

MS-GIST Projects Spring 2024

Friday, April 26

** Presentations will be in person (ENR2 S495) and via Zoom.*

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

**** Zoom links are available on request. Please contact Andrew Grogan - atgrogan@arizona.edu*

Date/Time	Presentation Title	Student Name
04/26/24 09:00 - 09:25 AM (Zoom Only)	Spatial plotting of the Individual Battles, Casualty Rates, and the Strategic Situation of Napoleon's Six Days Campaign	Clinton Austin
04/26/24 10:00 - 10:25 AM (In Person and Zoom)	Landsat Automated Scene Selection Toolbox	Todd Eastman
04/26/24 10:30 - 10:55 AM (In Person and Zoom)	Spatial Analysis of Traffic Crashes in Pima County Exploring Social and Environmental Components	Nancy E. Gamba Gomez
04/26/24 11:00 - 11:25 AM (In Person and Zoom)	Least Cost Path Analysis of the O'odham Oriole Song Series Journey	Mary Todd
04/26/24 11:30 - 11:55 AM (Zoom Only)	Paradise on Fire: 2023 Maui-Lahaina Wildfire Case Study	Francis Mengote
04/26/24 01:00 - 01:25 PM (In Person and Zoom)	Harm Reduction in Arizona - A Web Mapping Approach	Ethan Chang
04/26/24 04:00 - 04:25 PM (Zoom Only)	Arizona National Scenic Trail Re-routes Using Least-Cost Corridor Analysis	Tamara Holt

Spatial plotting of the Individual Battles, Casualty Rates, and the Strategic Situation of Napoleon's Six Days Campaign

Clinton Austin
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04/26/24, 09:00 - 09:25 AM

Abstract:

In the Napoleonic Wars, the Six Days' Campaign between Napoleon and Marshal Blucher took place in the Champagne Region of France from February 10th to February 15th, 1814. Napoleon commanded around 30,000 inexperienced conscripts, while Blucher led approximately 60,000 hardened veterans of the Army of Silesia, which included Russians and Prussians. The project utilizes the Military Symbol Editor to create daily overlays of units' dispossession from both armies. These overlays demonstrate how the armies reacted to the individual battles before and after each engagement. The strategic overlay map showing the armies' dispossession before the campaign's start offers greater context as to why the battles occurred as they did. Polygons are created around the engagement zones of each battle to apply dot-density overlays to the map. Dot density maps the number of casualties from both armies at each battle, which draws attention to the number of losses and the disproportionate rate after each battle. Dashboards allow for an interactive tool for viewers, providing more information about each army and individual units. The story map allows for a historical campaign narrative and combines all overlays for a more significant educational product. The project provides a deeper understanding of military campaigns, not just for history enthusiasts but also for students and educators. Using GIS technology, the maps are interactive and provide an immersive experience for the user, allowing them to explore the campaign in great detail and visualize the events as they occurred.

Keywords: Napoleonic Wars, Military Tools, Digitization, Dot Density, Spatial Analysis.

Landsat Automated Scene Selection Toolbox

Todd Eastman
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04/26/24, 10:00 - 10:25 AM

Abstract:

The manual web-based download and use of United States Geological Survey (USGS) Landsat imagery to perform raster-based geoprocessing analysis is often time-consuming and repetitive in nature. Searching, sorting, and downloading images to cover an area of interest is overly complicated and error-prone due to the naming conventions of the output files and the level of excellent data management skills required. The purpose of this project is to automate web-based date, coverage area search, and download of Landsat imagery so that the Geographic Information System (GIS) analyst can focus on geoprocessing analysis and spend less time on data management. The solution to this problem is in the form of an ArcGIS toolbox developed and written in Python. Inputs to the toolbox include a selected feature (point, line, or polygon), date of interest, percent maximum cloud coverage, and a buffer length used to calculate an extent that buffers the input feature. Given the user's input, the tool searches the Landsat online USGS database for the date and study area of interest to locate the necessary Landsat imagery. The tool output is the downloaded Landsat imagery in the form of a ArcGIS mosaic dataset that encompasses the user's input extent. The tool typically completes this automated process within three to five minutes as compared to a manual process which may take hours if not days depending on the input extent complexity. This tool will provide time saving benefits to any analyst interested in utilizing Landsat imagery in their geoprocessing analysis.

Keywords: USGS, Landsat, ArcGIS, Python Toolbox, Automation

Spatial Analysis of Traffic Crashes in Pima County Exploring Social and Environmental Components

Nancy E. Gamba Gomez
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04/26/24, 10:30 - 10:55 AM

Abstract:

This study aims to understand traffic crash dynamics, focusing on hotspot identification at critical intersections and roads connecting to major freeways in Pima County. It seeks insights into social and environmental factors impacting road safety, facilitating informed decision-making. Despite fatalities comprising only 1.42% of crashes compared to the majority categorized as no injury at 60.90%, the significance of traffic accidents remains high due to their substantial economic, emotional, and social costs, impacting the broader community and region. This project utilizes advanced GIS techniques to analyze traffic crashes in Pima County from 2019 to 2023, aiming to identify high-frequency crash locations, analyze crash types, discern timing and frequency patterns, and investigate human and environmental factors contributing to incidents. Detailed accident data undergoes Hot Spot analysis, emphasizing crash severity, with an initial 100-meter bandwidth to identify significant clusters. Demographic and socioeconomic mapping, referencing non-residential zones, supplements the analysis. The Social Vulnerability Index (SVI) offers insights into regional social dynamics. Most accidents occur in favorable conditions, such as good lighting and clear weather, with rear-end collisions predominant. This pattern implies that driver distraction could play a significant role in these incidents.

Keywords: Crash severity, Pima county, hot spots, clusters, outliers

Least Cost Path Analysis of the O'odham Oriole Song Series Journey

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04/26/24, 11:00 - 11:25 AM

Abstract:

The Oriole Songs are a series of traditional Akimel O'odham songs which describe a journey from the middle Gila River in southern Arizona to the salt flats on the northern coast of the Gulf of California in Mexico and back. O'odham men travelled from their traditional homelands to gather salt, marine resources, and complete a sacred pilgrimage. Anthropologist Donald Bahr recorded Vincent Joseph, a Gila River Indian Community (GRIC) member, speak and sing the Oriole Song series in the early 1980s. The songs reference landmarks along the route, as well as locations mentioned in O'odham mythologies. Although numerous visible trails segments, trail markers, and linear artifact scatters exist in the archaeological record, the exact path of the route remains unknown. This study explores the potential route(s) utilized by Akimel O'odham and Peeposh peoples and their ancestors on the journey described in the Oriole Song series. A least cost path was created using ArcGIS Pro of the entire hypothetical route beginning and ending in Blackwater, Arizona. The results were compared to trails and trail-related features documented in the archaeological record, historic maps, and ethnographic and modern O'odham knowledge. Results indicate that the least cost path successfully predicted the location of documented trails in some segments but diverted away from others. Areas where the least cost path overlaps documented trails suggests these segments were commonly used trails for routine activities, as they were the most expedient route. However, because the least cost path does not come near documented trails in other segments, the Oriole Songs also demonstrate a cognitive geography of the Akimel O'odham social landscape.

Keywords: archaeology, GIS, least cost path, O'odham, trails

Paradise on Fire: 2023 Maui-Lahaina Wildfire Case Study

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04/26/24, 11:30 - 11:55 AM

Abstract:

On August 8, 2023, a devastating wildfire occurred in the county of Maui in Hawaii. This research analyzes: 1) the cause of the wildfire; 2) the emergency services effectiveness in Lahaina; and 3) the financial cost of the wildfire. Different sources such as official statements, news articles, and scholarly articles were used to gather information and ArcGIS was the primary tool for analysis and visualization. The prevailing theory for the cause of the wildfire is that a combination of downed power lines, drought, and hurricane winds may have sparked and spread the wildfire. Visual analysis using imagery and land use for Maui, coupled with reports of extended droughts throughout the islands, strongly suggest that although the downed power lines theory is yet to be confirmed, any small source of fire could have started the wildfire. A network analysis was conducted to verify the effectiveness of emergency services in the vicinity of Lahaina. Per the analysis, the emergency services are sufficient on a small-scale incident, however a huge disaster requires more than the one fire station near Lahaina. Remaining fire stations around Maui would be hard-pressed to reach the small town on time. Using the parcel data from Hawaii Statewide GIS program and calculating the damage within the fire boundary of Lahaina, approximately 2,363 properties, including land and buildings were burned which cost approximately 2.86 billion dollars and 973 homes were destroyed costing around 812 million dollars.

Keywords: Case study, Maui, Lahaina, Wildfire, Network Analysis

Harm Reduction in Arizona – A Web Mapping Approach

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04/26/24, 01:00 - 01:25 PM

Abstract:

In the United States, the number of people who die from drug overdose has been climbing since 1999. This phenomenon is commonly referred to as the opioid epidemic. Overdose deaths are not the only concern associated with this epidemic, either. Methods of opioid use such as injection can lead to other health problems such as the transmission of bloodborne illnesses if performed unsafely. To counteract the impact of the opioid epidemic, a method known as harm reduction has been adopted by the public health community. While harm reduction describes a variety of medical practices, the overall aim is to provide specialized healthcare for people who use drugs, given their unique medical needs. In Arizona, one agency responsible for coordinating harm reduction efforts is the University of Arizona's Harm Reduction Research Laboratory. This project was conceived as part of that agency's efforts. After surveying every pharmacy in Arizona, the Harm Reduction Lab was interested in creating a publicly available web map displaying the survey results. This project outlines the procedures taken to produce that map, from geocoding and editing address points, to cleaning and hosting the data in an online format, and finally creating a web map ready for public exposure. The final product is a web map of every pharmacy in the State of Arizona, with detailed information of which pharmacies offer harm reduction services and which types of service they provide. The web map is publicly available and can be used on both PC and mobile devices.

Keywords: Harm Reduction, Web Mapping, Arizona, Pharmacy, GIS

Arizona National Scenic Trail Re-routes Using Least-Cost Corridor Analysis

Tamara Holt
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04/26/24, 04:00 - 04:25 PM

Abstract:

The Arizona National Scenic Trail (AZNST) is an 800-mile non-motorized path the length of Arizona from the border Mexico to Utah, crossing very diverse terrain from deserts, mountains, canyons, and forests. The Arizona Trail Association (ATA) is a non-profit organization that protects, maintains, enhances, promotes, and sustains the Arizona National Scenic Trail for hikers, mountain bikers, and equestrian riders. The ATA organization has 12 trail re-routing projects in 4 of the National Forests (Kaibab, Coconino, Tonto, and Coronado) totaling 70 miles of various lengths (0.1 miles – 25 miles). The goal of this study is to create a least-cost corridor and optimal path model in ArcGIS Model Builder to help streamline the process of determining trail reroutes that will incorporate environmental sustainability, safety, comfort, and aesthetics. The study focuses on three sections of the AZNST within the Coconino National Forest – Anderson Mesa (12 miles), Maverick (25 miles), and East Clear Creek (3 miles). These study areas were chosen since extensive field work and GPS field data points have been gathered from two of the locations (Anderson Mesa and Maverick). The field data was compared to the least-cost corridor and optimal path generated by the model. The model was applied to the third study area, East Clear Creek, which has steeper terrain to verify if the least-cost corridor and optimal path followed the natural contour lines of the terrain.

Keywords: Arizona Trail Association, Arizona National Scenic Trail, optimal path, least-cost corridor, ATA, AZT, AZNST.