

**NORTHERN ILLINOIS UNIVERSITY**

Acoustic Emissions Tree Monitoring System

**A Capstone Submitted to the**

**University Honors Program**

**In Partial Fulfillment of the**

**Requirements of the Baccalaureate Degree**

**With Honors**

**Department Of**

Electrical Engineering

**By**

Theresa Li

**DeKalb, Illinois**

Spring 2021

University Honors Program  
Capstone Faculty Approval Page

Capstone Title (print or type)

Acoustic Emissions Tree Monitoring System

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Faculty Approval Signature: approval emailed by professor

Department of (print or type): Electrical Engineering

Date of Approval (print or type): 4/17/2021

Date and Venue of Presentation: 4/23/21, Senior Design Demonstration Day

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## HONORS CAPSTONE ABSTRACT

Trees play an essential role of providing oxygen and taking in the increasing carbon dioxide in the atmosphere. They can live thousands of years, but their lives can be cut short due to unexplained circumstances. The Morton Arboretum's Center for Tree Science speculates that acoustic emissions (AE) can help resolve these mysteries by detailing and quantifying the stress waves inside a tree to better understand the health and well-being of trees. For this goal, an electrical circuit and accompanying mechanical housings were designed to support an AE sensor. The AE sensor system was tested in Northern Illinois University's Digital Signal Processing Lab's anechoic chamber. During testing, the system recorded three distinct responses from each mode of testing. While the device displayed an ability to serve as a platform to collect AE readings, improvements to the mechanical housing for eventual long-term deployment and expansions to the circuit to support more detailed data collection methods can be made.