# Geo-Emotions Cartography: Immersive psychogeography lived experience

Wacta, Christine


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# Geo-Emotions Cartography: Immersive psychogeography lived experience

**Christine Wacta**

## An AI approach for DE-coding subjective qualitative data into a quantitative system of information network in the studies of

Geo-Emotions Cartography is a participatory mapping initiative that uses geospatial tools with AI capability to collect and spatialise the intangible activities of humans (traces-emotions-feedback). The collected data represents a layer of user-lived experiences missing in urban design processes and is necessary to improve the development of human-centred design solutions. This paper presents the pedagogical approach used in a human-centred design course—an entry-level undergraduate class in the Interior Architecture and Design school. The course activities are inspired by the psychogeography concept described by Guy-Ernest Debord (1956) in Théorie de la Dérive. While la dérive [the drift] involves a low-tech, playful-constructive behaviour by participants, with an awareness of psycho-geographical effects, the Geo-Emotions capture takes a novel approach of meshing objective, high-tech big-data with subjective, low-tech, ephemeral, loosely human data that is prone to individual bias, judgment, and opinion, i.e., personal-cultural-religious.

The proposal supports both city planning processes and the design of related systems—transportation, communication, and green infrastructure—with a qualitative human behavioural information system network. This pedagogical trial mirrors the systemic methods by weaving together tensions and contradictions, i.e., the result of human emotions, with science to cause the hidden attributes with their inherent relationships to emerge as complex systems for new research in human geography as subtopics of urban design. It further explores the gamified principles of la dérive theory

and instils a constructivist-cognitive mindset in the students and participants. Through this process, the development of the systems of thoughts and understanding is driven by the student's engagement with the community, and the individual's efforts to understand one's relationship to the environment results in cognitive development that creates a heightened collective learning experience shared back into the classroom. The students involved in this process have no prior experience with geospatial tools or analysis.

KEYWORDS: geo-community, geo-emotions-mapping, AI, system thinking, human ecology, collective intelligence

RSD TOPIC(S): Learning & Education, Mapping & Modelling, Methods & Methodology

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## Introduction

At a time when more data is collected than we know what to do with, and when applications on handheld devices such as Canvas (Occipital Inc.), Sitescape (FARO-Solutions), *Scan Anything,* and TechMed-3D (TechMed-3D) are capable of gathering incredibly accurate data on our environment or ourselves like never before, it seems logical to set standards for systemic approach with geospatial technology (GIS) to harness and leverage complex spatial data analysis that links human habitus (traces-patterns-interaction) with the built environment. This interdisciplinary work is supported by contemporary literature, and yet it extends well beyond theory to develop a deeper understanding of both the interactions in psychogeography and the place where cognitive skills meet learning theory. It is at this juncture that we create rehabilitative solutions for urban living spaces, which consider linking the intimate users' experiences with a larger surrounding social system as core components for systemic design solutions.

Geo-Emotions cartography revives the underlying systems and reconnects the naturally occurring tensions between high-tech versus low-tech, professionals versus amateurish, precision versus imperfection and digital versus tactile. In this geo-game of tensions, contradictions between culture, religion and geography are fused to create evolving and transformative cultures where conformity is no longer the norm and societies possessing this knowledge are positioned for healthy growth.

## Working hypothesis and state of the question

Cities are undergoing increasingly complex stages of spatial, physical, social, and geographical transformations, emerging from new forms and functions that surface and compromise previous dynamics, directly affecting the users 'experience. Moreover, the forecasts of increases in urban population in the future promise enormous challenges in the ability of cities to welcome and manage the new inflows of people and their needs for housing-work-entertainment and other life necessities that existing infrastructures cannot satisfy. This new population will form new social diversities and inequalities, with their own spatial patterns, segregations and differentiations hitherto unknown. Hence, there's a need to reimagine and conduct user-centric and user-led participatory initiatives that engage people as key players in generating, capturing, and recording essential data for urban analytics to move urban planning and design towards more systemic human-centred processes.

## Systemic nature of Geo-Emotions

This project used a system thinking method to combine geospatial analytical tools with creative mindsets to make sense of complex system challenges for informed design solutions that adjust and shift the systems. Geospatial analysis is connected to the digital data infrastructure, which facilitates the community engagement initiative and helps expand the network to the digital information hub, broadly defined as "a centralised solution to store and organise information, data, files and other relevant assets." (Sowards, 2021) It is anchored in existing data infrastructure, adds human-centred design, and validates the idea that even sophisticated system infrastructure shall include humane system thinking to efficiently replicate digital reality and establish a pre-populated Geo-INFO Hub, with physical and emotional system

infrastructure data as the foundation for the contextual framework of systemic design. Our proposal explores the contribution of community-nonacademic systems thinking to help better integrate the unfiltered complex realities of the terrains into design education. This process blends into the act of learning the extreme complexity of community life in which students extend ArcGIS toolkits to develop skill sets and linkage with "the people of the place" (Carl Steinitz, 2012) as practical systems oriented design methods (Birger Sevaldson, 2005), while still benefiting from the theory and methodology from the classroom.

Location-based crowdsourcing is nothing new. Since its release in 2012, the National Oceanic and Atmospheric Administration's (NOAA) mPING mobile application[1] has received over 860,000 location-specific weather condition reports, which help meteorologists improve their forecasting and track severe weather: "Scientists can compare volunteer reports from the field with what radar detects, using the data to develop new technologies to determine precipitation" (U.S. General Services Administration). Emotion cryptography is a participatory initiative that delineates a systemic effort and invites millions of users to contribute personal views on services and topics of their choice through mobile devices spatialised anonymously. The data is manipulated by students to:

- **Visualise** the systems to gain comprehensible views
- **Humanise** the system through community engagement to cause insights to surface for arguments to stakeholders
- **Redesign** the system by prioritising human-centred systems thinking with feedback loops for iterative design with lasting changes

[1] https://mping.nssl.noaa.gov/

## Related work

The Geo-Emotions application uses statistical analysis in urban planning, mirroring sociologist methods that consist of observation, social theory, interviews, and recorded traces to study a range of topics, including social-cultural trends and many other related topics to develop human-centred system thinking for better design solutions. Max Weber (1864-1920) and Georg Simmel (1858-1918) studied and theorised the economic, social, and cultural processes of urbanisation and its effects on social alienation, class formation, and the production or destruction of collective and individual identities. Theories were further expanded by researchers who worked at the University of Chicago in the early twentieth century. The work of Robert Park, Louis Wirth, and Ernest Burgess on the inner city of Chicago revolutionised the purpose of urban research in sociology, and even though it represents the most significant historical advancements in understanding the city within the social sciences, it remains merely theoretical. Our proposal integrates systemic methods in spatial data collection activity with emotions mapping (Foster); it leverages theory and application and suggests numerous studies about understanding _how user emotions are systematically intertwined with space and time, _How context triggers user's reactions and _How to make sense of the spatialised intangible data. In his theory of la Dérive, Debord (1956) focuses on the effect of psychogeography experience with manually recorded studies. Similar applications such as Mappiness (London School of Economics and Political Science) and Shmapped (Richardson, 2017) have been developed for measuring and recording user emotions: the first allows the users to take pictures of what makes them happy, the second focuses on the emotions around green spaces and parks in Sheffield, UK. While both apps., collect geolocated users' data, they do not incorporate the flexibility and multi-emotions-capture options, nor do they record the speed, time spent, or direction of travel as does the Geo-Emotions app.

### Application development framework and process

Geo-Emotions-application uses the ArcGIS platform with other—AI, IoT, Geomatic and robotic—tools to develop a data exchange/deployment system network. Existing methods of data capture with the integration of SLAM (Simultaneous-Localization and Mapping) are often limited with little flexibility and non-inclusion of the end-users, though they provide highly precise scans of indoor-outdoor environments (objective-tangible data), as well as digital traces of the activities of the inhabitants (subjective-ephemeral and intangible); yet they miss the users' essential system of information and feedback at the time of the event. The users' viewpoints and emotions often emerge in contradiction with those suggested by the automatic massive captures. Geo-Emotions-capture's instant feedback system contrasts with the traditional paper questionnaires or web surveys conducted when the users are no longer on-site.

## Conceptual stages and methodology

The process begins with the development of several proof-of-concept prototypes that include various human-centred issues experienced by city dwellers. The original concept to create a larger complex system thinking (not in the scope of this paper) is to give the end-users full control and ability to reconfigure the user interface (UI) by adding-removing option buttons based on location, capturing preferences and personal interests, such setting permits to invite all users to co-create a complex Metaverse-style systemic environment that does not yet exist. This remains a goal in the ongoing research development.

## The concept

Various categories with customizable-reorganizable diagrams based on the user and area of interest (AOI).

**Step 1: Creating the "shell" for the app**

After an initial survey of the location and interviews with the end users and future participants, each student sets up the UI according to the Quick-Capture app's built-in attributes.

**Step 2: Developing attributes for emotions-capture**

Three data types are used to represent geographic features and their attributes:

> **Points** represent physical infrastructure, e.g., roads, lights, buildings, or any visible structure or being. Instances are represented by points on the map. Point features are symbolized with camera icon.
>
> **Lines** trace the path taken by the user in motion. Emotions are recorded along the path; one or more emotions can be initiated at the same time. For each emotional reaction, the user is given a popup to further express their thoughts.
>
> **Polygons** are enclosed shapes that indicate an area of study, e.g., areas in a park with excessively worn sidewalks that need attention. A Polygon is activated in motion. Instances are represented with polygons on the map.

## UI design and customisation

The urban infrastructure is the version students use to test the app. Students can add to, remove from, or recreate their own. Users activate one or more emotions while simultaneously photographing their experience.

## UI design and representation

In the Fall of 2022, the Geo-Emotions Mapping application was tested in two locations: Savannah, GA, USA and Paris, France.

**App testing in the undergraduate human-centred design course**

In the human-centred design course, students establish links between social issues and environmental issues and develop a human-centred system thinking strategy as essential traction for systemic change. Most human-related environmental design issues, even those that seem unrelated, are, in fact, systemically linked for the simple fact that they are intertwined with the-place-time-user and cannot be extracted or isolated nor addressed separately without negating the system integrity. Each of these crises is systemic in that they cannot be broken down into independent parts to be treated separately (Ben Sweeting, 2020). Horst Rittel and Melvin Webber call these wicked problems with complex interdependencies. The participatory nature of the class activities connects the students to the intangible qualitative, hardly measurable system of; (emotional, cultural-religious-political views, background, preferences, and bias); it brings forth a ludic _Metaverse-style Play initiative where location-specific design and behaviours become the learning and teaching tools that inform other locations in ways that transform, shift the mindsets resulting in the RE-assessment of location-based solutions. These learning opportunities contribute to expanding knowledge and growth in other locations toward augmented systemic thinking at a global scale. Richard Sennett describes such a process when he says that “cities should not be ‘user-friendly’ but instead encourage people from different walks of life to encounter one another and learn to get along. Jane Jacobs confirms this statement when she says, “Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody”. This proposal invites users to co-create an alternative place from the collective intelligence of all.

**Teaching and learning as cognitive constructivism**

The geospatial tools used here support cognitivist teaching methods in helping students:

- assimilate new scientific processed information
- observe systems change through data collection, analysis, and visualisation

This enables them to confront and modify their existing views to accommodate new information within the systemic thinking framework of the activities. As in Piaget’s theory of constructivism, knowledge is actively constructed by learners based on their

existing cognitive structures. In this teaching methodology, learning is relative to everyone's stage of cognitive development as well as the context and encounters they make since "Humans must construct their knowledge" (Piaget, 1953).

This proposal deploys and visualises the design process and development on a live dashboard where changes are instantly updated and visualised as they impact and cause shifts to the system, which is further studied and understood in situ.

Class activities and community participation resulted in the creation of a wealth of collective knowledge or "collective intelligence" (Mortamais, 2019), heightened student's inventiveness and novelties, which contributed to the development of new teaching methodologies that dared to break with the "dogmatic approach" still used in design education today.

**Assigning the geo-emotions cartography activity**

Students are given a QR code to test for a week. They record their emotions about an environment of choice; no specifics are given. Students must answer three questions.

- What are their findings and experiences?
- What would they change and why?
- What worked? And what did not?

**Assignment: Developing an app**

After the test, students develop an app in four steps.

Step 1: Select an area of interest (AOI) that is accessible and often visited.

Step 2: Find ten people to interview about their daily life experiences. Students develop their interview questions based on their location and interests, making sure the interviewees agree to test the app for 7-10 days after it is created.

Step 3: Synthesize users' feedback and use it to develop the app.; then share with users for Data capture.

Step 4: Analyze-spatialize-interpret results and conclude.

## Field trail spin-offs

This section describes three student projects as use cases: farmers' markets in a digital age, turning lost spaces into public spaces, and safety around campus.

### Student #1—farmers' markets in a digital age

Student#1 developed a participatory initiative to understand the local food movement, its systemic nature, and environmental change's impact on agriculture, nutrition, and health toward the concepts of resilient communities and a sustainable planet.

#### Procedure and Interviews

Student#1 visited the Statesboro, GA, Farmers Market and met vendors and market goers to learn about the market's resources and features. The interview questions were developed to include the challenges, issues, accessibility, design features, and other related issues of farmers' markets. Ten volunteers were interviewed about their experience in the markets.

#### Interview data synthesis

Interview results showed a need for basic infrastructure: bike racks, seating, and public transportation. Challenges faced include the lack of public transportation, the distance between the market and housing developments, and the lack of parking. Answers were split between preferences for indoor versus. outdoor markets, and weather protection of the market facility, with emphasis on the natural environment of open air. Answers also varied depending on the distance that participants wanted to walk or drive to or from the market. Most people were willing to walk 15-minutes while others said they would walk up to an hour, weather permitting. A few participants would drive within a 5-mile radius while others for up to two hours, and 10 out of 11 participants shared that they look for fresh fruits and vegetables at the market, while several emphasised the desire for small, unique experiences and the importance of a different environment than that of the grocery store.

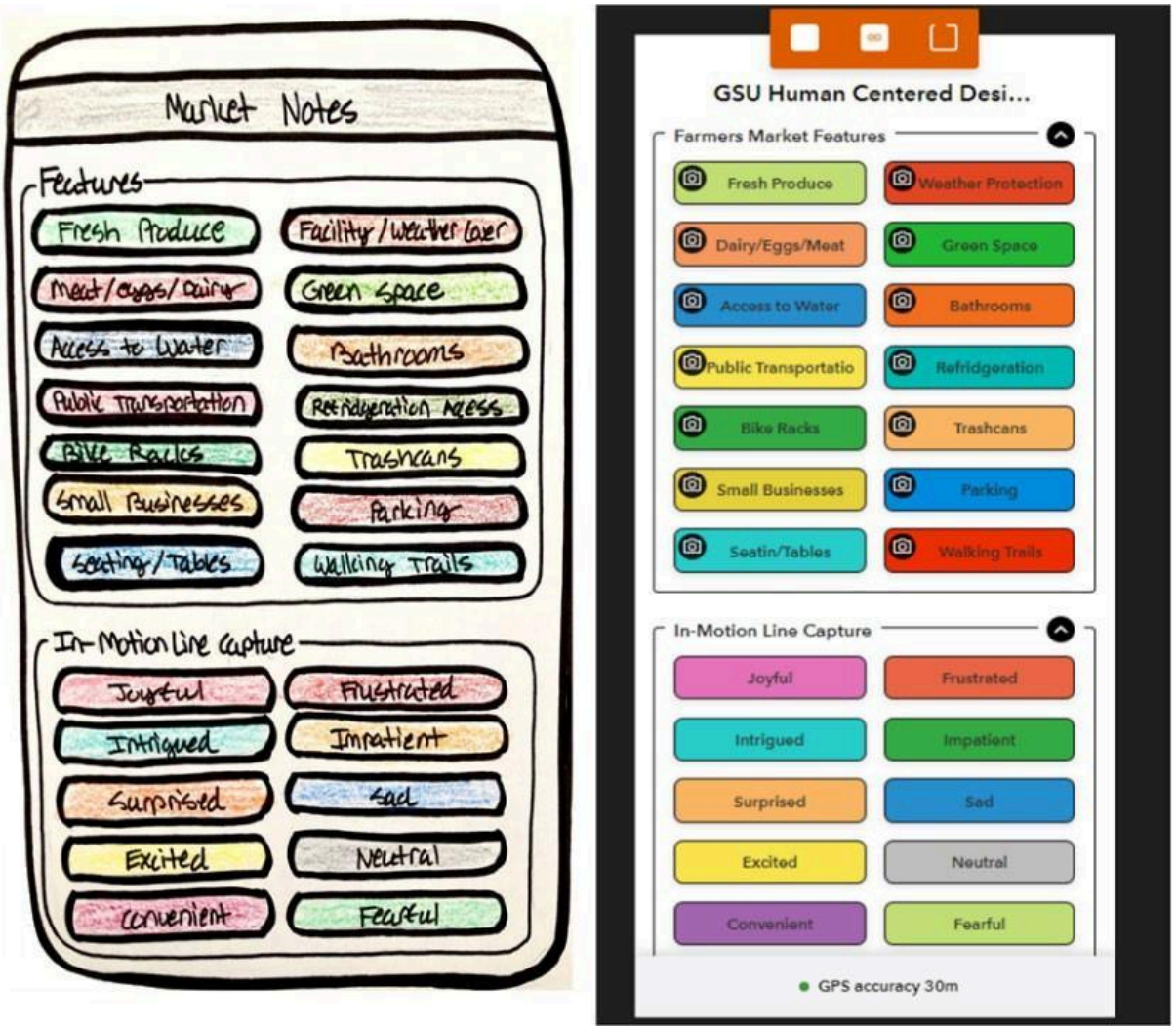


Figure 1. Student #1: Final drafted app (left) and final app. shared with participants (right).

**Student#1 app development**

Four Geo-Emotions app UIs were developed for this project.

- Option 1 explores interview items and emotions such as “Trails,” local “Honey,” and convenience.
- Option 2 explores emotions such as impatience with features such as "Market-2-Go" and "Artisans".
- Options 3 and 4 explore farmers' markets and fresh products.

**Student#1 Final app Design**

The final design combines all ideas (Figure 1). The Geo-Emotions application includes points for capturing features and items related to the farmers' market structure, in-Motion Line Capture tracks users' emotions as they move throughout the market.

The results are encouraging in that the users did not only capture in their communities; many travelled to places like Atlanta (5 hours away) or Alabama. The activity is still ongoing, and we still receive and visualise ongoing data capture on the Hub. A QR code (Figure 2, above) and website were developed: https://arcg.is/1eO89b.

**Woodstock, Georgia Farmers Market findings**

The Data indicates a large white population with a far larger percentage of white-collar to blue-collar workers, a large percentage of college degrees, and a median income of around $ 60,000.00 a year. The tapestry segmentation shows many "upscale avenues." Population density is significantly higher within 5 minutes of the market as compared to 15-30 minutes, with home ownership increasing steadily farther away from the market. The tendency to buy or not buy organic and local foods hovers just below or above the national tendency for all distances around the market.

**Atlanta, Georgia Municipal Market findings**

In this area, the population density decreases as one moves away from the market, while median household income greatly increases. Interestingly, the median age hovers around 50 within 5 minutes of the market but drops to 20/30 within 15-30 minutes. The percentage of white-collar workers is well above that of blue-collar workers at all distances to the market, commuting times are lower, and college housing is prominent due to the proximity of Georgia State and Georgia Tech. Higher educational achievement is widespread within 15–30 minutes of the market but drops noticeably within 5 minutes. The demand for local and organic foods is above the national demand, while the tendency not to buy local and organic is below the national tendency.


Figure 3. Student#2 Final app design and UI development based on interview (top). Emotions captures results and users' traces (bottom).

## Student #2—turning lost spaces into public spaces

Student#2 developed the Geo-Emotions app to transform unused lost spaces into public places. Interviewees shared issues related to their daily interactions and their suggested solutions on how to address those issues (Figure 3).

Five men and five women were interviewed from various cultures, ages, education levels, and interests. Many similarities emerged from the interview in what they perceived as a safe environment and ideal infrastructure for their community. The data collected provided a basis for building a systemic Co-designing-initiative where users voluntarily participate in re-imagining their ideal environment based solely on individual perception with no influence from any societal trends or exterior views. This non-conventional, loosely, and systemic network approach to Co-Design yields many benefits and opportunities that come as disruptive forces to the known top-down

conventional model. The user-participatory approach encompasses various sub-systems with illimited networks and interconnectedness to human geography with a level of complexity that cannot be understood or tackled with the conventional design approach. This highly complex open cycle system functions through users' input-analysis-output and causes the model to shift-adjust-change based on inputs, location, time, trends, or other individual attributes. This proposal presents a high learning potential that heightens the cognitive structure of the participants and augments the designer's knowledge of human systemic thinking with location intelligence; this transformative process introduces Co-Design as a gamified and humane sub-topic of urban design, where the iterative process of participatory design happens within a constant re-adjustable system of complex networks.

**Student#2 capture and overall findings.**

Student#2 focused on the common interest shared by the interviewees: having a safe, inclusive, and inviting atmosphere in the community with gathering areas for talking, eating, reading, and playing.  Home privacy was important, but well-designed public spaces were the most needed. Another issue was the need for improved sidewalks for walking in neighborhoods. Seven out of ten reported the lack of bike lanes or pedestrian paths, which results in unsafe streets.

Nine out of ten people interviewed shared concerns about safety within two blocks of their home at certain times of day. This information helped develop the Geo-Emotions app's user Interface above.

Student#2 collected results from various geography beyond the original location where the interview was conducted.

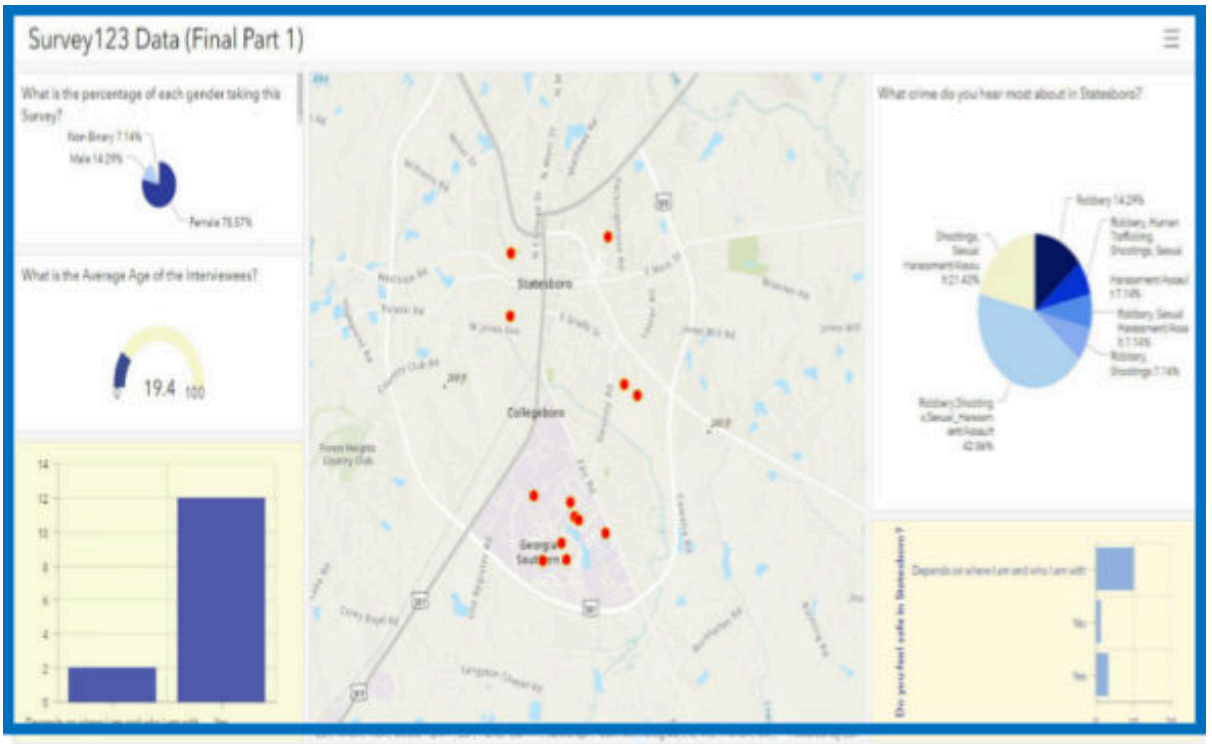


Figure 4. Student #3 dashboard with interactive infographics.

## Student #3—safety around campus

Student#3 used three ArcGIS applications for this project: ArcGIS-Online, ArcGIS-Survey 1-2-3 and ArcGIS-Dashboard (Figure 4).

The process starts with the interview questions through ArcGIS-Survey 1-2-3 for automation and efficiency. Unlike the previous two, this operates directly online with no actual meeting with the interviewees. A link was sent with preloaded questionnaires with the “If” condition for follow-up questions. This approach is built as a system that automatically connects specific questions to corresponding following questions. This provides more flexibility and a broader result since all interviewees do not necessarily get the same questions.

## Other students' work outcomes

The cumulative work of all 78 students in the human-centred design course revealed many research venues and a surprisingly rich array of topics. Even though all students followed the same assignment guidelines, the results and focus were different and

mirrored the cognitive constructivism approach, where each student actively constructed a knowledge system based on their existing cognitive structures. With only ten participants involved per student, the results were useful but not representative of the reality of the neighbourhood; this indicated the need for scaling up to a city or region.

Introducing geospatial tools instilled in students an insatiable thirst to research and engage with the community. Student #1, for example, explored the census data and took the research a notch higher to a comparative study that helped link various locations to make sense of the interdependency of the facts in all locations. Only three out of seventy-eight projects are presented in this proposal; the seventy-five others are equally unique and tell different stories about human geography and systemic thinking.

The learning and outcomes could not have been imparted by one single professor. The results from fall 2022 have created the basis upon which we hope to improve next term based on the lessons learned.

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## Author

Dr Christine C. Wacta is an African-born French architect who holds a license in Architecture, D.P.L.G Paris-la-Defense (France), a Master of Architecture from the University of Minnesota (2001) and a PhD from Sorbonne University (2019). She has worked as an intern architect in Dresden, Germany, Paris, France, and Minneapolis, Minnesota, and most recently is an Assistant Professor at the School of Human Ecology, GA Southern University, Statesboro, GA, USA. cwacta@geoedugaming.org