Applied Geography Conference AGX 2022

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Book of Abstracts

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Exploring Career Paths Workshop: For Students and Recent Graduates

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Striking out to build your career can be daunting, even as a geographer who has many skills, talents, and a robust knowledge base. In this coaching-workshop session, Catherine Lee and Dawna Cerney aim to help you shape your steps from student to career professional with an examination of your personal key values. As an active participant, you will begin to dig into your strengths while considering your weaknesses to help direct your career path. The workshop will include guided personal reflections and discussion to help determine where you have previously shone so you can illuminate your future. A synergistic discussion to identify novel and emerging career possibilities is a key component of this session.

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Career Changes Workshop - Investigating Opportunities and Personal Directions for Mid Career Professionals

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Changing directions mid career, whether it is a personal choice or imposed, can feel intimidating and overwhelming. The highly elastic and intrinsic characteristics of a geographer can manifest careers in both traditional and emerging fields, as well as be a natural fit for intriguing, evolving and unexpected career fields. Join personal coach and career chameleon Catherine Lee along with Dawna Cerney academic geographer if you are considering or in the midst of a career change. This coaching workshop is intended to help participants hone in on personal areas of interest and key personal values to recognize industry areas that may not otherwise be considered. Participants will be asked to identify their soft skills that are valued by industry and government while leveraging their geographic skills.

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Indigenous Peoples and COVID-19 in health regions of Canada

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Indigenous peoples are generally at a greater risk of poor health outcomes than non-Indigenous Canadians. Emerging data from the COVID-19 pandemic has revealed higher infection and mortality rates of the elderly, Indigenous, and health-related vulnerable populations, which points to pre-existing health disparities and inequities among this population. This research focuses on the

socioeconomic and health vulnerabilities to the COVID-19 pandemic among Indigenous peoples living in Canada's health regions. Using microdata from the 2017 Aboriginal Peoples Survey, the paper represented social, economic, and health-related deprivation indicators of the 970,000 Indigenous peoples living in urban areas (off-reserve). These socioeconomic deprivation indicators were then integrated with the 2021 population estimates of Statistics Canada and comprehensive health region summaries from Esri's data hub for COVID-19 data. Bivariate local indicators of spatial association (BiLISA) cluster maps revealed considerable geographic variations in measures of social and health vulnerabilities of Indigenous peoples to COVID-19. Results provide preliminary evidence of socioeconomic inequities in the distribution of infection fatality and case fatality from COVID-19 to Indigenous peoples in Canada. The research suggests focusing on culturally appropriate social and health determinants for inclusive and effective health-related emergency planning and programs.

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The effects of globalization and renewable and non-renewable energy consumption on economic growth in Canada: Does ICT development make a difference?

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Abstract

The impacts of globalization on national economies through the cross-border exchange of knowledge and ideas, goods, technology and services are evident worldwide. With this notion, we empirically assess the roles of globalization and renewable and non-renewable energy consumption on economic growth within the purview of financial development and ICT development in Canada for the period 1981-2020. We employ a novel quantitative technique, the dynamic autoregressive distributed lag (DARDL), to analyse the co-integrating and counterfactual relationships among the variables. We find that globalization, renewable and non-renewable energy consumption, financial development, and ICT development positively affect economic growth. In the short run, all variables show a positive relationship with economic growth except for financial development. We confirm the robustness of this study's findings using the Dynamic OLS (DOLS) approach. Due to the mixed order of integration in the series, we apply the Toda-Yamamoto causality test and the findings divulge that there is a bidirectional causal link between globalization and economic growth, renewable energy consumption and economic growth, and non-renewable energy consumption and economic growth. It is also found that there is a unidirectional causal link of financial development to economic growth, ICT development to economic growth, globalization to financial development, and globalization to ICT development. We provide several significant policy implications.

Keywords: Globalization, Renewable energy; Non-renewable energy; Economic growth; ICT development

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Career thinking among geography majors in a sophomore class at UNT

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Contemporary university geography programs face challenges in an increasingly enrollment-driven environment. Students are seeking degrees with straight-forward pathways to careers. Faculty members are forced to confront the question "why geography as a major?" It is well known that the merits of a geographic perspective are not understood in the United States, and the discipline is widely and inaccurately described as one of "maps and capitals." This limiting belief presents a challenge when attracting majors, but even those students who choose geography—in our experience—are not clear on what they will do with a geography degree. In our undergraduate degree program, we are adopting key strategies to prepare our majors for careers. We approach the challenge of preparing undergraduates for careers in our sophomore class, Foundations of Geographic Research, by adopting three principles: 1) students know that they are interested in geography, but they are commonly not able to articulate why; 2) students do not know how geographic knowledge is produced; and 3) geographic knowledge is produced through effective use of research skills that are relevant to many career paths. We teach the class in four blocks to challenge students to question their interests within the field, to articulate why they are geographers, to learn and convey the merits of research skills, and to choose their own path within the major. In this presentation we describe those four blocks related to the three principles described above.

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Papers in Applied Geography: Meet the Editors

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*Papers in Applied Geograph*y is the official journal of AGX. Join our session for useful insights for both the novice and established author. You'll hear from each topically focused associate editor on the types of manuscripts they seek, the types that have been recently accepted, and common characteristics of both accepted and rejected papers. The editor-in-chief will conclude the presentations with information about the submission and review process and what you can expect as an author. [Jay, insert here what you think you'll cover]. After these brief presentations there will be ample time for both Q&A and to connect with the associate editor in your specialty area.

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Teaching Problem-Solving and the Practice of Applied Geography: Thoughts on Career Readiness

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One of the most central contributions post-secondary education can provide to its students is provision of the knowledge and skills needed to begin and prosper in their chosen careers. Career readiness is thus a goal that faculty in applied geography must understand and be equipped to address. This paper focuses on a specific challenge within this career readiness realm: the ability to solve problems. Here we discuss the meaning of "problem-solving", how it relates to the linked concepts of "research" and "exercise completion", and explore considerations in setting paths for students to follow to problem-solving success in the specific context of business GIS.

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Building teamwork and geospatial skills in introductory human geography

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In my introductory human geography course, students work in teams to construct a GoogleEarth Web Virtual Tour of an assigned country. Each tour must include destinations that represent human-environment interaction, and the geographies of population, culture, politics, economies, and rural-urban places. Students gain experience with teamwork, geographic representation, identification and evaluation of geographic information, and the application of geographic theories to a real-world context.

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Incorporating Career Preparation and Professional Development into the Curriculum

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In our related paper session, we stated that undergraduate research is sometimes dichotomized into "academic" research that prepares students for graduate programs and "applied" projects that are oriented toward preparing students for specific career paths. We argue that such is a false dichotomy and that research skills are at the core of both applied and academic work and provided curricular examples of student research projects that are used as a means to apply geographic knowledge and methodology to solve real-world problems and to build a range of transferable skills that prepare students for careers. In this panel geography scholars, educators, and professionals discuss these same topics to evaluate just how geographic problem-solving skills translate into research and professional careers.

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How special is "specialty"? Applying a spatial econometric model to contrast the location drivers and trade area compositions of specialty grocers and traditional supermarkets in the United States

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For two decades, specialty grocers have been common players in the retail landscape, particularly in the U.S. Chains like Whole Foods, Trader Joe's, and The Fresh Market have made a splash in the grocery sector with their improved shopping experience and gourmet assortments. The increasingly competitive landscape created by these newcomers with a unique offering prompted even the more time-tested, traditional supermarkets such as Kroger and Safeway to rethink their approach to the grocery business. Many business scholars and economists have made great efforts to understand the value proposition of these specialty grocers, and gauge their long-term viability in the retail economy. Geographers, however, have been noticeably and uncomfortably silent on specialty grocery stores, in spite of the rich history of geographic studies of traditional supermarkets dating back to the 1960s. There remains an outstanding opportunity to contrast the location drivers of specialty grocers to those of traditional supermarkets. The purpose of this study is to leverage spatial econometric modeling to identify universal location patterns and key drivers in the siting of specialty grocery stores in the contiguous United States, and to compare these drivers to those of traditional supermarkets, which have already been theoretically and empirically defended. Our methodological approach will begin with an exploratory spatial data analysis (ESDA) of specialty grocery locations in the contiguous United States, followed by a spatial econometric model that will contrast the impact of various locational and demographic factors in siting specialty grocers versus traditional supermarkets.

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US-99 - California's "Main Street" Measuring Gas/Food/Lodging "Attractiveness"

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The "Huff Model" and the "Location Quotient" are two tools in the geographer's toolbox in measuring a communities "geographic strength" as well as "geographic pull" relative to other communities in the area. US-99, the predecessor to CA-99, has been known as "California's Main Street," running from the Mexico border to the Oregon border as well as points further north. Once I-5 was completed in the early 1970's, much of CA-99 north/south traffic shifted to the faster route, though less services were available to the traveler. This research specifically looks at CA-99 between Bakersfield and Stockton, and how each community pulls specifically for gas/convenience stores, food (restaurants), and lodging. Are the quantities of establishments serving the "local" population, or are they pulling from outside the region? Has population change/growth had an impact. Do community pull attractors (i.e., universities, gateways, etc.) influence the gas/food/lodging base. Quality of the establishments? Easy on/off the freeway? What role does older motels and/or historical community stigma play? Besides measuring "geographic strength" and "pull," this paper will describe some "key takeaways" and "strategies" for select communities.

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Sustaining Human Nutrition in an Increasingly Urban World

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The complex interaction between social, economic, and environmental processes coupled with the transformation of the landscape due to urbanization and technological development has impacts on human welfare and ecosystem services. The need to balance societal needs with environmental concerns presents many complex relationships that shape decisions about urban sustainability. Many countries are experiencing rapid urbanization, especially developing countries, and therefore, a conceptual framework that allows planners and decision-makers to better understand the impact of land use choices on societies and the environment is needed. The research presented here proposes the Urban Nutrition (UN) framework that conceptualizes these complex relationships and exemplifies how a decision-maker may use such a framework in the context of local nutritional security by evaluating the relationship between patterns of urbanization, the use of agricultural production technologies to improve the nutritional output of agricultural land, and assessment of environmental degradation represented by soil erosion.

AGC22 / 13

How Small Towns Can Capitalize of the Work from Home Movement Post Covid

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This panel session is part one of a two-part series on Small Town Revitalization. Points of discussion will explore ways small towns can become attractors to potential transplant residents through the new "work from home" job market. Explorations include "What are some challenges, and economical solutions for these communities?" "How can geography facilitate supporting this opportunity and challenge?" "Is there a minimum distance a community need to be from a larger metro?" "Other amenities such as schools and safety a requirement?" "Is there a minimal level of "retail" (i.e., gas, full-service grocery stores, restaurants, pharmacies, etc.) that is required to attract new residents." Opportunities for regionalism?"

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Small Town Revitalization and Placemaking

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This panel session is part two of a two-part series on Small Town Revitalization. Panel members will examine ways in which small towns can use "placemaking" to build both community and be an

attractor for tourism in bringing non-residents into your downtowns or town squares. Examples of successful communities will be used as case studies to facilitate new ideas. What are some of the challenges, and what community involvement is needed? Can geography be an asset?

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Air pollution monitoring and environmental justice

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Environmental air pollution remains a major contributor to negative health outcomes and mortality but the relationship between socially vulnerable populations and air pollution is not well understood. Although air pollution affects all people, the combination of underlying health, socioeconomic and demographic factors exacerbate the impact for socially vulnerable population groups. This paper seeks to understand how air pollution monitor placement strategies may neglect social vulnerabilities and therefore, potentially underestimate exposure burdens in vulnerable populations. The results for a large population city indicate twelve variables as significant for ozone air pollution monitoring spatial scales – 6, 10 and 20 km. Higher per capita income ($p<.05$) and multi-unit structure housing type ($p<.05$) predicted coverage by existing monitor system, while higher percent of mobile homes ($p<.001$) predicted no-coverage. These results indicate that existing pollution sensor coverage may neglect areas with concentrations of socially vulnerable populations and future monitoring placement decisions must address this imbalance.

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Sustainable Development Goals and Geospatial

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The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, including the United States… provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. In this session we will invite papers that highlight the use of spatial thinking in addressing various issues of sustainability. Esri will share the work that we are doing to help countries, agencies and citizens alike achieve the SDGs including an overview of how GIS and geospatial information plays a role, and latest resources developed to support the community.

AGC22 / 17

Designing Student Research Projects for Professional Development

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Research projects are a way to help students develop disciplinary and transferable skills that can contribute to their professional development and career preparation. However, how research projects are structured will impact the kinds of skills students are exposed to. In particular, structured versus unstructured tasks focus on different skills. On one end of the spectrum are highly structured aspects of projects where instructors outline everything students should do step-by-step. For example, lab exercises guide students through a specific process often to achieve a correct answer. In contrast, unstructured aspects of projects are more open-ended and require students to decide what steps should be taken. In many ways, deciding which aspects of a project should be structured versus unstructured is a trial and error process for instructors. But we often make these decisions based on the time constraints of the course given the amount of content we want to cover. In this talk, I use examples from several applied geography course projects to discuss the strengths and challenges of structured and unstructured components of research projects and highlight the professional skills students can develop.

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How do we define access to government services?

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As the pandemic changed where and how we work, where we transport ourselves and our families, how we get life and health essentials like food and medicine, and how we access social services. In an urban environment, networks of knowledge mattered just as much as transportation, and in fact, the two are often congruous. Knowing where to go is one thing, knowing how to access what you want once you get there, and getting the government or institution to provide it during a time of shifting policies is a whole other. This paper session explores that uniquely dynamic environment.

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Risk Factor Variations of US County-Level Cancer Mortality, A Geographic Random Forest Approach

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Background: The association between cancer mortality and risk factors may vary by geography. However, conventional methodological approaches rarely account for this variation. **Methods**: This geospatial cross-sectional study included individuals who died from cancer during 2008-2019 in the US, aggregated at the county level. We applied conventional random forest models nationwide and by US region, and the geographical random forest model (accounting for local variation of association) to assess associations between a wide range of risk factors and cancer mortality. **Results**: Based on the variable importance measure, the random forest models identified multiple risk factors highly associated with cancer mortality, including smoking, receipt of food stamps, and obesity. The geographical random forest model further identified risk factors that varied at the county level. For example, receipt of food stamps was a high-importance factor in the Appalachian region, North

and South Dakota, and Northern California; smoking was of high importance in Kentucky and Tennessee; female-headed households were high-importance factors in North and South Dakota. Geographic areas with certain high-importance risk factors did not consistently have a corresponding high prevalence of the same risk factors. **Conclusion**: The associations between cancer mortality and risk factors vary by geography in a way that does not correspond strictly to risk factor prevalence. The degree to which other place-specific characteristics, observed and unobserved, modify risk factor effects should be further explored. This work suggests that risk factor importance may be a preferable paradigm for selecting cancer control interventions compared to risk factor prevalence.

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Powerful Geography in K-12 and University Teaching and Learning

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The Grosvenor Center for Geographic Education and National Center for Research in Geography Education at Texas State University propose a new framework for geography teaching called Powerful Geography, which revolutionizes the traditional top-down notion of standards in geography education developed 25+ years ago. Powerful Geography offers a new conceptual approach to professional development for K-12 and university-level educators. This new approach aims to model geographic knowledge and skills from the bottom-up to offer the best preparation that students need to attain personal and career goals and aspirations. Our panel will discuss the rationale for Powerful Geography and describe how it builds on prior research. We will describe the utility of our Powerful Geography website as a resource for educators and discuss the national and international perspectives that informed this new approach. We will present our multi-year research and development plan and open conversation about ways to apply the concepts of Powerful Geography in the classroom.

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Communities, GIS, and Drones in Belize

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Little has been published in the geography literature about how we might develop longer-term community-based research training programs for undergraduate students and K-12 teachers, especially in international field settings. Here, we seek to contribute to a broader discussion of how to intentionally train future geographers and educators in international, community-based research programs. Such programs can emphasize community-university collaboration, alternative forms of knowledge production, and research deliverables that extend beyond papers and conference presentations. We address two questions in this presentation. First, what might community-based research training programs for students look like? Second, what key skillsets will students take away from

a community-based research experience? We use these practical questions to inform our broader discussion as part of an evaluation of student learning in our National Science Foundation Research Experiences for Undergraduates & teachers training program in Belize.

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Use of Open-Source Web-Based Maps, Aerials, and Street Views in Banking Due Diligence

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When a lending institution is evaluating properties as collateral for mortgage loans, the reports obtained by vendors such as appraisers and environmental consultants sometimes raise additional important questions that the vendors cannot adequately answer. Fortunately, open-source web-based mapping applications like Google and Bing Maps, including their street-view, bird's-eye, and aerial view features, offer a relatively quick, effective, and low cost way to obtain critical insights on the current and past condition of a lending institution's collateral properties. Although the properties are located throughout the United States, insights can be easily obtained from a desk in an office located anywhere. In this session, the head of the appraisal department for a nationwide bank with $18 billion in assets, consisting primarily of commercial and industrial properties, will discuss actual case studies involving the discovery/affirmation of suspected cases of loan and/or appraisal fraud, as well as affirmation of critical property attributes, using these applications. Examples will include unpermitted construction at a gas station, the addition of an unpermitted mezzanine to an industrial building, a "minor renovation" to a house that was proven to be a complete tear-down and rebuild without proper permits, an appraiser who certified that he inspected four adjacent buildings but somehow did not notice that two of them had been demolished, and a case where the viability of two billboards, which an appraiser had declared inconsequential, was verified by multiple Google street views over several years showing that they continuously had active advertisers.

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Building Resilience against COVID-19 in urban Africa

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The COVID-19 pandemic is widely regarded as the worst public health crisis humanity has ever confronted. Currently, urban areas lie at the heart of this pandemic because they bear a substantial proportion of the morbidity and mortality burden. Although Africa is currently the least urbanised, it nonetheless has the fastest urban growth in the world. Nearly 50 percent of Africa's population are found in urban settlements which face a myriad of challenges such as climate change, housing congestion, flooding etc. The ongoing COVID-19 crisis has further exacerbated existing urban socio-spatial inequalities. Given the foregoing, there is a critical need to reconceptualise and transform African urban spaces in light of the new challenges associated with COVID-19. In this light, this conference session therefore hopes to bring an interdisciplinary lens to the study of the intersectionalities between COVID-19 and these realities with a view to building resilience for urban Africa.

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Krishna's Monsoon Swing: More Observations on Teaching Geoscience with the Humanities.

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This presentation represents the third part of my "Meteorology and Myth" Geographic Education series. This series of teaching modules is meant to bridge the gap between the natural sciences (physical geography) and the humanities (human geography) in general education Geoscience. Humanities majors can benefit from a better understanding of Earth and Atmospheric Science; conversely STEM students need better understanding of culture, religion and the humanities. Culture, religion and art are linked through an explanation of a physical geography process, in this case – the monsoon cycle of South Asia. Two sections of an introductory, general education geography course participated. Students were surveyed on their background knowledge about India, Hinduism and South Asian Geography. Participants listened to lectures and watched video clips of monsoon meteorology. Students were organized into small discussion groups, and each was assigned one sub-topic about the causes, effects, and significance of the South Asian monsoon. Students studied the dynamics of the monsoon system. Topics included Land vs water contrasts, ITCZ, jet stream position, El Niño-Southern Oscillation, Madden-Julian Oscillation, Indian Ocean Dipole, tropical cyclones, Tibetan Plateau, and Beryllium isotope analysis. Student conclusions were posted to an online discussion board. Results indicate that students gained significant confidence in their understanding of the nature of monsoons and their impact and influence upon humanity.

Keywords: geography education, meteorology, cultural geography

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Building a Meaningful Professional Network for Students

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This panel session will explore ways by which students can discuss strategies to develop professional networks that will help facilitate career development. Panelists include students and faculty experts.

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Strategies for Successfully Securing Funding as a Student

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FILL

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Assessing Efforts to Increase Flood Resilience Through the Community Rating System Program

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Flooding comprises the largest proportion of economic losses derived from disasters in the United States. and is poised to become the main driver of disaster-driven economic loss worldwide. Community-level flood planning has the potential to alleviate part of this problem. The United States Community Rating System (CRS) incentivizes community floodplain management practices in exchange for flood insurance premium rate discounts. The main goal of the CRS program is to mitigate flood damage to insurable property. Using multi-period difference-in-differences, this paper quantifies whether and to what extent this goal is achieved by the program. The study finds inconclusive evidence on whether losses on insured buildings do decrease as a result. These findings have important implications when considering the design of future programs from a climate justice lens, as previous research suggests that not all communities have the resources to adhere to this program and only members of the communities that do are able to benefit from flood insurance discounts. Further research is underway to explore whether the program contributes to increasing other dimensions of community resilience beyond infrastructure protection

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Validation of 3D deep learning-based classification in the virtual world of 3D video games

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Acquisition of the 3D point cloud data for indoor and outdoor scenes becomes increasingly efficient and productive with the development of LiDAR and drone technologies, spurring the progress of 3D GIS applications (e.g., smart city) by providing essential 3D datasets. Deep learning, representing a cutting-edge machine learning method, may also contribute to the applications of 3D GIS in understanding point process in 3D context. Deep neural networks taking point cloud as input have been becoming prevalent since 2017 due to its state-of-the-art performance in learning and predicting 3D shapes. Deep learning-based methods require a quite large training dataset to achieve an adequate performance; however, specialists may face “data-hungry” to train such a deep neural network especially in a 3D content of a specific application (e.g., hydraulic structures in this study). On the other hand, it also require a bunch of data to validate the performance of the model in classification. We demonstrate our empirical knowledge in mitigating such data-hungry issue in validation by using 3D models retrieved from 3D video game.

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Spatial heuristics in consumers’ shopping decisions

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Shopping is one of the most frequent everyday activities that involve undertaking spatial decisions i.e. where to shop and how to reach the store. Although consumers' spatial behaviours have been often investigated using the Expected Utility Theory, numerous researchers point out that real-life consumers' behaviours violate the standard model of expected utility. The question that arises is: what are the possible causes of this violation? The research aimed to verify one of the possible answers to this question i.e. that the consumers' spatial choices are influenced by spatial decision heuristics. The theoretical framework of the research was the Prospect Theory, developed by A. Tversky and D. Kahneman in 1979, according to which individuals in their decisions are under influence of heuristics which are mental shortcuts that individuals use to make quick decisions to find solutions for often complex problems. Data were obtained through an online questionnaire distributed among students of the University of Vienna (N=155). The analysis confirmed part of the hypothesis formulated based on previous research and theories: consumers' preference for clustered shopping destinations (Brooks, Kaufmann, Lichtestein, 2004), later-destination direction attractor bias (Fu, Bravo, Roskos, 2015), diminishing sensitivity in seeking bargains (Azar, 2011), present bias (O'Donoghue, Rabin, 2015), and loss aversion defined as the higher value of "willingness to accept" than "willingness to pay" (Hjorth, Fosgerau, 2009). The hypothesis that were not confirmed were: the initial segment strategy (Bailenson, Shum, Uttal, 2000); substitution effect/'as the crow flies' effect (Raghubir, Krishna, 1996); and decoy effect (Fukushi, Guevara, Maldonado, 2021).

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Socio-spatial Analysis of Farmers Markets in Charlotte, North Carolina

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This study examines the relationship between farmers market consumers and vendors, and the spatial interaction between the two. The goal of this research is to understand the behavioral and socioeconomic characteristics or the demand-side and of the supply-side of farmers markets, and what factors affect decisions of consumers and vendors when choosing a farmers market from a geographic perspective. Fairly little is known about farmers markets, and prior studies are rather limited and somewhat dated as well. This study is conducted in Mecklenburg County, North Carolina, where the City of Charlotte is located. Population and vendor data collected through a survey questionnaire consists of shopping and selling habits and motivations. We present the socio-demographic profile of farmers markets shoppers, and contract with the general county population and with prior studies. We also analyze shoppers' motivations and the motivations of vendors. In this process, we also tease out the differences between markets across the county. Lastly, we study shoppers' choices of markets through an analysis of spatial interactions and underscore the respective roles of distance and farmers markets intrinsic characteristics. This research enhances our understanding of factors affecting a consumer or vendor's decision when choosing a farmers market. The results show that factors like the number of vendors, the hours of operations, and the age of the farmers market all positively correlate to an increase in customers, whereas the distance to the farmers market negatively affects customer attendance.

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Mapping a decade of public health data to support a community intervention program

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The Healthy Start program has provided federal funding to a number of communities across the US to support perinatal health for both mother and child through case management as well as community intervention and education. As might be expected, there are many spatial issues connected to understanding community and individual needs for the program. This presentation will focus on on-going work with one Healthy Start program supporting expecting mothers in Robeson County, NC and the use of state level data to find community trends within the county for variables including low-weight births, neonatal deaths, and preterm births. In addition to these standardized variables, an example of one impact on expecting and neonatal mothers caused by local environmental vulnerabilities will also be discussed.

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Disrupting Illicit Supply Networks: Exploring Behavioral Responses in Narco-Trafficking Operating Networks in a Spatial Optimization and Simulation Testbed Environment

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Cocaine- or 'narco'-trafficking through the Central American corridor supplies over 80% of the cocaine consumed in North America. Despite numerous related national security concerns, efforts to stem the flow of cocaine into the U.S. have not been sufficiently successful. Recent advances within diverse fields, such as operations research, criminology, and data science, are advancing knowledge of the scope, structure, and history of cocaine demand and supply between cocaine production and consumption regions. However, there remain significant gaps in the understanding of the behavioral nature of the actors within the illicit drug trafficking networks, of the complex operational environment of those charged with disrupting those networks, and in the ability to model, predict, and plan for the outcomes of the interactions between these opposing forces. This work presents the effort to model these interactions in a replica testbed of the operational environment in such a way as to 1) access a range of solution procedures both heuristic and guaranteed optimal, 2) use the state-of-the-art data scientific techniques to manage the massive intermediate data generated by the solution procedures, and 3) support the analysis of results of tests of interdiction/trafficking behaviors over many scenarios. The testbed environment presented combines spatial analytic techniques, optimization, agent-based modeling, and high-performance computing in the context of military and law enforcement operations, in a manner not as of yet observed in the literature.

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Is GDP Per Capita in the Southwest Region Influenced by Environmental Health Factors?

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The primary objective of this study is to determine the extent to which environmental health factors have a negative effect on GDP per capita on a regional level. It is important to know the effect that various environmental health factors have on GDP per capita, so that governmental entities can make decisions based on the effects that environmental health factors have on GDP per capita. Asthma and drought were the environmental health factors selected for this study because asthma and drought both impact the southwest region, the study area selected. Specifically, an exploratory data analysis was performed on asthma and drought. A linear regression model was built to determine if GDP per capita in 2018 is influenced by asthma or drought, and a test for spatial autocorrelation was used to determine the extent to which a spatial regression model is the best model. Results indicate that the spatial regression models significantly improved the fit of the linear regression model indicating that the southwest region has spatial autocorrelation, and that a spatial regression model should be used instead of OLS models. Of the spatial regression models, the spatial error model had a slightly better fit than the spatial lag model. It was shown that asthma significantly lowered GDP in 2018 for the southwest region, whereas drought did not have a significant effect on GDP.

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Using Earth Observations to Identify Spatial and Temporal Trends in Harmful Algal Blooms in Lake Champlain

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Lake Champlain provides clean drinking water for 35% of the surrounding watershed and offers recreational opportunities to millions of tourists, but it is threatened by increasing occurrences of harmful algal blooms (HABs). The excess phosphorus runoff into Lake Champlain over the past decade encouraged toxic cyanobacterial formations, thereby increasing the severity of HABs on the local economy and ecology. In partnership with the Natural Resources Conservation Service (NRCS) Northeast Region, this project utilized Earth observations to identify risk factors associated with HABs. The team detected historic algal bloom trends with Sentinel-2 MultiSpectral Instrument (MSI), Sentinel-3 Ocean and Land Color Instrument (OLCI), Landsat 8 Operational Land Imager (OLI), and Landsat 9 OLI-2. The team also used Sentinel-3 OLCI and the German Aerospace Center's Earth Sensing Imagery Spectrometer (DESIS) to visualize algal bloom patterns, and Landsat 8 OLI, Landsat 9 OLI-2, and the Shuttle Radar Topography Mission (SRTM) to identify phosphorus sources within the watershed. Analyses indicated an increase in cyanobacteria blooms during the summer months from 2016–2022, with Missisquoi and St. Albans Bay exhibiting the greatest concentrations of toxic events. Furthermore, 16% of the watershed was identified as posing an immediate threat to the lake's hydrology. The area of greatest concern was the Missisquoi Bay sub-watershed, with 229,044 acres of land prone to excessive phosphorus runoff. Providing this information to the NRCS Northeast Region enabled the organization to quantify risk factors associated with algal blooms and modify mitigation efforts to better target future bloom events.

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Combining Risk Assessments for Drinking Water Protection with Ecosystem Services - An Application

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Reliable access to water sources of good quality is of great importance to enable a safe and sustainable drinking water supply. The populations in the Nordic countries regard their drinking water quality as reliable and safe, leaving little enthusiasm for further restrictions around their source waters. However, stakeholders typically underestimate the benefits of protection efforts as assessments focus only on the provision of drinking water and disregard the additional ecosystem services provided by a clean drinking water source. For an equitable accounting of protection costs versus the benefits of clean water, all ecosystem services provided by a drinking water source should be considered. Ecosystem service assessments allow holistic identification of costs and benefits and illustrate synergies and trade-offs of protective measures beyond the drinking water protection.
We present an adapted list of the Common International Classification of Ecosystem Services that allows straightforward assessment of all biotic and abiotic services provided by a drinking water source. We illustrate a practical application of a Swedish case study on how to integrate ecosystem services into a risk assessment following the WHO Water Safety Plans guidelines. The approach provides valuable information for identifying and mitigating risks towards drinking water sources. The presented method is straightforward and does not require expert knowledge of ecosystem services, and can be used to communicate and negotiate the extent of water protection measures with relevant stakeholders and decision-makers.

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Food Insecurity Among University Students and the Effectiveness of Food Assistance Programs Amid the Global Pandemic

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This study aimed to understand the prevalence of food insecurity among university students and the effectiveness of federal, campus, and community food assistance programs in reducing their food insecurity during the Covid-19 pandemic. A mixed methods approach was used in this research. Survey questionnaires were distributed to students via Qualtrics at the University of Central Florida. The information on students' socio-demographics, food insecurity, and utilization of food assistance programs were collected. A total of 220 completed questionnaires were returned. A binary logistic regression was applied to analyze the relationship between students' food insecurity and their utilization of federal, campus, and community food assistance programs with sociodemographic factors as control variables.

Among the surveyed students, 35.45% (78) of them reported that they experienced food insecurity during the pandemic. About 9.6% (21) of students used a campus food pantry, while 7.2% (16) of students used community food assistance programs, and 8.1% (18) of students used federal food assistance programs. Findings show a significant difference among racial and gender groups. Higher percentages of food insecure students were found among those socially vulnerable groups, for example, woman (36.8%) and another gender identity like transgender (60%) compared to man (27.6%), and Black (56.2%) and Hispanic (36.8%) compared with non-Hispanic White (32.4%). The analysis also shows that food assistance programs had little influence on students' food insecurity because of their limited use of food assistance programs. Implications of this study will voice students experiencing food insecurity and suggest the need to improve food assistance programs and services.

Key words: food insecurity, university students, food assistance programs, global pandemic

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Entering the fast lane? When Chinese platform companies encounter Nigeria's informal transport politics

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Africa's urban public transport systems largely rely on privately operated minibuses. Their services are commonly called 'informal' because they fill the gaps left by government-sanctioned public transport services while providing the urban poor with livelihoods. The everyday mobilities of most African urban inhabitants hinge on ubiquitous informal transport networks that are divided spatially among various transport unions, with limited state intervention. As Africa's megacity with some 20 million inhabitants, Lagos depends on many informal transport workers: Its more than 70,000 danfo minibuses are governed by divisional transport unions. In recent years, platform companies sponsored by Chinese capitalists and operated by Nigerians hoped to profit from Lagos's massive urban mobility. Some start-ups have created new digital platforms and tried to embed their platforms in the existing danfo systems. Drawing on a case study of a platform company which was initiated in 2019 and quickly failed within a year, this study will elaborate on how this new player tried to enter the local informal transport systems but struggled with the state-union politics in Lagos. The influx of Chinese capital into Africa's informal transport systems and its effects have yet to be studied in depth. This study will make important contributions to our understanding of dynamic Chinese-African interactions in this new form of globalization.

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Disambiguate 'deviations': definitions, dimensions, and diversified demonstrations

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Deviation is a usual notion in scientific analysis. At a first glance, a deviation emerges when the observed pattern or the calculated result is different from what we supposed in advance; intuitively, we always want to eliminate or mitigate it. However, when we look into the term with extra care and curiosity, we can excavate a rich collection of its meanings and indications given the context and purpose of a research: depending on the setting of the benchmark, a deviation can be measured from (1) the truth, (2) the general trend, (3) *ex-ante* knowledge based on past experience, (4) a theoretical value under assumptions, (5) an expectation under the null hypothesis, or (6) a theoretical extremum. These plenty of deviations are sitting at different stages of scientific research, and bringing us a rich spectrum of epistemology to deal with it. Exemplified by several selected studies in urban science, we can see that 'deviation' demonstrates diversified opportunities for applied geographers to take full advantage of it.

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Using Bayesian multilevel models to analyze Neighborhood Socioeconomic Deprivation on Birthweights: A case study in Fulton County, Georgia, USA

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Multilevel models (MMs) based on the frequentist framework have long been used to analyze the neighborhood effects on a variety of response variables including birth outcomes. In recent years, Bayesian multilevel models (BMMs) are increasingly used in geographic research due to several advantages: 1) researchers can more flexibly define the underlying process that they believe to have driven the data generation; 2) researchers can incorporate prior knowledge into the data analysis; 3) model results can provide direct interpretation to the uncertainty in the model parameters. However, Bayesian methods can also be challenging, particularly regarding the selection of priors, model valuation, and reporting and interpretation of model results. In this study, we demonstrate the process of fitting BMRMs using Stan via the R package brms. We construct, evaluate, and interpret the results of BMRMs using a birthweight dataset from Fulton County, Georgia, the USA in 2015. We fitted two-level random intercept models with the live and singleton births as the individual level and census tracts as the neighborhood level. The purpose of the models was to analyze the neighborhood-level social deprivation on birthweight after controlling key individual-level variables such as newborns' gender and mothers' racial and socioeconomic characteristics. We followed the WAMBS checklist (When to worry and how to Avoid the Misuse of Bayesian Statistics) to address the challenges of building and interpreting BMRMs.

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Hydrometeorology of July 2022 flash floods, Eastern Kentucky

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On 27-28th July 2022 heavy rains resulted in spatially uneven flash flooding across the Kentucky River Basin. As part of the wider Appalachian region, these watersheds are characterized by rugged topography with steep inclines and significant relief. Strip mining across the region has also severely impacted surface drainage and runoff, further exacerbating the impacts of flash flooding. To quantify the scale and impact of this event, we analyzed corresponding hydrometeorological activity using radar, precipitation and stream gauge data for three unregulated watersheds within the headwater forks of the Kentucky River Basin. Peak hydrograph, storm lag time, and runoff ratios were calculated for each watershed for comparison and then placed in a historical context based on the regional precipitation frequency and stream gauge peak flow records. Our analysis found that the July 27-28th event corresponded to the 2-hour 500 year precipitation frequency event resulting in record flooding for the Whitesburg branch of the North Fork Kentucky River. In contrast, neighboring headwater basins only experienced 2-hour 10 year precipitation frequencies from the same event, resulting in far less serious flooding. These results indicate the extremely localized nature of this particular storm event and the potential influence of surface strip mining coverage in generating wide-ranging highly localized flash flooding in this region. Warning of these hydrometeorological events at a highly localized scale and a better understanding of local surface runoff responses will be imperative to prevent fatalities in the future.

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The impact of conservation efforts and population characteristics on land use and land cover in the Hudson River estuary watershed

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Local planning initiatives play an important role in ecosystem management. Ecologists help local governments in reducing negative impacts of development on ecosystems by providing them with conservation tools and guidelines. This research analyzes the relationships between municipal conservation efforts, socio-economic characteristics of the population and land use-land cover (LULC) changes in the Hudson River Estuary watershed by investigating the connections between the areas with significant LULC changes and various municipal conservation policies and practices obtained through the collaboration with the Hudson River Estuary Program. Created in 1987, the Hudson River Estuary Program uses a combination of science and outreach to help people enjoy, protect, and revitalize the Hudson River estuary. Comprehensive conservation actions represent an effective, place-based approach to provides communities with ecosystem services through the creation, restoration and conservation of ecological components. This research analyses municipal conservation planning actions by developing a comprehensive Municipal Conservation Efforts Index that integrates various conservation strategies and reflects the municipal capacity to ecosystem-based adaptation. These strategies and actions target different elements of ecosystems and, as the result, aim to protect and sustain different ecosystem services. The proposed index recognizes the interaction between alternative natural resources (for example, forest and wildlife), and consequently, the interconnection between associated conservation plans and policies. This analysis utilizes a political ecology and the socio-ecological systems (SES) frameworks to examine the associations between the differences in the Conservation Efforts Index values, population characteristics and land use-land cover in the Hudson River estuary watershed.

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Natural Amenities vs. Consumption Amenities and Their Impact on Cost of Living

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Amenity-based development has gained widespread popularity yet some of its implications have not been fully explored. Patterned after the well-known paper by Glaeser, Kolko and Saiz (2001), the impact of consumption amenities on living costs in a cross-section of 133 U.S. metropolitan areas in 2018 are examined. Regression results indicate that metro cost-of-living is most heavily influenced by household income and the relationship between the two is somewhat inelastic. The results also indicate greater concentrations of consumption amenities are associated with higher living costs, but their impact is only about half that of natural amenities. For urban development policy, it appears that consumption amenities can partially compensate for a lack of natural amenities but important distributional issues associated with amenity-based development need to be considered by policy makers.

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Are Some Cities Tornado Magnets?

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More tornadoes occur in the United States than any other country in the world. Although the majority of these tornadoes are relatively weak, those rated as violent tornadoes (EF4 or 5), often result in catastrophic damage and loss of life. While these events are rare, certain areas are more prone to experiencing violent tornadoes than others. One such possible tornado magnet, Tanner, Alabama, has experienced three F/EF5 tornadoes since 1950, which is an exceptionally high number given the national total is 59. The purpose of this project is to identify if Tanner's pattern of high-magnitude tornadoes can be replicated through the use of Monte Carlo-style simulations of random points. Four variations of the same test were replicated 1000 times each, where the number of points that fell into the specified buffer zone for each replication was recorded. When using a constraint the size of Tanner (83.7km2), there was less than a 0.001% for any one simulation to produce three violent tornadoes within the city's area. These results show that the pattern of F/EF5 tornadoes seen in Tanner is unlikely to have occurred by random chance. Tanner being a tornado magnet could be the result of factors such as the relationship between tornado locations and ocean-atmospheric teleconnections, synoptic meteorological conditions, and/or land-surface heterogeneity. Future research will continue to evaluate Tanner and other possible tornado magnets to determine how unique these places are and why violent tornadoes disproportionately affect these locations.

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Using geographic information systems to link population estimates to wastewater surveillance data in New York State, USA

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Purpose: Sewer systems provide many services to communities that have access to them beyond removal of waste and wastewater. Understanding of these systems' geographic coverage is essential for wastewater-based epidemiology (WBE), which requires accurate estimates for the population contributing wastewater. Reliable estimates for the boundaries of a sewer service area or sewershed can be used to link upstream populations to wastewater samples taken at treatment plants or other locations within a sewer system. These geographic data are usually managed by public utilities, municipal offices, and some government agencies, however, there are no centralized databases for geographic information on sewer systems. *Methods:* We created a database for all municipal sewersheds in New York State for the purpose of supporting statewide wastewater surveillance efforts to support public health. We used a combination of public tax records with sewer access information, physical maps, and municipal records to organize and draw digital boundaries compatible with geographic information systems. *Conclusions:* The methods we employed to create these data will be useful to inform similar efforts in other jurisdictions and the data have many public health applications as well as being informative for water/environmental research and infrastructure projects. *Findings:* Specific knowledge of sewer systems can improve the response time for setting up new sampling locations to monitor newly detected pathogens of concern. Geographic data can also be combined with other data sources like census data to improve sampling plans to increase public health services in socially vulnerable communities.

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Progress in Retail Location Decision Making: Geospatial Big Data Adoption, Use and Development

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The growth of spatial big data has provided opportunities for the enhancement of retail location decision-making (RLDM) activities. Through a series of semi-structured interviews with retail location decision makers, this study examines progress in the use of data and technologies when making location-based decisions. Specifically, this study has two central objectives: (i) to identify the availability and use of technology and geospatial big data within RLDM; (ii) to identify the adoption and development of geospatial big data within retail firms. The study finds significant changes in the usage of geospatial big data and analytics within RLDM. There has been significant development in decision making approaches as they are starting to have greater reliance on new data sources, such as social media and mobile location data. With important changes to consumption behavior (i.e., the balance of online vs offline) there is added pressure on retailers to better understand consumers in order to maintain relevance in an increasingly competitive environment. The study findings suggest that retailers are looking to a broader range of data sources to provide a 360 perspective on their customers and the underlying consumer base. Despite this growth in data acquisition and collection, the interviews highlighted that many of the long-standing challenges related to translating data adoption to data use remain ever-present. The paper concludes with a summary of the opportunities and challenges associated with the adoption, use and development of geospatial big data within RLDM.

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Greenways and Property Values Along the Urban-Rural Continuum

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Public greenways are a desirable amenity and many households are willing to pay a premium to live near them. While it is well-known that proximity to greenways generally enhances the sales price of single-family homes, less is known about how this premium varies across urban, suburban, and rural settings within a metropolitan area. Using data from over 36,000 single-family home sales in the Charlotte, NC MSA covering the 2015-2019 period, we seek to determine whether or not this positive effect is measurably greater in high density areas than lower density ones. Regardless of density, we also expect the impact of greenways on the sales price of single-family homes to display a localized distance decay effect. We find support for the primary hypothesis – that the impact of greenway proximity on the sales price of single-family houses follows an urban-rural gradient where amenity capitalization is greater in higher-density areas than lower-density ones. However, there is only partial support for our second hypothesis – that within each group, the price premium declines with distance from the greenway.

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Estimating the Effects of COVID-19: E-commerce and Commercial Real Estate

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The COVID-19 pandemic placed significant restrictions on both the movements of consumers and the operations of commercial enterprises around the world. These restrictions prevented consumers from conducting in person commerce and resulted in significant growth of E-commerce activity. This forced change in consumer behaviour has led many to predict long term and permanent effects on the demand for commercial space. The result is that forecasts about E-commerce and demand for commercial space that were conducted pre-pandemic need to be updated in order to produce forecasts that are seen to incorporate this new set of circumstances. This paper addresses this need by taking previous research done to forecast the effects of E-commerce on the demand for commercial space in 2018 and updating that research again in 2022 to not only provide an updated set of forecasts that incorporate COVID-19, but also to produce a longitudinal study that shows how these forecasts changed between 2018 and 2022. The research uses a Delphi survey methodology to gather the collective knowledge of 17 experts from the Toronto region about a set of 9 different NAICS categories for 2025, 2031, and 2041. The survey included both quantitative and qualitative elements to produce a set of forecasts that are presented according to consensus, high, and low estimate scenarios. Results of the survey showed that for most experts, the forecasts of demand for commercial space actually increased in most categories in contrast to what many thought would result from elevated levels of E-commerce during the pandemic.

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Thermal Safety and Risk of Children's Outdoor Playhouses

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Playhouses are a common piece of outdoor play equipment for many children. However, a knowledge gap exists concerning such play equipment's thermal safety. Children are particularly susceptible to serious heat-related illnesses for various reasons, including an underdeveloped thermoregulatory system and decreased sweating rate relative to adults. Based on our knowledge, Labosier et al. (2019) is the only published work to specifically address the relationship between children's outdoor playhouses and thermal safety. The work presented here continues previous research on the thermal safety of children's outdoor play equipment. Temperature and relative humidity data are collected in 10-minute intervals from a playhouse's interior and from a proximal HOBO Onset weather station for comparison purposes. Data were used to calculate heat index values both inside the playhouse and outside in the ambient environment. Results suggest that internal playhouse temperature and heat index values are warmer than the ambient environment supporting previous work. These findings suggest that caution and adult supervision should be exercised when children are using such equipment in a play setting.

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Clustering Retail Activities: an Exploratory Hexagonal Approach

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Identifying and classifying clusters of commercial activity has been a core research task within the retail geography subdiscipline for many decades. By delimiting the boundaries of commercial activity and subsequently grouping the resulting spatial imprints into homogeneous clusters it is possible

to provide systematic insights into the evolution of the retail landscape over time. This paper details an exploratory clustering methodology centred on a hierarchical geospatial indexing system that divides the world into hexagonal cells and implements the partitioning among medoids (PAM) clustering technique. The research builds on the work of Ballantyne et al. (2002), providing both a critique and extension to their approach using a large-scale data set of Canadian major retail chain stores and shopping centres. With the increasing availability of big data sets on both commercial activities (supply) and consumers (demand) providing new opportunities to develop novel spatial approaches to support corporate decision making. The findings highlight the potential to rapidly automate and systemize the clustering of spatial big data sets of commercial activity. However, the exploratory research also reveals a number of significant methodological considerations that need to be taken into account. These include issues such as spatial scale of analysis, selection of clustering variables, choice of weighting schemes, ground truthing of results, and so on. The paper concludes with a set of future research questions and suggested extensions to the approach.

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Recognizing Texas Women in Time and Place

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Historical Markers are more than just a collection of images, stories, and text references that have been engraved as means of public remembrance; they also reflect the social and cultural sense of place of the landscape. However, due to difficulties with data interpretation and visualization of these places, little research has been done in geography on capturing the inherent motives besides their location. Thus, with the advancements in methods and tools of Geographic Information Sciences (GIScience) in spatial humanities projects, I examined the spatial-temporal distribution of 703 women historical markers to ascertain how patterns reflect the narratives of women in Texas. All historical markers were examined using corpus linguistics (CL) tools and GIScience. CL showed that Texas women are positively represented based on character, achievements, ranking, and association with an individual or event, or place. CL results also revealed unequal representation of white, African American, and non-white Texas women which matched women's rights history in Texas. On the other hand, GIS visualizations showed that women are generally less represented across Texas with 703 out of 16819 markers on women with most historical markers clustered within the Mid, North, South, and East Texas regions.
Overall, this mixed-method qualitative approach provided the needed foundational tools in the application of spatial analytical perspectives and tools to complicated literature such as historical marker text narrations.

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Real-World Applications of Thiessen Polygon Analysis

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Did you know that Thiessen polygons, otherwise known as Voronoi polygons/diagrams, can be utilized as a method of spatial analysis for more than just determining average precipitation in hydrometeorology? From finding a grocery store's zone of influence to locating the approximate area of contaminated soil and groundwater on a former manufacturing site, Thiessen polygons are applied in a myriad of real-world professions and practices.

This paper will take you on an engaging historical journey of Thiessen polygon analysis from Descartes' illustration of the "heavens" in 1644 to John Snow's application of death counts per polygon to determine the source of Cholera in 1854 London. In addition, this paper will include examples of present day practices and will give an overview on how to create your own Thiessen polygon analysis utilizing ESRI ArcGIS Pro.

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The Impacts of Urban Enterprise Zones in New Jersey: The Case of the City of Paterson

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The New Jersey UEZ Program was created in 1983 to stimulate revitalization in urban communities through various incentives. Using both quantitative and qualitative data from a variety of sources, this paper examines the economic and social impacts of urban enterprise zone (UEZ) in New Jersey and in particular, the city of Paterson, the state's third largest city. Preliminary analysis indicate that while there are a variety of benefits that UEZ municipalities receive from the program, including reduction in unemployment and poverty, increased economic activity, greater output, earnings, and employment growth for participating businesses in UEZs. In Paterson, analysis of socioeconomic data, including household income, unemployment, and home value show that individuals living in UEZs are not necessarily better off than individuals living in comparable non-UEZ areas. The primary issue is whether the UEZ program stimulates local economies enough to justify the lower tax rate.

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A Call to Geography to Address the Ethical Concerns in Spatial Data and AI

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Since the 1980's geographers have examined ethics within geographic analysis in response to the claim of value-neutrality within quantitative spatial analysis. Proctor (1998) noted that values are as "much a part of geography as facts". Over the last 24 years it has become easy to identify ethical evaluations in geographic work such as social and environmental justice, but greater considerations of ethical implications should be considered in all geographic work. Because quantitative spatial analysis continues to be considered as objective, it is necessary to address how values influence the work of applied geographers, and how applied geographers can minimize bias that can occur within spatial data. A recent call by Ravit Dotan stated that there is an ethical necessity to consider geography when programing for AI. Generally conditions such as bias within data collection and analysis must be considered. This panel explores the ethical considerations that geographers must make with data, and how geographers must address the need for spatial considerations to be included in AI programming.

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Ethics: Advancing and Teaching Ethics in Geography and GIS.

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As geography's tenets, spatial data, and tools (such as GIS software) become available to other academic disciplines and to the general public, it is easier to make authoritative maps that adhere to standards and promote accountability. But it also means that there is an opportunity for misuse and misinterpretation by a wider variety and number of data producers and data consumers. Recent efforts from AAG, the ICA, the IMIA, the GIS Certification Institute, Esri, and other organizations have resulted in codes of ethics, a Mapmaker's Mantra, and an increased awareness of the importance of ethics. How can we more effectively teach ethics? How can we make more honest and authoritative maps and apps? How can geographic data be made and used ethically? We invite those interested to contribute to a lively and timely session that will encourage discussion.

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Data Science

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The era of spatial data science has arrived. Fueled by the need to analyze massive collections of data and renewed interest in artificial intelligence, the demand for data scientists is rapidly growing. However, educating future data scientists is challenging, in fact, a moving target. Researchers frequently introduce new algorithms and analysis methods. As a result, knowing which aspects of spatial data science to teach is often the most challenging part of course design. One approach to safeguarding our course content from these rapid changes is to focus on teaching the broader competencies in data science in addition to leveraging the technology built around them. In this webinar, we'll explore the core competencies of data science and demonstrate analytical workflows that can help develop those competencies.

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Using Downscaled Climate Model Output to Investigate the Effects of Climate Change in North Carolina

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The impacts of climate change are already evident and projections suggest that the impacts will increase in their severity over the remainder of the century. RCP8.5 is the most extreme climate projection scenario in CMIP5 and represents a world that has 8.5 watts per square meter of radiative forcing compared to the pre-Industrial era of the year 1750. Currently, radiative forcing is about 2.5 watts per square meter. While the realism of the specific path that RCP8.5 describes is debated, the projected changes in temperature, humidity, and precipitation by the end of the century are perhaps the most relevant metrics. Regardless of the emissions pathway, there are multiple scenarios

which produce changes in these metrics similar to RCP8.5 once uncertainties related to climate sensitivity and feedbacks are considered. This study investigates how RCP8.5 could impact the coastal, piedmont, and mountain systems in North Carolina using downscaled CMIP5 climate model data. Results of this study indicate potentially significant differences in climatological metrics by the end of the century. We study minimum and maximum temperature, humidity, and precipitation and attempt to connect the projected changes to societally-relevant impacts, such as changes in heat stress.

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Urban Sprawl, Intergenerational Mobility, and Racial Inequality in the United States

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• This study examines how urban sprawl affects intergenerational mobility and racial inequality from an intergenerational perspective in U.S. counties using spatial error regression, geographically weighted regression, and path analysis. We find that urban sprawl variables do not all affect IM in the same direction, and the magnitude of the effect of one urban sprawl variable depends on other variables. Urban sprawl variables also indirectly influence IM through inequality, segregation, social capital, and unemployment rates; these indirect effects on IM are larger than their direct effects. This study shows that the relationship between IM and urban spatial variables is not straightforward, and that building economically just cities requires more than reducing segregation and increasing density. We also find that proportion of Blacks has the largest indirect and total effects on intergenerational mobility (IM), which are spatially stationary across the US, and is mediated by racial segregation, social capital, unemployment, education, and single parenthood. Furthermore, we find that urban sprawl increases racial inequality in IM between Whites and Blacks through increasing racial bias of white people, but urban sprawl directly decreases racial inequality by decreasing the social capital of Blacks and Whites separately and decreasing racial segregation. Overall, urban sprawl reduces racial inequality in IM. These findings suggest that compact development with greater racial integration by sharing social capital and other resources closes racial inequality over generations.

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An exploration of how applied planning riddles can inform teaching a graduate environmental planning class

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One of the more exciting aspects of teaching in a graduate applied geography program is the opportunity to explore the linkages between real world planning issues and concepts covered in class. In spring of 2022, I developed and delivered a graduate class in environmental planning at New Mexico State University. In my research to build the class, I contacted a range of professional planners and affordable housing advocates to explore real world planning issues. Several of these people agreed to visit class as subject matter experts (SMEs), and I was also able to bring a Webinar to the class that explored form-based code. Through these SME class visits and the Webinar, I brought informed professional voices who were knowledgeable about real world planning issues into the

classroom, which offered a window into issues "torn from the headlines," literally. Issues we explored included 1) how best to advance multi-modal transportation planning; 2) the challenges of conservation easement planning in the Rocky Mountain West and how to meet these challenges; and 3) the complex riddle of advancing affordable housing in the Las Cruces, NM region, which has experienced major increases in housing costs and challenges in providing housing for the unhoused population. Through team-based learning exercises on real-world applied planning riddles, students had an opportunity to apply classroom concepts towards solving these riddles. The emerging results of this work include a quality graduate education experience that is highly informed by real world issues.

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An exploration of how current academic research can inform urban planning efforts to improve the quality of life of people living in the Las Cruces, NM region.

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The Geography Department at New Mexico State University has long standing relationships with regional planning agencies in the City of Las Cruces (CLC), NM and Doña Ana County. In building a graduate level environmental planning class at NMSU in fall 2021 and spring 2022, I worked with advocates for multi-modal transportation planning and affordable housing to gather data on these challenges to share with the class. These efforts involved working with the League of Women's Voters of Southern New Mexico, Velo Cruces (a local bicycle advocacy organization), and PlaceMakers, an urban planning firm with expertise in affordable housing. Through this research and advocacy work with the Las Cruces City Council, I was appointed to an ad hoc citizens technical advisory committee tasked to advise the CLC planning staff on the revision of the land development code supporting the CLC comprehensive plan. This provides me a great opportunity to apply the most current academic research into how best to advance planning towards improving quality of life (complete streets, multi-modal transportation, just sustainabilities, and affordable housing) into the committee's work. The emerging results of this work include providing input to an applied planning process that is informed by the most current academic research into these topics. At the time of submitting this abstract, I am actively engaged in this work and able to make a modest, but meaningful contribution to the revision of the land development code supporting the CLC comprehensive plan.

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Dynamic Landscape Suitability for Illicit Trafficking in Central America

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Narco-traffickers successfully exploit the heterogeneous landscapes of Central America for illicit trafficking. Despite long-standing and continued efforts to disrupt cocaine trafficking, Narco-traffickers successfully adapt to disruptions from interdiction efforts by spatially adjusting smuggling routes to

evade detection. This research drew from spatial theories of crime to develop a landscape suitability analysis. Multi-level, mixed effects negative binomial regression models predicted the suitability of landscapes for cocaine trafficking across 17 departamentos from 2007 to 2018. Informed by long-term research in the region, independent variables included proximity to roads, country borders, and international ports, indigenous territories, population density, and protected areas. The year of peak interdiction in each departamento was used to analyze spatial shifts in landscape suitability before and after maximum counterdrug interdiction pressure. Areas with lower population density, those closer to international borders, and indigenous territories were disproportionately exploited as cocaine trafficking routes following peak interdiction. The results highlight the ways spatial adaptations made by narco- traffickers are intentional, logical, and predictable choices based on the socio-environmental characteristics of Central America's landscapes. Given that interdiction resources are limited in comparison to the degree and extent of ongoing narcotrafficking activity, and given that the locations of that activity are highly dynamic, understanding which features of the landscape are most associated with illicit trafficking can inform both short-term interdiction strategies and broader counterdrug policy.

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A fuzzy DROP model assessment of vulnerability to rising temperatures from climate change in Bexar County Texas.

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Rising temperatures and daunting heatwaves are currently enveloping the globe and having the largest impact on urban areas. The development of Google Earth Engine has provided humanity with access to statistical analysis of large datasets, both in scale and time. Google Earth Engine provides a very robust and product-ready dataset which can be leveraged to conduct mixed models, (in this case using actual land surface temperature changes with social indicators to provide insights into vulnerable geographies and populations). This research leverages existing methods for computing social vulnerability with novel model applications of timeseries statistical models using MODIS Land Surface Temperature and algebraic synthesis of Sentinel-5 to create a fuzzy vulnerability model assessing susceptibility to rising temperatures in Bexar County, Texas and analyze the qualitative efficacy of the fuzzy model. The datasets utilized consisted of social vulnerability, temperature, and pollution indicators. The variables were then assigned fuzzy membership consisting of V=vulnerable or R=Resilient and set into a fuzzy model containing 24 rules. Areas in San Antonio that are most vulnerable to rising temperatures are middle class to lower middle class geographies with clear-cut, unsustainable urban developments and rural places. The use Mann Kendell and Sens Slope for statistical analysis provides a very robust dataset towards temperature changes occurring and are compatible with fuzzy modeling, though can be difficult to manage with social vulnerability datasets which dominate the model.

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Why Don't You Just...?: Spatial Analysis of Seemingly Simple Questions

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Spatial analysts are frequently tasked with seemingly simple problems that turn out to be conceptual or computational headaches. While it is now well-known that mapping and visualization of spatial data provides powerful insights to identification, analysis and resolution of important human, physical, and environmental puzzles, the simplicity of visualizations sometime belies the thorny conceptual issues that lie behind them. Coastal mapping and calculating distance-to-coastlines can be one such headache. Fractal geometry aside, the political geography of coastal counties in the U.S. presents a number of thorny issues when spatial analysists respond to "why don't you just calculate distance-to-coastline?" This very request arose in a cost-of-living study where we wanted to estimate the impact of coastal proximity on county-level living costs. In this paper, we discuss and illustrate some of the analytical issues that arise when attempting to define U.S. coast lines (Atlantic, Pacific, Gulf and Great Lakes) so that distance-to-coastline can be calculated. Preliminary attempts are discussed as is our final solution to this task along with its visualization. We briefly demonstrate how these measures are used in the context of cost-of-living modeling.

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The Demographic Characteristics of American Indians

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Americans Indians were living in North America long before the arrival of Europeans. At the time of contact, American Indians were engaged in traditional lifestyle of gathering, hunting, fishing, and trapping. Socially, they were living in tribal groups organized by leaders and governed by consensus. There was strong commitment to community welfare and ethics of sharing among tribal members. With adequate food supply, American Indians experienced relatively stable population growth. The arrival of Europeans in 1492 changed the social and demographic characteristics of American Indians. For about 400 years, American Indian population consistently declined because of contact with Europeans and introduction of new diseases into these communities. Apart from that, Native Americans were victims of ethnic cleansing and territorial relocation. In recent years, American Indian's population has rebounded because of high fertility rate, increase in life expectancy, and change in reporting mechanism of ancestry. The question is what are the present economic, social, and demographic characteristics of American Indians? Which states account for the highest proportion of Americans Indians? Using United States census data, this paper offers answers to these questions. The analysis indicates that, Native American population is younger and increasing rapidly. While Alaska accounts for the state with the highest percentage of American Indian population (14.8%), 5 states including Kentucky, Pennsylvania, West Virginia, New Hampshire, and Ohio have very low population.

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Spatial Statistics: What, When, and How?

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Spatial analysis has gained widespread acceptance in many planning, decision making and resource contexts and spatial statistics are an important part of the geographer's tool box. Just the same, many of us are unsure about the "what's, when's and how's" that surround their use. What is the difference between OLS, SAR, Spatial Durbin, and GWR? When should one technique be instead of another?

How do we interpret the output from these techniques? Using county-level cost-of-living data, we illustrate the use of these techniques with an emphasis on interpretation of their output.

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Assessing Food Retail Environments around Head Start Programs and Daycares in Greater Orlando

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Childhood obesity rates in the United States continue to rise overtime and the prevalence of obesity is high for racial/ethnic minority children from households at low social economic status. Unequal food retail environments (FRE) are considered a crucial agent of the upward trend of social disparities in childhood obesity. Head start programs aim to provide low-income families with pre-school aged children free early development services and equal learning opportunities. This study aims to 1) assess and compare FREs around Head-Start programs and daycares in the Greater Orlando area, and examine whether the FREs are associated with community social vulnerability index (SVI). Data were collected from the U.S. Department of Agriculture, Google Maps, and the Centers of Disease Control and Prevention and were sorted via ArcGIS Pro. Spatial and statistical analysis are applied for mapping and assessing the quality of FREs around daycare and head-start centers. A greater prevalence of unhealthy food stores was identified in a 0.5 mile vicinity of Head Start programs than healthy food stores. Conversely, a greater prevalence of healthy food stores were within a 0.5 mile vicinity of daycare programs. Regression analysis is used to quantitatively assess correlations between SVI and FREs in Greater Orlando. The findings from this study will equip researchers with new findings vital to building a deeper understanding and more solidified empirical foundation of the influence of food environments on families of varying socioeconomic status.

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Vegetation Indices and their Relation to Tiger snail Populations in West Virginia

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This research utilizes normalized difference vegetation indices (NDVI) to identify correlations between vegetation density in the West Virginia section of the Appalachian Mountains and Tiger snail (Aguispira alternate) populations over time. We hypothesize that urban sprawl, which reduces vegetation density, has adversely affected tiger snail populations, which thrive in wooded environments that provide access to water and algae. Our research will identify the changes in vegetation indices along the West Virginia section of the Appalachian Mountains from the 1960s to the present day as a correlate for urban expansion. These changes will then be compared to changes in tiger snail populations and locations during the same time period.

The data we are using come from field observations dating back to the 1960s. These observations have tracked variations in the size and location of tiger snail populations. Our data demonstrate that

tiger snail communities have experienced varying degrees of population increase or decline across the Eastern US.

We derive our NDVI data from Aster and Landsat (for pre-2000 data) imagery. These data sources provide multi-spectral coverage which allows for the identification of chlorophyll pigment absorption via the red band and reflectivity found in plant material via the near-infrared band. We use ArcGIS Pro to blend these bands together into a single band the values of which are then indicative of vegetation density at the time the image was taken. Change over time will be identified using images throughout the span of multi-spectral coverage (starting in 1972).

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Rapid urbanization and uneven food system development

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Access to supermarkets and public markets shape food security in urban Southern Africa. Using remotely sensed retailer location and population datasets, we analyze the spatial-temporal development of supermarkets and public markets in Lusaka, Zambia from 2004 to 2020. As Lusaka's population grew by 116%, we found that supermarkets increased from 9 to 54 (500%) while public markets increased from 52 to 65 (25%). Using SaTScan spatial-temporal analysis, we identified seven significant areas of high supermarket development ($p<0.05$) clustered from 2013 to 2020 in lower density, higher income residential areas. During this period ten new public markets were community-established, suggesting the prevalence of a collective, bottom-up approach to public market development and a lack of direct involvement by the government to support public markets at a similar pace as population growth. Supermarket development without concomitant development of public markets, can negatively impact food access, food security, and food system equitability in two ways: 1) supermarket development is spatially uneven, favoring more food secure residential areas; 2) supermarket development is outpacing the establishment of public markets, which have more favorable food purchasing conditions for low-income households. Improving food access and food security in rapidly growing Southern African cities will require policies that promote food retailer diversity, which can improve urban food system resilience and equitability.

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Environmental Determinants of Tiger Snail Persistence across the Eastern United States

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This research seeks to map the persistence and disappearance in tiger snail (Anguispira alternata) across the Northeastern US and to understand if and how acid rain, soil calcium levels, and snail persistence or disappearance are connected.
The data used include 1300 county-level field observations about tiger snail occurrences, calcium levels in the top 5cm of soil, and acid rain levels. After dataset cleaning, ArcGIS Pro was used to map the persistence and disappearance of tiger snails, variations in soil calcium levels, and acid rain. Union overlay analysis was then employed to examine whether acid rain levels, below normal soil calcium, and the affects persistence and disappearance of tiger snails are correlated.
Results of the analysis show that tiger snails generally persisted in an area north from Virginia, through Pennsylvania into New York state. Counties where snails existed before 1960 but disappeared after 1960 are widely scattered and non-contiguous, mostly located in West Virginia, Virginia, and Pennsylvania. Results of the overlay analysis show that there is no immediately obvious correlation among acid rain levels, soil calcium depletion, and the disappearance of tiger snails, though more thorough studies will follow.

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Urban positionality in urban network: Through the lens of alter-based centrality and national-local perspectives

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Urban Positionality refers to how differences in position and power shape identities, influences and access in the urban network or space of flows. Accurate determination of urban positionality is helpful for a city to formulate reasonable development goals and strategies in the context of close cooperation and stiff competition with other cities. Clearly, the same city may have different positionality in different networks, and different perspectives or methods will lead to different understanding of the positionality of cities. As an attempt by a new angle to enrich the understandings of urban positionality, this paper constructs a regional urban network using intercity calling data, and comprehensively analyzes the positionality of each city in the urban network through the lens of alter-based centrality and national-local perspectives. The results show that: (1) In an urban network, the influence of geographical location on urban positionality continues to remain significant, especially with respect to the centrality of the city; (2) The power space of the urban network has the characteristics of hierarchy and territoriality; (3) Rescaling is an important method to improve the positionality of cities at all levels; (4) Borrowed size is an important way for smaller cities to improve their positionality. At the same time, as an extension of the study, we believe that for some old industrial areas, the positionality transformation of city is as important as industrial transformation, as a regional development strategy.

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The evolution of structural resilience of global oil and gas resources trade network

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This research establishes a network resilience evaluation framework of the global oil and gas resource trade network in 2010, 2015 and 2020. The results are as follows: The links of the oil trade network

present a gradually shrinking trend, and the gas trade network presents a trend of close connection first and then reduced. In terms of network density, network centrality, network connectivity and network size, the structural resilience of the oil and gas resource trade network displays a shrinking trend, and the gas trade network is superior. Concerning invulnerability and recovery, the resilience of the oil trade network is superior to the natural gas trade network. In simulated attacks, the oil trade network reveals a higher resilience towards intentional attacks, and the gas trade network shows a higher resilience towards random attacks. The Strait of Hormuz and the Strait of Malacca are critical chokepoints in the networks.

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Towards a malaria-free world for children: Geographic patterns of pediatric malaria transmission in Nigeria (2008-2018)

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Pediatric malaria account for nearly about 80% of malaria related in deaths in the African region. In addition, Nigeria has the largest proportion of malaria morbidity on the continent. This paper thus examined the geographical patterns of pediatric malaria in Nigeria with a view to understanding the nature of its pattern as well as identifying its risk factors. Data on pediatric malaria cases in Nigeria for the years 2008, 2013 and 2018 were obtained from the Nigeria Demographic and Health Survey (NDHS) reports while information on risk factors were obtained from other published sources. Global Moran's I and Local Moran were applied to measure the degree of geographic clustering and identify the location of disease clusters respectively. A linear regression model was estimated to determine the effect of socioeconomic, climatic and environmental factors on the spatial pattern of pediatric malaria. There was evidence of positive spatial autocorrelation in the distribution of pediatric malaria cases while hotspots were found in different parts of the country across the years. Poverty was the most significant factor affecting the pattern of infection. It was suggested that intensive campaign awareness and poverty alleviation programmes should be pursued so as to eliminate malaria among children.

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The spatial dependence of resilience and its determinants: A spatial analysis of Canadian regions' resilience to the Great Recession

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Regions exhibited heterogenous resiliency to the Great Recession. In the context of Canada, some regions were more impacted than others, resulting in heterogeneous resilient behaviours. The asymmetric resilience of regional economies to the Great Recession has been well documented, what is less known is the spatial dependency of resilience and its determinants, especially in countries that have a more dispersed population. Therefore, this paper aims to examine the spatial dependency of

286 Canadian regions' resilience to the Great Recession using a spatial econometric analysis, specifically the spatial Durbin model. The paper finds that regions' resilience to the Great Recession was influenced by their neighbouring regions' resilience, indicating spatial dependency. It also found that several determinants of resilience had a spillover effect. Particularly, regions' resilience was negatively affected by neighbouring regions with a higher proportion of entrepreneurs and human capital, and those who specialized in the manufacturing industry. In contrast, regions whose neighbouring areas specialized in the technology industry had a positive spillover effect on their resiliency. The findings in this paper provide novel insights into the spatial dynamics of regional resilience, indicating that regions are not isolated entities but are synergetic and intertwined. As well, they highlight the importance of relative proximity compared to absolute proximity.

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Analysis of centennial changes in human activity intensity and its causes in the Amur River watershed

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A watershed is a basic geographical unit in which natural and anthropogenic elements interact. Few have investigated human activity change by watershed. We analyzed changes of human activity intensity in the Amur River cross-border watershed from 1900-2016. The changes showed strong linkages to major historical events that occurred in both China and Russia, corresponding to national policies as well as to local and international events. The similarities and differences between the two countries in policies and positions in international events resulted in synchronous and asynchronous changes, suggesting policy shifts drive human activities in accordance with natural features of the watershed.

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Modeling and Mapping Flood Hazard with a Flood Risk Assessment Tool: A Case Study of Austin, Texas

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As a hazard, flood is an extremely important indicator of how a city is resilient to waterborne diseases and epidemics. Over many decades, flood as a hazard has been a major factor in inducing displacement of marginalized section of the people. Austin city within Central Texas has been identified as one of the major hotspots for flooding in recent decades. Thus, the objectives of the paper are two folded: 1) Empirically, we analyzed and mapped out the susceptibility levels from the factors of physical environments to assess the risk of urban flooding (rainfall data, surface water bodies and topography); in Austin, Texas and 2) Methodologically, we created a re-useable ArcGIS scripting tool that can be used by researchers to automate the process of flood risk modelling with certain criteria. The paper showcases a novel time sensitive building of a tool which will enable better visibility of flood within the city of Austin.

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Characterizing mixed-use buildings by integrating multi-source big data

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Few research has successfully integrated big data from multiple sources to characterize urban mixed-use buildings. Our study proposed a probabilistic model to integrate multi-source and big geospatial data (social network data, taxi trajectories, Points of Interest, and remote sensing images) to characterize urban
mixed-use buildings. Our model probabilistic model was demonstrated with a case study in Tianhe District, Guangzhou, China. The prediction accuracy was 85% against ground truth data from field surveys. We also found that Most mixed-use buildings were located along major streets. Our proposed model not only can identify mixed-use buildings in cities but also provide useful information for urban planning and policymaking.

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Transect and Classification Analysis of Archived UAS Data of Ice Jam Flooding in Plymouth, NH

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This poster reports on GIS analysis performed on archived UAS data of the Plymouth, NH ice jam of February 2017. Ice jams are a costly occurrence throughout the northern CONUS as noted by the USACE Ice Jam Database (2020). Data collected with a DJI Inspire 1 with FC550 sensor for image collection over four miles of the Pemigewasset River resulted in a final 3 cm resolution mosaic image of the ice jam impacted area. We accessed the data set from USGS Earth Explorer and processed it with ArcGIS. First, we examined the aerial mosaic of the ice flow in relation to prior high resolution aerial photos. We compare DEMs derived from the aerial imagery with 1 meter resolution USGS DEMs of the area at ten transect locations located along the river. In addition, supervised and unsupervised classification methods are used to differentiate areal extent of ice, snow, water, and soil. Analytical results of the UAS data using transect and classification methods demonstrate utility of rapid data collection with UAS for flood response.

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Assessment of STEM Entrepreneurship Training in GIS Courses for Career Preparation

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We report on a project linking students from GIS and GPS courses with two Computers & Society classes to develop drone startup business ideas. Students worked in teams to develop drone startup business ideas to present to alumni judges with related expertise. Firstly, students received training and coaching on lean startup methods to develop viable proposals from a professor with NSF I-Corps training and a professor with extensive computing business experience. Secondly, teams received instructor feedback and refined their ideas. Next, students delivered their concepts in a 'pitch contest' event held at the end of the semester featuring guest judges, university alumni working in geotechnical or STEM business careers. Based on results from student surveys, we provide conclusions on the effectiveness of this interdisciplinary teaching method in terms of accomplishing learning outcomes, engaging students via teleconferencing, collaborative team project work, and developing students' general skills related to STEM careers.

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Tracking Environmental Impacts on tiger snail Populations in West Virginia

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Previous research indicates that tiger snail (Anguispira alternata) populations are responsive to changing environmental conditions, including vegetation change and acid rain deposition. Acid rain is particularly important as its introduction to soil leads to the depletion of calcium, a crucial component of snail shells. In this study we hypothesize that basins and valleys intensify the impact of acid rain on soil calcium in highly localized locations and therefore reduces Tiger snail populations in those locations.

Our study area is the Appalachia Mountain region in West Virginia. The data used come from field observations of the presence or absence of tiger snails before and after 1960. Soil calcium data were derived from geochemical and mineralogical maps produced by the USGS. Acid rain data came from the USGS. To model the impact of topography we generated digital elevation models (DEM) for the study area using Aster imagery. The Sink tool in the ArcGIS Pro's Hydrological Modelling toolset was used to identify areas where water collects, or rainfall sinks. Using overlay analysis, we correlated the location of rainfall sinks with areas of below normal soil calcium levels, acid rain, and Tiger snail disappearance/ persistence.

A preliminary analysis shows that patterns of tiger snail disappearance after 1960 are only loosely correlated with acid rain deposition, variable levels of acid rain deposition, and below normal soil calcium. The Sink tool analysis likewise shows only loose correlations with acid rain, below normal soil calcium, rainfall sinks, and snail disappearance and persistence.

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Comparative study on evolution and path of shrinking cities and growing cities living space based on POI data of living facilities

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Urban shrinkage has aroused the attention of a wide range of scholars involved in the fields of Geography and Urban Sciences. With the development of information technology and big data, the serious drawbacks of fixed research approaches and traditional data methods have become apparent. Unlike previous research ideas and data selection methods, this research introduces POI data related to amenities and uses the "trans-space" comparative idea and "representational" index to identify the differences between a shrinking city and a growing city. To be more specific, this research first examines the shrinking city of Fushun and the growing city of Wuhu, both of which possess similar basic properties. Then, GIS spatial analysis methods are used to compare the external characteristics of development between the two cities, in order to provide a new approach to the study of urban shrinkage.

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Using Ontology Learning and Semantic Mapping to Improve Hazard Modeling and Risk Assessment

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"Operational Readiness for Public Health Emergencies in the U.S. (ORPHEUS) is a decision support framework that shall enable public health practitioners and responders to guide individuals, groups, communities, and populations out of the chaos brought upon a geographic region by natural or human-made disasters" (Dr. Armin Mikler). Informal sources of data (e.g., Twitter) are not readily usable in research aimed at understanding the technical characteristics of hazards and their impacts. Ontologies can be used to organize unstructured data into a formal conceptualization of a particular domain. However, the process of creating hazard ontologies is a time-intensive process. The research focus is to identify and apply methods to automate semantic mapping/ontology mapping from knowledge bases of disaster-related information (e.g., scholarly articles) through the use of ontology learning techniques. Then, apply ontologies constructed through semi-automated processes to organize Tweets on disasters, hazards, and related impacts into a structured graph database for use in ORPHEUS.

Dataset: Web of Science indexed papers (e.g., highly cited or most recent) on hazards (e.g., floods); Impacts of hazards (e.g., floods) reported on Twitter.

Methods & Preliminary Results:
First, building and extracting hazard ontologies using ontology learning techniques, such as Support Vector Machine, Term Frequency Inverse Document Frequency (TFIDF), and Bag of Words which are used to classify keywords for the concepts in ontology learning. Second, classifying Twitter real-time data (Tweet related to disaster / Tweet not related to disaster). Third, applying ontologies to Twitter data to extract impact, place, and context-specific (i.e., disaster) information using Latent Dirichlet Allocation (LDA) and Latent Semantic Analysis (LSA). Both LDA and LSA were applied to flood Twitter dataset. The techniques were able to identify the most important words in a topic. According to the results, flood is the most common word among the tweets. Lastly, organizing information extracted in a graph database.

This research will contribute to ORPHEUS by enabling the automated extraction and organization of unstructured data into structured data and information that is related to a crisis resulting from a hazard. Such information can provide critical intelligence for improving disaster planning, recovery, and resilience efforts. This system can also be used to process real-time data to uncover the effects of disasters in different locations, thereby improving critical disaster relief efforts.

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Quantifying Algal Biomass to Understand Water Quality in Urban Ponds

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Globally, water quality degradation is a growing concern. One source of decline is increased algal biomass that can be tied to high concentrations of nitrogen and phosphorus. To understand this relationship, we quantified algal biomass and environmental parameters in urban ponds. Water samples were collected in the Charlotte-Mecklenburg area from two stormwater ponds and two beaver dam ponds of comparable size. Water samples and environmental parameters were collected from four different locations around each pond at relatively equal intervals due to the variability of the algal blooms across the ponds. Algal biomass was measured as chlorophyll a concentration using a fluorometer. Samples from each site were filtered for total suspended solids, then ashed to analyze percent carbon. The remaining field data (conductivity, dissolved oxygen, and temperature) were collected using YSI hand-held meters. Algal taxa were identified qualitatively by counting the number of green algae, blue-green algae, diatoms, and desmids under a compound microscope. Based on our findings, urban beaver dam ponds have lower algal biomass compared to the stormwater ponds. There were fewer algae cells found in the urban beaver dam ponds than in the stormwater ponds. We also found that beaver ponds had more blue green algae which sometimes produce harmful toxins. These findings indicate that there may be a role the presence of beavers play to regulating levels of algal biomass. By understanding variability in algal biomass among different types of ponds, we can better assess water issues and improve decision making for water quality in urban areas.

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The Use of Mobility Data in Estimating Airport Catchment Areas: A Case Study of A Multiple Airport Region in Texas

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Airport catchment area refers to the region where an airport has the most competitive capability to attract local and nearby residents. A precise estimation of airport catchment areas is essential for enhancing marketing efforts and operations of airports. In this article, we adopted mobility data to delineate the airport catchment area. We performed a case study of a multi-airport region in the Dallas-Fort Worth-Arlington metropolitan area, which includes Dallas Fort Worth International Airport (DFW) and Dallas Love Field Airport (DAL). Using the mobility data and spatial analysis, we identified the catchment areas of selected airports. Meanwhile, we designed a post-estimation framework to test the robustness of mobile data estimation results through examining the stability of data sampling rate and spatial autocorrelation of the data. This analysis demonstrated the potential use of mobility data in identifying travel patterns of air passengers and delineating airport catchment areas. The results of this study not only assist airports in understanding their current market but also help identify the competition in the multiple airport regions.

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Preserving Florida's Agricultural Land

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Florida's agricultural land is being threatened by growth and development throughout the state, which will have social, environmental, and economic consequences. This project's objective is to prove the feasibility of preserving Florida's agricultural land through effective governance. In order to demonstrate the viability, the benefits of agricultural lands, all stakeholders, and the current land management practices must first be assessed. The major stakeholders identified are farmers, legislators, business leaders, and developers. This study will provide background information, a review of research, a stakeholder analysis, a business model canvas, and recommendations. The new land management policy does prove to be a viable option, but the biggest drawback is the loss developers will face. Florida legislators will need to prioritize agriculture and its benefits to enact a new policy.

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Applied legal geographies of wildfire and water in New Mexico

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Global climate models project that New Mexico's Upper Rio Grande watershed is expected to become more arid and experience greater climatic and hydrological extremes in the next 50 years. The resulting transitions will have dramatic implications for downstream water users. The Upper Rio Grande and its tributaries provide water to about half of New Mexico's population, including the downstream communities of Albuquerque and Santa Fe and surrounding agricultural areas. In the absence of formal climate adaptation strategies, informal governance arrangements are emerging to facilitate watershed climate mitigation strategies, including fuel treatments and stream remediation. One example is the Rio Grande Water Fund, a collaborative effort coordinating work to protect storage, delivery, and quality of Rio Grande water through landscape-scale forest restoration treatments in tributary forested watersheds. This article examines the Rio Grande Water Fund (RGWF) as one example of an emerging adaptation strategy that is working within—and beyond—existing legal and policy frameworks to accomplish more collaborative efforts across jurisdictional lines and administrative barriers. This paper examines the RGWF as an emerging strategy within the adaptive governance framework.

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The COVID-19 Pandemic and Pediatric Vehicular Hyperthermia

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Pediatric Vehicular Heatstroke (PVH) occurs when children are left in hot cars and has led to over 900 preventable deaths since 1998. In contrast to 2018 and 2019 where there were over 50 deaths per year, PVH deaths declined in 2020 – coinciding with the onset of the COVID-19 pandemic. Proposed explanations for this decline include reduced driving and/or changes in the behavior of parents and caregivers. The hypothesis, that changes in travel patterns and parent perceptions during the pandemic led to a decline in PVH deaths, was tested through a survey of 127 parents and caregivers

of young children who own a vehicle and frequently drive. This research explores parents' and caregivers' perceptions and protective actions regarding PVH and any changes resulting from the COVID-19 pandemic. Statistical analysis of the survey results suggests that a difference in risk perception or behavioral intentions among parents and caregivers did not explain the drop in PVH. We propose that the 2020 drop in PVH deaths is likely attributed to decreased travel during the pandemic, which contributed to fewer children being forgotten or knowingly left in a car but not in the number of children who gain access. As the pandemic passes and vehicular miles traveled rebound, the risk of PVH could increase if education and other interventions are not successful in changing caregivers' behaviors.

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Urban Form and COVID-19: Analysis of Health Outcomes in Sprawling and Compact U.S. Metropolitan Counties during the Lockdown and Post-lockdown Periods

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There is a research gap on the links between urban form and COVID-19. Building on prior results showing a significant connection between various measures of sprawl and quality-of-life, this study examines the impact of compactness measured by sprawl index on COVID-19 infection and death rates in metropolitan counties of the U.S. Additionally, we study the impact of density, land use mix, activity catering, and street accessibility controlling for socio-demographic, and health care characteristics. To understand the impact of social policies on health outcomes in sprawling and compact counties, different stages of the pandemic have been considered including the lockdown period (March 1 to June 30) and the post-lockdown period (Sept 1 to Dec 31) in 2020. We found that the infection and death rates due to COVID-19 during the lockdown period in the most sprawling counties were more than double those in the most compact US counties. The sprawl/compactness index and its elements have different associations regarding strength and direction in different stages even after controlling for socioeconomic and health care factors. The study contributes to policy development and urban planning efforts vital during the post-pandemic period that should incorporate ways to limit the spread and the impact of COVID-19 and other emerging diseases.

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Stretching the Racial and Economic Geographies of Renting: Race, Income, and the Geographic Heft of Atlanta's Unrivaled Housing Investor

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There has been a noteworthy shift in single-family homeownership to single-family rentership in the post-2008 US housing market. Invitation Homes, a publicly-listed corporation established in 2012, owns 80,000 houses across the United States. Existing research shows real estate firms' activity is spatially concentrated, but research is yet to establish the extent to which this unrivaled single-family ownership maps onto familiar geographies of race and income housing tenure inequality. Using descriptive statistics and spatial analysis, this paper analyzes the geography of Invitation Homes' concentration in relation to neighborhood racial and income segregation in Atlanta. The

long-standing and well-documented black-white homeownership gap is particularly pronounced in Atlanta, currently at 30% (74% white and 44% Black). Given that Invitation Homes' is at the forefront of the shift to single-family rentership in Atlanta, the firm's largest market, it stands to reason its geography would map on to the geography of single-family rentals. However, by isolating the firm's portfolio in relation to the single-family housing stock, this research reveals additional insights into the dynamic residential geographies unfolding in metropolitan Atlanta.. While upper-middle income and whiter suburban neighborhoods have historically been owner-occupied, Invitation Homes is most concentrated in these neighborhoods. Further, when compared to foreclosures, single-family rentals, and other non-Invitation Homes post-Recession single-family rentals, Invitation Homes is most concentrated in less segregated, whiter, and higher-income suburban neighborhoods. I discuss implications and ideas for further research.

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Modeling the Risk of Exposure to Wastewater Spills in Catchment Areas

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In Georgia, between December 2020 and May 2022, just over 1000 wastewater spills reported to the Georgia Environmental Protection Division resulted in approximately 200 million liters of raw sewage spilled into local watersheds. Untreated sewage can contain disease-causing pathogens that could result in severe gastrointestinal disease when exposed to young, elderly, or immune-compromised individuals. Our proposed modeling method utilizes various GIS techniques to model a spill path and the area affected. With this path, we can estimate the number of individuals that are potentially exposed through LandScan population data. Further, we can approximate the number of pathogens that these persons are exposed to by using a simulated gastrointestinal disease-causing pathogen in wastewater dataset and evaluate the infectivity of spills in the region using functional curves of these pathogens. The pathogens included in our exposure model are Adenovirus, Campylobacter, Cryptosporidium, Giardia, Norovirus, Rotavirus, and Salmonella. The risk scores for catchment areas can be beneficial for those who enjoy water recreation so as to avoid the water bodies within catchment areas that have high scores. Additionally, these scores could be utilized by decision-makers to prioritize fixing potential sewer infrastructure in areas that have high scores.

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Creating and Using the Historical Housing Unit and Urbanization Database (HHUUD10)

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Subcounty housing unit counts are important for studying geo-historical patterns of (sub)urbanization, land-use change, and residential loss and gain. The most commonly used subcounty geographical unit for social research in the United States is the census tract. However, the changing geometries

and historically incomplete coverage of tracts present significant obstacles for longitudinal analysis that existing datasets do not sufficiently address. Overcoming these barriers, we provide housing unit estimates in consistent 2010 tract boundaries for every census year from 1940 to 2010 plus 2019 for the entire continental US. Moreover, we develop an "urbanization year" indicator that denotes if and when tracts became "urbanized" during this timeframe. We produce these data by blending existing interpolation techniques with a novel procedure we call "maximum reabsorption." Conducting out-of-sample validation, we find that our hybrid approach generally produces more reliable estimates than existing alternatives. The final dataset, Historical Housing Unit and Urbanization Database 2010 (HHUUD10), has myriad potential uses for research involving housing, population, and land-use change, as well as (sub)urbanization.

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The relationship between the network-pattern-based street spatial environment and crime of robberies and thefts, with the former DP District of HS City in China as an example

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As the spatial carrier of people's daily behaviors, the street network and behaviors therein constitute the main spatial environment of street network, which affects criminal behavior. Previous studies have shown that there are frequent cases of robberies and thefts in the streets, and the street network pattern and routine activity subjects are both related to crime. However, there are few in-depth explorations of such a relationship. Based on the police patrol area unit of the original DP District of HS City, this paper has adopted spatial analysis and statistical analysis methods to analyze the road network data, demographic data, mobile phone signaling data and other relevant data in order to explore the relationship between crime and street morphological characteristics including geometric and topological form, the relationship between crime and routine activity subjects including dynamic population and static population, and the impact of the street network on robberies and thefts. The results have shown that the factors affecting thefts and robberies in the street network are quite different. "X-shaped unit" street network, road network density, road network permeability of low-speed traffic, static population density and dynamic population density all have an important impact on thefts. "T-shaped unit" street network, density of actual residents and migrants in static population are related to robberies. But the street network pattern has not shown a significant correlation with robberies. The coexistence of the accessibility of the street network and the risk of crime is a challenge to create a safe street environment in the future.

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Social or Environmental Factors: Which Affects Obesity More?

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Obesity in the United States has become endemic, as by many accounts over one-third of Americans are obese. This is a heavily researched topic, but papers usually focus on socio-economic and racial/ethnic factors, the built environment (e.g., walkability), or the availability of fresh foods (e.g., food deserts). This paper expands the influence of the environment by considering climate, population density (as a proxy for rurality), and other environmental factors to determine how much they correlate with obesity at the county level in Oklahoma. Most importantly, this paper seeks to determine which of the myriad factors plays the biggest role in understanding obesity.

Understanding what traits seem to lead to higher or lower obesity levels can provide health departments and other involved agencies with insight into how positive traits (those that correlate with lower obesity) can be enhanced or recreated as well as how negative traits can be reduced or mitigated to encourage healthier outcomes in higher obesity areas.

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An assessment of drinking water quality in Negombo coastal region in Sri Lanka

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The present study has been carried out to assess the spatio-temporal quality variations of groundwater in Negombo coastal region, Sri Lanka. Total of 18 water quality parameters were used for the analysis, including Alkalinity, Calcium, Chloride, Electrical Conductivity (EC), Fluoride, Hardness, Iron, Magnesium, Nitrate, pH, Phosphate, Sodium, Sulphate, Total Dissolved Solid, Turbidity, Cadmium and Lead, collected from thirty one groundwater samples. The Weighted Arithmetic Water Quality Index (WQI) was used to assess the quality of groundwater. Overall groundwater quality index values were varied between 19-1211, with an average of 116 and standard deviation of 148.3566. Considerable temporal changes were observed in different seasons. The water quality index values in May 2013 ranged between 20-2018, in September 19-233, in December 31-503, in March 19-874 and 10-1211. The deviations of WQI indexes were comparatively high in May 2013 and May 2014 during the beginning of South West Monsoon periods with high rainfall. The lowest value of the WQI index is fluctuated 10-31 while the highest value of the WQI is ranged between 223-1211 indicating high variations as well. On an overall only 6% of the groundwater samples in the area could be considered as excellent for drinking and 32%of the groundwater considered as good quality. 23% of the groundwater in the area has poor quality while 14% of the samples have very poor water quality. 25% of the water in the area is not suitable for drinking.

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Building a resilient energy grid: development of an urban-scale model for energy prediction

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Often old and outdated, urban electric grids in America are incompatible with residential and commercial usage requirements. Recent weather events, such as the 2021 winter storm in Texas, have exposed serious vulnerabilities in the resilience of the electric infrastructure to support unprecedented surges in electricity demand. The growing threat of such events with climate change and the migration of populations into urban centers requires a reassessment of energy consumption patterns

in US cities. While both private providers and state regulatory bodies may have detailed information on energy consumption patterns, there is a need to develop computational models to predict consumption patterns during extreme weather events, including winter storms and heatwaves. Further, electric grids are typically built to optimize the protection of the grids themselves, rather than to minimize the human impact of electric grid failures, which tend to disproportionately impact vulnerable and hard-to-reach populations. This research uses a 3D model of the buildings in the City of Atlanta, GA to create a gradient of energy usage with the granularity of a single building and propose a plan for grid distribution optimized for human-centric usage and need. Although this paper focuses only on the City of Atlanta, the method developed can be applied to any geographic region for which 3D building models are available.

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Using mobility data to evaluate changes in outdoor recreational activity across major COVID variants

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The rapid spread of the novel coronavirus disease has caused devastating impacts and losses to countries worldwide, posing new challenges for how populations work and engage in outdoor recreational activities. Public health recommendations regarding social distancing measures, mask mandates, and shutdowns disrupted existing mobility patterns, primarily consisting of a combination of commutes for work and entertainment. However, throughout the pandemic, innovations in vaccines, a better understanding of the virus, and variations in COVID-19 strains influenced perceptions of risk, leading to modifications of social interaction and other behaviors that, in turn, had varying levels of influence on mobility patterns across cities in the US. Given segregation in many large US cities, we expect to find differences in levels of engagement in outdoor and indoor activities across geographic spaces. Further, given changes in perceptions of COVID-19 over time, we also examine if these differences in participation in outdoor activities changed over time. This study uses human mobility data from SafeGraph to analyze park use among different demographic and socioeconomic groups during the COVID-19 pandemic and associated variants, compared with previous, non-pandemic years, which serve as a baseline. This research will contribute to the growing body of literature on COVID-19 and associated disparities in exposure to risk using mobility data and conduct exploratory analyses in the spatial and temporal domains using two major cities in the USA (Miami and Atlanta) as study areas.

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Flood detection for heterogeneous land covers from synthetic aperture radar (SAR) data: a case study of 2016 Louisiana flood

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Near real-time inundation mapping is critical for rescue and damage assessment for flooding events. Synthetic aperture radar (SAR) is one of the most potential resources for near real-time flood detection due to its fine spatial resolution, short revisit intervals, and not be affected by bad weather. However, the accuracy of inundation area delineated from SAR imagery is susceptible to a variety of land covers, especially trees and buildings. The present study presents a case study of the response of SAR backscatter intensity to flood water upon different land covers for the 2016 August flood in Louisiana. Land cover is classified using support vector machine (SVM) with Sentinel-2 optical

images during similar time period with the flood event. The changes in Sentinel-1 backscatter coefficient between before and after the flood event is masked by different land covers. Flooded areas are extracted from each land cover mask respectively using SVM from the SAR change. The flood detection results are validated by the aerial photos from the NOAA Emergency Response Imagery for each land cover separately. Our results indicated that the flood detection had the most accurate result for open space, while the urban areas with buildings and sparse trees showed a relatively large uncertainty. The flood under dense canopy of broadleaf close forest can hardly be detect by Sentinel-1 SAR images.

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Modelling the impact of future state of land use-land cover change patterns on land surface temperatures in the Greater Kumasi Region, Ghana

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Background
Despite the current challenge urban sprawl in Kumasi, its land use-land cover patterns in the future as they relate to land surface temperatures is not well understood. This study predicts the future state of LULC and LST in and beyond the frontiers of Greater Kumasi.
Methods
The study used coupled Artificial Neural Networks, Cellular-Automaton-Markov chains together with multiple regression to simulate the future state of LULC and LST for 2032 and 2042. Landsat imageries from 1986 to 2022 were acquired from USGS. Various vector data from OpenStreetMap, and population density from socioeconomic data and application center. Support vector machine was used for image classification. Validation of CA-Markov relied on various kappa statistics.
Results
Between 1986 and 2022, built-up areas increased by 18.63%, high density forest decreased by 42.13%, whereas low density forest increased by 20.21%. Between 1986 and 2042, built-up area is expected to expand by 27.44%, high density forest is expected to decline by 45%, low density forest is expected to increase by 19.097%, whereas water body and baregrounds are expected to decrease by 0.61% and 0.134% respectively. Very high LSTs increased by 8.23% between 1986 and 2022. Between 1986-2042, LSTs are expected to increase spatially by 16.145%. Mean LSTs is expected to increase by 7.43 oC (36.03% increase) between 1986 and 2042.
Conclusion
This research findings call for sound institutional and sector-based coordination and collaborations especially between the Ghana Environmental Protection Agency (EPA), Country Planning Department (TCPD) and Lands Commission (LC) to comprehensively plan for anticipated changes in heat patterns across an urban area in Sub-Saharan Africa.

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Home and Older Chinese immigrants' well-being in the context of COVID-19

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The COVID-19 pandemic has signified the importance of home in people's everyday lives and wellbeing. While strictly staying at home, the pandemic provides a unique lens in studying how wellbeing is negotiated through different dimensions of home for older immigrants. This paper conceptualizes home as an intersection of embodied everyday living space, a fluid site of social relations and a symbolic place that are constantly negotiating for older immigrants in Canada. Drawing data from a virtual focus group study conducted in early 2021 in Toronto, this paper explores how different home spaces have been shifted, and their significance for older Chinese immigrants' wellbeing under pandemic conditions. While home serves as a fixed physical boundary under public health orders, it has been actively reconfigured as a place of connections with strong symbolic notions. Different dimensions of wellbeing are compromised while constrained at home, however, wellbeing is also actively shaped and supported through home for older Chinese immigrants during the pandemic. These processes are informed by embodied everyday experience at home, as well as the interrelatedness of old age, ethinic-cultural and transnational identities connected with proximate, distant and symbolic homes during the pandemic. Our findings make an important contribution to rethink home and the wellbeing of older immigrants in post-pandemic aging societies.

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An Approach to the OMB recognized Geographic Need: "a territorially exhaustive classification that covers all of the United States and Puerto Rico."

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On January 19, 2021, in the Federal Register, the Office of Management and Budget (0MB) requested public comment on the recommendations it had received from the Metropolitan and Micropolitan Statistical Area Standards Review Committee for changes to OMB's metropolitan and micropolitan statistical area standards. The "Overview of Recommendations From the Metropolitan and Micropolitan Statistical Area Standards Review Committee" included: "(3) Research should be undertaken on an additional, territorially exhaustive classification that covers all of the United States and Puerto Rico." This paper presents an approach to single-layer coverage that adds value to the historic State and County alphabetically assigned FIPS codes with a geocode method that would be used for the substate district geography chosen by each State. The county, county equivalent or municipality Census geographies are the building blocks; thus, historical data will aggregate into the substate district framework. The geocoding method will enable the aggregating of analytical regions smaller or larger than any basic substate district within a State or any contiguous multi-State area. The proposal is based on the long-term success of the implementation of The Virginia Area Development Act of 1968 led to the delineation of 22 Planning Districts, as other States had done. It was unique in that a 1972 Executive Order required State Agencies that used sub-State districts for their management to realign them to an individual Planning District or multiples. Virginia's progress has been substantial due to the geographic alignment that flowed from this simple administrative action.

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Race, Gender and Commuting: A Critical Overview of Research on Work Trips

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The paper examines the nature of urban workers' commutes based on race and gender. It shows prevalent paradoxes and intersections in transportation disadvantages and commuting burdens. Diminished gender gaps in work-trip lengths are not consistent across race and ethnic groups. Research findings complicate the intersectionality discourse in urban and transportation geography. In order to better address urban inequities, planners and scholars must pay attention to changing socio-spatial dimensions of employment access that adversely impact marginalized workers in metropolitan areas.