GEOINT 2018 Symposium
Student Poster Abstracts

Misdiagnosis of ADHD in the Black Community
Phillip Agbesi, North Carolina Central University

ADHD which stands for Attention-Deficit/Hyperactivity disorder is often diagnosed to children and is characterized as having trouble staying focused, excessive activity, sitting for long periods of time to name a few. More often than not the diagnosis is mainly given to boys and historically white male children are the most diagnosed by a percentage. However as of recently the amount of black/latino children who are being diagnosed has increased 70% from 2001 to 2010. Through statistical observation it can be seen that there are higher rates for ADHD in the southern United States, which also houses the highest black population as a percentage and in the black community it contains the highest rates of single parent households and most of the time the single parent is the mother. Many of the symptoms of this "disease" ADHD however can be often triggered and go uncontrolled because of the lack of discipline that would typically be given by the father. This meaning that instead of black children being consoled and disciplined, the children are castigated and mislabeled with a disorder that could be fixed in due time.

How to Steal an Election: Gerrymandering in America
Andy Avilia, George Mason University

Gerrymandering has been a political issue for a long time now but legislation has been slow to act against it. However, there have been some recent changes due to the introduction of the Efficiency Gap. The Efficiency Gap is a formula used to calculate the magnitude of whether a congressional district has been gerrymandered or not. Recently, the Supreme Court heard a case involving gerrymandering in Wisconsin that was based on the use of the Efficiency Gap. There is now the potential of having a concrete definition to measure partisan gerrymandering and this can mean far reaching implications for the future composition of Congress. In this project we attempted to find what sorts of factors can lead to higher Efficiency Gap values thus being correlated with either higher or lower gerrymandered districts.

Remote Sensing in Agriculture
Raven Balthrop, North Carolina Central University

Remote sensing is a term used for the identification and collection of information without having physical contact with the object of study, Agriculture. The most common types of remote sensing used in agriculture are divided into four main categories of resolution: spatial resolution, spectral resolution, radiometric resolution, and temporal resolution. Spatial resolution is the distance between the image that is being studied, and the instrument which is sensing it. With spectral resolution, information can be obtained regarding crop health and by determinations as the color of plants – bright green healthy plants will have a different spectral wavelength than dying or decaying yellow or brown colored plants.

Using the NC Vital Statistics Database to Examine the Spatial Distribution of Ulcerative Colitis in North Carolina
Cory Caddell, North Carolina Central University

Falling within the same class of diseases such as Crohn's Disease, Ulcerative Colitis is the medical condition which is an inflammatory bowel disease (IBD) that causes long-lasting inflammation and ulcers (sores) in your digestive tract. Ulcerative colitis affects the innermost lining of your large intestine (colon) and rectum. This disease can sometimes lead to life-threatening complications. While it has no known cure, treatment can greatly reduce signs and symptoms of the disease. There has been little work to explore the spatial distribution of this phenomenon in the United States, as most work on this subject has done so at a coarse scale. Using tabular data provided by the North Carolina Vital Statistics Database (https://dataverse.unc.edu/dataverse/NCVITAL), deaths in which Ulcerative Colitis is noted as a primary and secondary cause of death using an ICD (International Classification of Deaths) can be queried from these data. Between 2000 and 2014, there were 90 deaths primarily attributed to Ulcerative Colitis, and almost 331 deaths have had Ulcerative Colitis listed in their death certificate via an ICD code, which can mean that this disease played a factor that lead to their death.

Using GIS (Geographic Information Systems) techniques, results from this tabular analysis can be summarized at the zip code level and mapped across the state of North Carolina. This presentation will highlight the data sources used in the analysis, agglomeration techniques, challenges in working with these data resulting in the spatial distribution of Ulcerative Colitis throughout the state and patterns attached to this disease.

Mapping Water Depths at Different Tide Levels
Josh Calloway, University of South Carolina

In South Carolina, water levels can fluctuate as much as ten feet between high tide and low tide. Low tide can leave areas dry that had several feet of water at high tide and uncover navigational hazards such as oyster reefs. Emergency responders need to know what areas can be accessed at low water and what areas can be utilized at high water for faster response.

This study will explore the data sources from NOAA nautical charts to extract the water depths at mean lower low water (MLLW). The water depth data from these nautical charts will be combined with tide chart data to interpolate water depth surfaces at high and low tides. These interpolated maps will be compared to aerial imagery taken at different tide levels to show where navigation is possible for each tide. These maps will be a navigation aid to emergency responders.

The Rise of Cocaine Supply into the US since 2016
Marisela De La Cruz, Penn State University

Given the geostrategic facilities, Colombia is the United States' primary supplier of cocaine. In fact, more than 90 percent of smuggled cocaine into the US comes from Colombia, whereas less than 10 percent comes from Peru. Despite manual and aerial eradication, the political environment in Colombia regarding peace negotiations has had an impact in the recent massively increased production of cocaine. Thus, cocaine seizures in United States has paralleled the rise in Colombian cocaine production. These choropleth maps (map 1 and map 2) represent the seizures in the US during 2015 and 2016, after significant reduction of manual and aerial coca eradication methods in Colombia. The increase of cocaine production in Colombia pose a threat to the United States. Even if cocaine is not viewed as the current greatest drug threat, overdose deaths caused by cocaine has increased from 2015 to 2016 in the United States (map 3).

The Use of Different Optimization Algorithms to Define Service Areas of Police Stations for Portugal
André Filipe Mendes Duarte, NOVA Information Management School, Universidade Nova de Lisboa

In the framework of the project SIM4SECURITY (Forecast and Spatial Analysis Model for Public Security, Ref. FCT - PTDC / ATPDEM / 1538/2014), we studied the optimization of the distribution of security forces, taking into account socio-economic characteristics of the population in continental Portugal. The objective of this research was the creation of spatially contiguous regions using advanced spatial analysis tools, such as genetic algorithms in python language and in GIS environment (ArcPy or Gdal / OGR), that allow the visualization of solutions in space. This analysis enables the establishment of relationship between the population and their security needs, which will be considered in the attribution of the territorial arrangements of the security forces in Portugal.

A Spatial Data-Driven Response to the Opioid Epidemic in Massachusetts
Parker Edmonds, Northeastern University

On October 26, 2017, the U.S. Department of Health and Human Services declared the opioid epidemic a nationwide public health emergency. This project uses population based, spatial data-driven approaches to address the epidemic by appraising disparities in access to naloxone across Massachusetts. Results identify nine towns, experiencing multiple overdose deaths per year, without standing orders of naloxone at pharmacies. The project also uses overdose incident data acquired from the Cambridge Police Department for focused analysis. The purpose to establish street corners and public transportation stations where overdoses reoccur and pinpoint hotspots that would benefit from immediate access to naloxone. This analysis will be shared with General Emergency Medical Supplies (G.E.M.S.), a local startup, to assist with their pilot program of "where to install" naloxone dispensaries throughout Cambridge. Their goal is to allow bystanders to save a life by retrieving naloxone from the lockbox and administering the antidote to the victim.

Examining Virginia's Shenandoah Valley Farmland Streambank Restoration Practices Utilizing Geospatial Technology
Rhiannon English, James Madison University

The Shenandoah Valley encompasses some of the highest agricultural producing regions in Virginia, many of which are large contributors to non-point source pollution. The Conservation Reserve Enhancement Program (CREP) aids participating landowners in restoring riparian buffers to limit pollutant runoff impact on into freshwater and saltwater ecosystems. The study works to determine how spatial and temporal factors impact the effectiveness of riparian buffer restoration by measuring water quality through macroinvertebrate biotic indices (HBI, VA-SCI, and Shannon Diversity) and GIS analysis was employed to calculate land use characteristics surrounding farmland regions. Single variable, multiple variable, and linear regressions were performed within the watershed and buffer zones. It is hypothesized that greater lengths of implementation time will have a positive effect on the water quality of the streams. Additionally, it is hypothesized that certain variables can predict water quality, and determine biotic index relationships from both landuse characteristics and time since restoration.

Developing Iso Clusters On GIS Using UAV Orthophotography
Katherine E. Gates, North Carolina Central University

This research project uses data collected from the Drone Wetland Assessment Project DWAP to classify and analyze remotely sensed data in order to detect non-organic debris and measure the amount of change in non-organic debris over time. This project will take place at a small wetland area in central Orange County North Carolina. The goal of this project is to use aerial photography collected by an Inspire 1 UAS and Phantom 4 UAS to develop an automated process that will identify the different spectral signature of non-organic debris. This project is intended to create a methodology that can be incorporated with existing imagery to identify and classify "trash" in the natural environment. This research

imported the high resolution aerial photography produced by DWAP into ArcGIS spatial analysis software where each pixel was assigned a specific grouping (Water, Grass, Inorganic). An automated supervised classification was conducted using spatial analysis extension in Arc Map 10.3 in order to assign the rest of the pixels in the image. After conducted the supervised classification, analysis was conducted on each of the classified images to determine if the classification correctly identified the difference between organic and non-organic materials. Ultimately, this research will be used to develop a more efficient process of trash detection in local wetland environments.

Monitoring Radioactive Releases from Fukushima: A Comparison of Data and Models
Carolynne Hultquist, Penn State University

Previous work shows that citizen science data provides a reliable estimation of the spatial distribution of concentrations of radiation around Fukushima when compared to government data. A new methodology is presented for comparing a Lagrangian atmospheric transport & dispersion model and a Gaussian model to government and contributed radiation dose rates observations. The comparison of areas of elevated radiation shows that the citizen science observations align with the prediction of models representing dynamic behavior of radionuclides dispersed in the environment. Long-term citizen science projects can be used to address environmental concerns and understand human impacts when comparable sources of government data are not available.

1906 vs. 2018, Earthquake Impact on San Francisco
Jong Su Kim, University of Southern California

San Francisco's importance as a cultural, political, and economic center is undisputed, as is the city's vulnerability to earthquakes, especially "the big one." But the full scale of destruction possible even in 2018 is not fully comprehensible to today's residents. By drawing on historical data on the 1906 San Francisco earthquake, we can have a better understanding of what a similar earthquake might cause today. This poster will look at HAZUS, a tool used by GIS professionals to quantify earthquake preparedness and response, and an attempt will be made to fill potential holes using the Center for Disease Control's Social Vulnerability Index, and our own vulnerability indicators: like liquefaction, and hospital Structural Performance Category (SPC) ratings. This project is based off a team assignment for SSCI 401: Geospatial Intelligence. My partner was Leonard Ngo, and the class was taught by Dr. Steven D. Fleming.

Using Augmented Reality for Terrain Visualization in Support of Mission Planning and Professional Development
Jacob Marchillo, U.S. Military Academy at West Point

Despite its status as the world's premier ground combat force, the US Army continues to rely

on two dimensional maps for mission planning [e.g. intelligence preparation of the battle field (IBP)] and to educate its leaders in current tactics, as well as, presenting those tactics as executed in historic battles. Technology today enables far greater capability compared to the maps of old to support the warfighters' requirement to better visualize the operating environment. The intent of this project was to generate three dimensional (3D) terrain from aerial photos acquired via consumer grade drones in order to demonstrate the applicability of augmented reality technologies for 3D terrain visualization in use cases ranging from IBP to virtual staff rides.

Electric Vehicle Charging Station Locations: A Suitability Analysis in Redlands, California
Madison Mays, University of Redlands

Electric vehicles play an important role in contributing to a more environmentally friendly world. In order to achieve this, local governments must begin preparing for the change in infrastructure required for the installation of electric vehicle charging stations (EVCS). In collaboration with the City of Redlands, a suitability analysis was performed determining optimal locations for EVCS throughout the city with results presented in the form of static maps. This suitability analysis was completed by creating a tool using python script to weigh criteria for EVCS station locations. This tool additionally has the ability to be modified in the future for determining optimal locations as EVCS demand changes. The findings of this project serve the needs of electric vehicle users and overall contribute to a healthier, more sustainable world.

Revelations from Lidar: Maya Ground Reconnaissance
Kevin Mercy, University of Southern California

Archaeological field investigations of the Maya people have always been limited due to the thick jungle environment in which Maya sites are located. Due to the ability of Light Detection and Ranging (Lidar) data to penetrate jungle canopy, the recent PACUNAM Lidar data acquisition has provided high resolution surface data of several Maya regions in Guatemala. The Lidar data has revealed numerous unknown Maya sites which have become the focus of ground reconnaissance investigations. Analysis of the Lidar data and insights from the ground survey attest to the accuracy of the remotely sensed Lidar data, and demonstrate Maya settlements to be much more expansive than previously thought. The Lidar data is transforming traditional field survey methods and is providing new interpretations of Maya settlement patterns and of the ways in which Precolumbian polities interacted.

Assessing California's Thomas Wildfire and Debris Flow Risk with Multispectral Imagery
Erik Neeman, University of Utah

Multispectral Sentinel-2 imagery is used to investigate southern California's Thomas fire and subsequent debris flows in Montecito from December 2017 to January 2018. The pre- and post-fire environment is examined with the Normalized Burn Ratio to identify burned areas, which are then combined with a digital elevation model to broadly identify erosion potential. This assessment is further refined by adding precipitation data to generate a simplified debris flow risk product aimed at detecting high-risk locations that are currently inhabited or may be in the future. The normalized burn ratio is shown to be an effective measure for identifying burn-scarred areas. These burn regions may then be susceptible to increased debris flow risk if coincident with steep slopes and a sufficiently high-intensity precipitation event before regrowth and recovery occurs. Areas identified by the debris flow risk product are compared to observed debris flow regions in Montecito on 9 January 2018.

Using Sentinel-2 Data to Analyze Maritime Patterns in the South China Sea
Nicolette Niemiec, University of Redlands

The massiveness of the ocean makes it difficult to obtain detailed information regarding irregular maritime activities, such as ships standing still for days in the deep ocean. With the use of Sentinel-2 satellite images, AIS data, and an emphasis on remote sensing, a desktop application was created to alert the user of abnormal ship behavior in oceanic areas. The objective of this project was to analyze the identification and classification of ships to produce an improved understanding of nautical patterns. The South China Sea was the initial interest to the client due to national security, current territorial claims, and disagreements between the United States and China. The operations of trade, military maneuvers, fisheries, and the surrounding countries depend on the patterns of maritime movements. The feasibility of this application to input images from drone data and output abnormal ship behaviors was also tested.

DEEPNET - An Extensible Enterprise Framework for Rapid Geospatial Image Dataset Production
Tyler Nivin, University of Missouri – Columbia

Recent research has well established that Deep Learning methods are the state of the art for remote sensing scene classification and object detection. Training deep machine learning models (DLM) to achieve state-of-the-art performance requires a large amount of quality training data. While numerous general datasets have been published recently for remote sensing research, developing specialized datasets is necessary to operationalize DLM for real-world tasks. Therefore, we have developed a framework for the production of task specific image datasets; which includes open-/crowd-sourced vector data ingestion, curation, image acquisition, and dataset generation. These datasets can be used to train networks for a variety of applications including but not limited to: urban development tracking and planning, agriculture health monitoring and planning, military site discovery

Your Tweets Are My Targets: Open Source Tracking of Adversary Weapon System Development
Molly Phillips, C1C, U.S. Air Force Academy

I worked at the Defense Intelligence Agency in Washington D.C. this summer and was given the problem that an adversary nation was creating a weapon system we are trying to put an end to. I was tasked with locating individuals working for the different companies manufacturing this weapon system in order to make a non-kinetic kill of the weapon system. I analyzed open source media in conjunction with Top Secret reports in order to identify over 650 employees, the Research University they are attending to learn their skills, and published 8 reports into the Intelligence Community.

Spatial Analysis Flood Risk Assessment for the City of Boston
Rebecca Reuss, Northeastern University

Climate change is increasing the frequency of severe weather events, including hurricanes and tropical storms, which generate heavy rainfalls that negatively impact communities. Development projects in urban areas increase the percentage of impervious surfaces and reduce the acreage of vegetation available to absorb resulting water. The consequences of unregulated land use were evident from flooding experienced in greater Houston, TX, during Hurricane Harvey in August 2017. This project identifies developments in Boston, MA, constructed in high-risk locations that may suffer similar adverse effects from severe flooding. Geospatial data and a cloudburst flood risk model are applied to identify low-elevation sites that may collect rainwater and overflow during a storm. The distribution of at-risk buildings is understood in relation to impervious surfaces that prohibit natural drainage. They are compared with flood hazard zones designated by FEMA and the City of Boston to identify new locations for flood prevention strategies.

Predictive Analysis on V2 Strikes in WW2 London
Ryan Smith, Penn State University

The V2 Ballistic Missile was designed and used to attack multiple countries opposed to Germany during WWII. The first of its kind, the V2 was able to inflict massive damage and be reasonably accurate (4.5 km circular error probability reported during tests). This project entails using predictive analysis of V2 strikes on London using different predictive analyses including inductive and deductive methods. There were multiple cities targeted by the V2 weapons system, but this project focuses on London as an area of analysis primarily because of the detailed historical records available.

The main project purpose is to gain insight into the V2 weapons system which includes the

accuracy of the system as well the change in impact sites throughout the campaign due to Britain's disinformation campaign (Double-Cross system) by using geospatial methods of research.

Food Security: Low Income vs High Income Neighborhood Nutrition Sources
Tysean Wooten, North Carolina Central University

This study plans to examine the spatial relationship between the neighborhoods of low and high annual income levels and their proximity to nutritious food sources. Many low income families are forced to eat from food places that are not fulfilling their nutrition needs. Higher income families have healthier grocery stores around them and can afford its price. It will also look at the relationship between specific health problems caused by consuming food that is not as healthy such as junk food and fast food in the low income communities. By using a GIS (Geographic Information System), we can map out and analyze where food deserts are located and how they affect the people in that community. The study will feature the access each community has to healthy food in Raleigh, NC and the towns surrounding it. We will then be able to see the food deserts in this area and work to put better food options in that community which will reduce the health issues many face in low income communities due to an access to more affordable, nutritious food.