# THE UNIVERSITY OF CONNECTICUT

## Civil & Environmental Engineering

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**Masters Thesis Defense**

**Department of Civil & Environmental Engineering**

**University of Connecticut**

**1:00 pM – FRIDAY, AUGUST 30TH, 2019**

#### CAST 306

***Advisory Committee:***

Dr. Shinae Jang (Major Advisor)

Dr. Richard Christenson (Associate Advisor)

Dr. Kay Wille (Associate Advisor)

**ADVANCEMENTS IN NOVEL MATERIAL RFID-BASED CRACK SENSING AND BRIDGE WEIGH IN MOTION**

The current infrastructure in the United States is continually deteriorating. Smart structures in civil engineering are becoming increasingly popular due to the performance enhancing systems they contain. Many of these systems are related to sensing and monitoring the structure. Structural health monitoring (SHM) has state of the art technological advances in both these fields. This thesis contributes to the advancements in the SHM field, particularly crack detection and Bridge Weigh-In-Motion (BWIM). The crack detection research uses existing radio frequency identification (RFID) crack detection technology and applies it to a novel material, Ultra High-Performance Concrete (UHPC). This system uses backscatter power to detect environmental change has been experimentally assessed in the lab for crack detection with varying crack widths of UHPC. BWIM is the use of an in-service bridge and its responses to detect vehicle characteristics of that vehicle traveling over that bridge. For BWIM advancements, speed calculation of trucks traveling over bridges is a main factor in many BWIM methodology. This thesis presents three speed calculation methods using one or two sensors to use in the speed calculation portion of vehicle weight determination algorithm. With this new algorithm, bridge response, and truck weight data, the vehicles weights are determined. These additions to the SHM community both present low cost and non-intrusive methods that gain insight into these smart structures to better maintain the United States infrastructure network.