

# UNIVERSITY OF SOUTH FLORIDA

## *Major Research Area Paper Presentation*

### *Artificial Intelligence Versus Natural Selection: Using Computer Vision Techniques to Classify Bees and Bee Mimics*

by  
Tanvir Bhuiyan

### *For the Ph.D. degree in Computer Science and Engineering*

Many groups of stingless insects have independently evolved mimicry of bees to fool would-be predators. To investigate this mimicry, we trained artificial intelligence (AI) algorithms—specifically, computer vision—to classify citizen scientist images of bees, bumble bees, and diverse bee mimics. For detecting bees and bumble bees, our models achieved accuracies of 91.71% and 88.86%, respectively. As a proxy for a natural predator, our models were poorest in detecting bee mimics that exhibit both aggressive and defensive mimicry. Using the explainable AI method of class activation maps, we validated that our models learn from appropriate components within the image, which in turn provided anatomical insights. Our t-SNE plot yielded perfect within-group clustering, as well as between-group clustering that grossly replicated the phylogeny. Ultimately, the transdisciplinary approaches herein can enhance global citizen science efforts as well as investigations of mimicry and morphology of bees and other insects.

Tuesday, October 11<sup>th</sup> 2022,

6:00 pm

Online (Microsoft Teams)

THE PUBLIC IS INVITED

#### Examining Committee

Sriram Chellappan, Ph.D., Co-major Professor

Ryan Carney, Ph.D., Co-major Professor