

Introduction to the HICSS-56 Minitrack on GIS, Industry 4.0, and Sustainability

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1. Introduction to Minitrack

This is the second year the minitrack on GIS, Industry 4.0, and Sustainability is included in the Location Intelligence Track. It aims to provide a research forum by presenting scholarly research papers that discuss the varied facets of Geographic Information Systems (GIS) for Industry 4.0 and sustainability. Technologies emerged in the past decade, such as AI, machine learning, IoT, blockchain, and the Cloud, can make sustainable development possible by improving economic conditions without causing negative societal impacts. Hence industry trends increasingly focus on sustainable business practices, responsiveness to climate change, and related social and environmental issues. GIS (or location analytics) is one of the key technologies of Industry 4.0. Location data and spatial features embedded in emerging technologies often facilitate and accelerate technological advancements by integrating people, processes, things, cities, societies, and environments into one ecological system, which are bound to create not just extensive opportunities for economic gains, but also a positive externality of ecological sustainability.

2. Paper Presentation

The minitrack presents three papers: 1) “Exploring Food Accessibility and Social Vulnerability in Atlanta, Georgia,” by Vo, A., Plachkinova, M., Sai, Y., and Seal, K., 2) “A Hybrid Genetic Algorithm for Solving the VRP with Pickup and Delivery in Rural Aras,” by Stadler, T., Schrader, J., and Dunnweber, J., and 3) “Geographic Information Systems in Information Systems Research: Review and Research Prospects,” by Priefer, J.

The paper, “Exploring Food Accessibility and Social Vulnerability in Atlanta, Georgia,” examines the current state of food accessibility in Atlanta, GA, by using the 2020 Census data, and explores how social vulnerability and food deserts are related. The authors develop a food accessibility index by using the two-step floating catchment methodology originally proposed by Luo and Wang (2003) and combine it with CDC’s social

vulnerability index to identify highly vulnerable populations with low food access. They use ArcGIS Pro for geoprocessing calculations and visualize highly vulnerable populations with low food access on choropleth maps. The authors argue that while the concepts of social vulnerability and food deserts are not new, their work employs a new approach by combining the two indices to explore their relationship through spatial analyses. This research provides some policy implications: the spatial analysis of food deserts and social vulnerability in combination can show city officials where to add food supply stores by locating socially vulnerable communities where food supplies are insufficient. It can also suggest the future site selection for local food stores.

The paper, “A Hybrid Genetic Algorithm for Solving the VRP with Pickup and Delivery in Rural Aras,” presents a new approach for solving the capacitated vehicle routing problem for pickup and delivery (CVRPPD). As vehicle routing problems have become increasingly complex, especially in the rural areas where public transport is lacking, this research aims to improve mobility in rural areas by developing a mobility-on-demand solution by taking pickup (from home) and delivery (to desired destination) into account. It uses hybrid genetic search (HGS), which comes up with an optimized route more quickly by combining a genetic algorithm with a local search. The authors argue that the new approach leverages the benefits of heuristics, such as a local search, and an evolutionary approach, such as genetic algorithm. However, as they state, their algorithm can only be used effectively for solving the CVRPPD since the algorithm has many constraints in it. The authors plan to develop the algorithm further for better performance and make it available as open-source software, which can be used as a benchmark algorithm.

In the paper, “Geographic Information Systems in Information Systems (IS) Research: Review and Research Prospects,” the author argues that GIS has become essential to information systems research as open geospatial data are available from numerous digitally connected objects on the Internet of Things (IoT). However, the importance and relevance of GIS for IS studies have rarely been investigated. To address the gap,

the author conducts a systemic literature review by following the guidance introduced in Webster and Watson (2002); she reviewed 97 publications that focus on GIS since 1995. The literature is structured with four categories: 1) research methods, 2) relevance of GIS, 3) properties of GIS, and 4) research topic. Among others, she finds that 1) most papers used design-oriented methods (52%) or data-driven inductive research (41%), 2) most papers (67%) used existing GIS software or GIS functionalities as a black box, 3) a majority of the papers (86%) address four properties of GIS (Ehlers and Schiewe, 2012), such as acquisition, management, analysis, and presentation, when analyzing data, and 4) most papers use GIS for decision support (42%) and spatial analysis (41%). Proposing four research agendas, the author calls for more research theorizing and analyzing the design and use of GIS, as well as GIS value co-created in service systems.

3. Conclusion

This is the second year this minitrack is included in the Location Intelligence Track at the HICSS. The minitrack accepted three papers. We are pleased to see that the papers deal with diverse research themes, such as the use of GIS as a research tool, a development of a new algorithm incorporating spatial data, and an investigation of GIS literature and research opportunities in the IS field.

As the importance of spatial data and location analytics increases in the era of Big Data and AI, we expect more research be conducted in this area and look forward to receiving more research papers at the HICSS 2024. We believe that the paper included in the minitrack adds to the existing knowledge and practice of location analytics and intelligence in the system sciences. We also suggest that there is still limited knowledge in this area, which needs to be addressed and discovered by future research.

4. Reference

- Ehlers, M., & Schiewe, J. (2012). *Geoinformatik*. WBG Darmstadt.
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