MS-GIST Online
Master Projects 2020 Cohort
Thursday August 10th – 11th (Livestream via Zoom)

*** There will be 5 minute breaks between each presentation to facilitate transitions in Zoom.**

**** Zoom links available on a per request basis. Contact: atgrogan@email.arizona.edu**

Date/Time	Title	Person *
08/10/2020 1:00 – 1:30 pm	Mapping Insect Herbivory in the Amazon Rainforest of the Napo River Basin, Peru	Diane Sands
08/10/2020 3:00 – 3:30 pm	Assessing Environmental Vulnerability to Anthropogenic Impacts using GIS Based Weighted Linear Combination Analysis in Sequoia National Park, California	Daniel LaPointe
08/10/2020 4:00 – 3:30 pm	An NDVI Analysis of Post-Fire Greenup Rates in the Cienega de Santa Clara	Michael Ivison Jr.
08/11/2020 1:00 – 1:30 pm	Developing a GIS Based Model for the Prediction of Prehistoric Archaeological Sites in San Diego County, California	Simon Howard
08/11/2020 1:30 – 2:00 pm	Vehicle Detection Using Deep Learning in ArcGIS Pro	Cory Southall
08/11/2020 4:00 – 4:30 pm	The Impact of Sea Level Rise on Miami-Dade County	Neil Torralba

Mapping Insect Herbivory in the Amazon Rainforest of the Napo River Basin, Peru

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Abstract:

Looking at the entire tree, instead of just the forest understory, has led to the discovery of millions of new species, greatly expanding understanding of global biodiversity. Can looking at herbivory in different parts of the forest canopy allow for better forest management of the Amazon? To see the forest for the trees, one must first understand the trees. The data used in this study was collected along one of the longest canopy walkway systems in the world, extending horizontally 500 meters throughout the tree-tops and reaching a maximum height of nearly 35 meters. The samples were taken at the Amazon Conservatory for Tropical Studies (ACTS) in Peru. This project charts the average insect herbivory of different tree species at different heights in a subsection of the rainforest through statistical usage of geographic information technology. These samples, taken from differing elevations, may tell us the best locations for additional in-depth studies of canopy herbivory. Data extrapolations from this study may give a better picture of herbivory throughout the Amazon Rainforest, which in turn could steer better forest management.

Keywords:

Insect Herbivory, Amazon Rainforest, Napo Basin Peru, Canopy Walkway, Canopy Herbivory

Assessing Environmental Vulnerability to Anthropogenic Impacts using GIS Based Weighted Linear Combination Analysis in Sequoia National Park, California

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Abstract:

An annual increase in tourism in our National Parks brings increased human impacts on our treasured lands. As we learn more about how increased human activity affects our environment, we are able to develop more effective management techniques to help mitigate the harm caused. With limited resources, it is crucial the National Park Service is able to establish both efficient and effective management programs. These goals can be achieved with the assistance of user-friendly tools able to provide new information vital to the development of management methods. This study explores the use of suitability analysis by means of a weighted liner combination method to identify areas vulnerable to anthropogenic impacts in Sequoia National Park. The study then uses a cost distance model to predict areas of high human activity associated with greater environmental degradation. By adapting established methods and using readily available data, this study produced meaningful results. Using this approach, areas in Sequoia National Park were classified into 10 groups based on their environmental vulnerability to human activity. Results showed a normal distribution of area vulnerability, with 300 acres identified as the most vulnerable areas in the park. These vulnerable areas were determined to be located in the more accessible western portion of the park. With these areas identified, Sequoia National Park management can better focus their conservation efforts to support areas most in need of restoration. In doing so, they are able to ensure the Park remains unimpaired for the enjoyment of future generations.

Keywords:

Suitability Analysis, Weighted Linear Combination, Sequoia National Park, Environmental Vulnerability, Conservation

An NDVI Analysis of Post-Fire Greenup Rates in the Cienega de Santa Clara

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Abstract:

The Cienega de Santa Clara is an ecologically important wetland located in the Baja California region of Mexico, and part of a binational cooperation agreement between the United States and Mexico sharing water rights in the Colorado River Delta. In March 2011, a wildfire occurred that burned 70% of the cattail population. This study aims to measure the impact of the 2011 fire on the vegetation greenness of the subsequent growing season of April – October 2011 compared to 2009, 2010, and 2012. To solve this, remote sensing techniques using Landsat satellite imagery have been used to generate the Normalized Difference Vegetation Index to extract greenness metrics of vegetation density and dispersal. The 2011 yearly comparison results indicated a density value that was 19.75% greater than and a dispersal value that was 1.14% greater than other years while a Hot Spot Analysis comparing the peak growth of all four years indicated a 25.13% statistical increase in dense vegetation for 2011. In conclusion, the March 2011 wildfire positively affected greenness, giving credence to the possibility of prescribed burning being an additional management practice in the Cienega.

Keywords:

Normalized Difference Vegetation Index (NDVI), Wildfire, Greenup, Wetland Management, Colorado River Delta

Developing a GIS Based Model for the Prediction of Prehistoric Archaeological Sites in San Diego County, California

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Abstract:

Over the past 9,000 years people have moved to and settled in the greater San Diego area. With its abundant resources and diverse environmental conditions, San Diego presents an ideal set of settlement conditions for early people. The archaeological record suggests large settlements developed throughout this time all the way until contact with Europeans. However, much of these archaeological sites are at a great risk due to the urban sprawl of Southern California, as well as environmental disasters which may destroy or damage sites before they can be preserved or recorded. This project aimed to create a predictive model with the goal of identifying areas where archaeological sites has a high likelihood of existing. This model used a combination of known cultural preferences from prehistoric Southern Californians, as well as optimal environmental variables. Through a boolean analysis this data produced a map of San Diego County predicting where archaeological sites could be located. Finally, it was tested against a set of known archaeological sites with a high degree of success. This suggests that the model created is applicable to San Diego and could be used to help mitigate the loss of cultural resources in the future.

Keywords:

Predictive Modeling, California Archaeology, San Diego, Boolean Analysis, Site Identification.

Vehicle Detection Using Deep Learning in ArcGIS Pro

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Abstract:
This paper analyzes the complexity of training a deep learning algorithm for object detection in ESRI's ArcGIS Pro 2.5, and tests how accurate of a model can be created. Complexity has long been a barrier to entry for deep learning, a paradigm which can change the landscape of geographic research. To test the software, models were created to run object detection on vehicles using high-resolution imagery. Models with sample sizes of 100, 1,000, and 2,000 training patches were created using two convolutional neural networks (CNN), ResNet34 and ResNet50. Two models were created for each training sample size (six total), one for each CNN, and each of these models was tested according to three metrics; precision, recall, and F-score. The process from start to finish was transcribed into Python code to save time and assist with repeatability. The study concludes that a high-functioning model can be created using the software, as displayed by the ResNet50 2,000 sample model, achieving a final F-score of 90.7%. The process described in the study proved simple to implement, even for those with only minimal knowledge of deep learning. For the test of CNN's, ResNet50 shows to be the superior algorithm by all metrics, with the final 2,000 sample model outpacing the ResNet34 model by 4.5% on F-score. The takeaways from this study are not specific to vehicle detection, as this method can be replicated to detect different objects for many different purposes.

Keywords:
Deep Learning, Object Detection, CNN, ESRI, ResNet

The Impact of Sea Level Rise on Miami-Dade County

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Abstract:

Due to global warming, sea level rise (SLR) is becoming a significant problem for Miami-Dade County, FL. Located at the tip of Southeastern Florida and surrounded by water like a peninsula, the Everglades cover the westside of the county while the Atlantic Ocean surrounds the east and south, siting at an average elevation of 2 meters above sea level over a porous limestone foundation dominated by holes. Water can rise just as fast through the foundation as it is in the surrounding seas. By 2100, sea levels could rise by more than 2.5 meters. With high-tide and storm surges, sea levels could reach 8 meters above the mean sea level, flooding almost 70% of the county. The focus of this paper is to identify the land and roads being inundated as sea levels rise. To map areas that would be underwater when sea levels rise to 1 to 10 meters, ArcGIS Pro map algebra was used in the preparation of flooding scenarios of SLR increments of 2 meters at a time. With the six levels of sea rise scenarios, this information can determine the areas that are at risk of flooding.

Keywords:

King Tides, Storm Surges, Saltwater Intrusion, Porous Limestone, Inundated