Announcing the Final Examination of Shameek Bhattacharjee for the degree of Doctor of Philosophy

Time & Location: April 27, 2015 at 1:00 AM in HEC 438
Title: Quantifying Trust and Reputation for Defense against Adversaries in Multi-Channel Cognitive Radio Networks

Dynamic spectrum access (DSA) networks enabled by cognitive radios are envisioned to drive the next generation wireless networks to cater to the increasing demand for exhaustible radio spectrum. Cognitive radios, referred to as nodes, undergo continuous spectrum sensing so as to opportunistically use unused spectrum bands. Oftentimes, nodes participate in cooperative sensing and share spectrum reports for more accurate inference on channel status; however such cooperation makes these networks vulnerable to spectrum sensing data falsification (S.S.D.F) attacks. Thus, knowing the trustworthiness of various nodes is critical for network operations.

In this work, we propose an anomaly monitoring technique that captures anomalies in spectrum sensing data shared by the nodes which forms the basis for computing the trustworthiness. We quantify trustworthiness of nodes in normal and high-risk systems. An optimistic trust heuristic approximated by a Beta Distribution is used for a normal system, whereas for the high-risk system, we propose a conservative trust framework using a Dirichlet distribution and subjective logic. Using support vector machine, we are able to distinguish between malicious and non-malicious nodes. We propose trust-based and inversion-based fusion models to exclude reports from malicious nodes. Further, we are able to utilize the misleading information from malicious nodes. To defend against collaborative attacks by selfish nodes, we propose a Bayesian inference based spectrum decision reliability framework that can withstand a variety of S.S.D.F attack strategies and under various network and radio scenarios.

Through simulation experiments we show that both the optimistic and conservative trust models can identify malicious nodes irrespective of their attack strategies. We were able to improve accuracy of cooperative sensing using the proposed fusion schemes. We also show that our method outperforms other popular methods. The proposed Bayesian inference framework enables the nodes to rank the channels based on the reliability of the fusion results under selfish collaborative attacks.

Major: Computer Engineering

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Bachelor’s of Information Technology, BS, 2009, West Bengal University of Technology, India
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The public is welcome to attend.