent wireless world. Spectrum sensing is a key component in cognitive radio where smart wireless nodes must have accurate information on spectrum presence in order to make intelligent decisions on spectrum access, therefore the utilization of efficiency of the precious spectrum can be improved. In this dissertation, we focus on developing machine learning-based spectrum sensing algorithms in cognitive radio networks, especially in low signal-noise-ratio environment.

Based on the well-known kernel technique, a generalized likelihood ratio test algorithm is proposed. The analysis is performed to demonstrate the superiority and effectiveness of the detection performance. Moreover, the performance of traditional machine learning algorithms such as support vector machine, random forest, and gradient boosting machines are applied to compare with our new algorithm, and a LSTM deep neural network is designed for spectrum sensing to overcome the difficulty in accurately modeling for practical environment.

Massive multi-in multi-out (MIMO) is an emerging technology that allows improvement in spectrum efficiency. A random matrix theory based generalized likelihood ratio test algorithm is proposed for spectrum sensing in MIMO systems. Several other random matrix theory based approaches for spectrum sensing are studied. Experiments are performed to collect real environment signal data by using Universal Software Radio Peripheral 2 as the testbed platform. Data is used to test the performance of our proposed algorithms.