



**Doctoral Dissertation Defense Presentation**  
**Department of Electrical and Computer Engineering**

**Monday, February 15, 2021**  
**02:00 pm EST**  
**Zoom Video Conference**

**Strategies for Radar-Communication Spectrum Sharing**

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**Electrical Engineering**

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**Abstract:**

Spectrum sharing has become increasingly important since the past decade due to the ongoing congestion of spectral resources. Higher data rates in wireless communications require expansion of existing frequency allocations. Significant research efforts have been made in the direction of cognitive radio to effectively manage the existing frequency usage. Recently, coexistence of multiple platforms within same frequency bands is considered effective to mitigate spectral congestion. The coexistence of radar and communication platforms in the same frequency bands requires both systems to work collaboratively to mitigate their mutual interference. This challenge can be significantly simplified if both systems are controlled by a joint control entity. Joint radar-communication (JRC) system is such an example where

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radar and communication system objectives are achieved by the same physical platform.

In this dissertation, we discuss three different types of JRC systems and investigate novel signal processing techniques to optimize their performance. These JRC systems exploit either a single transmit antenna, an antenna array for beamforming, or a distributed JRC network. We present optimized resource allocation strategies for the three types of JRC systems. First, we consider a single transmit antenna-based JRC system and optimize the dual-purpose transmit orthogonal frequency division multiplexing (OFDM) waveforms based on the frequency-sensitive target response and characteristics of communication channels. Second, we perform resource optimization for multi-antenna beamforming-based JRC system, yielding minimized power usage and optimal selection of antennas for efficient utilization of hardware up-conversion chains. Finally, the problem of optimal power allocation in a distributed JRC system is addressed based on the target localization performance and the communication capacity.