Applied Mathematics Seminar



Dr. Brian Yurk, Hope College

Friday, December 2 1-1:50pm

MAK A2-167 or via zoom (request password from ortizron at gvsu dot edu)

Mapping plant populations in Lake Michigan sand dunes using drones and machine learning

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The Lake Michigan shoreline is home to the largest system of freshwater sand dunes in the world. The dunes host unique communities of plants and animals, including several rare species, some of which are considered threatened or endangered. These communities depend on the presence of dune activity (sand deposition and erosion), which results in a mosaic of vegetated and bare sand surfaces.

The goal of this research is to develop tools to create high-resolution maps of vegetation populations within the active parts of dune complexes. By comparing maps across time we hope to better understand the interactions between sand dune activity and marram grass population growth and spread. In particular, we are interested in understanding the conditions that lead to blowout initiation, growth, and healing. These processes are fundamental to maintaining active dune environments..

We developed a model to quantify vegetation density in dune complex-scale orthomosaics. The orthomosaics are stitched together from 500-1,000 multispectral images collected from 100-120 m using a drone. We use photographs taken from the ground to calibrate the large-scale models. The first step is to train a machine learning model to classify pixels in the ground-based images as live vegetation, dead vegetation, and sand. The classified photographs are used to estimate vegetation coverage over portions of the dune surface that can also be identified in the complex-scale orthomosaic. This is used to develop a second set of training data, this time to train a model to predict vegetation density using the orthomosaic. Finally, this model is used to predict vegetation density across the entire complex.





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