

**Proposal for an Area of Existing and Emerging Excellence:**

**Geodesign Sustainable Futures:  
A Campus-wide Initiative on Research and Curricular Development**

**Participating Academic Units:**

Architecture  
Geography

**Collaborating Leaders:**

PI: Dr. Jose Gamez (School of Architecture)  
Co-PI: Dr. Gang Chen (Department of Geography and Earth Sciences)

**Key Collaborator:**

Dr. Ming-Chun Lee (School of Architecture)

**Keywords:**

Geodesign, GIS, geospatial analytics, sustainability, built environments

## **Executive Summary**

Geodesign as an emerging field has recently gained worldwide attention from researchers and practitioners in such diverse areas as geography, ecology, environmental science, landscape architecture, urban studies, community design, urban planning, and many other allied professions. Since the first specialist meeting focused on spatial concepts in the intersection between GIS and design held at UCSB in 2008, there have been 13 other conferences, called Geodesign Summit, taking place on an annual basis in Redlands, California. In 2016, one decade after the term Geodesign was first coined, a special issue on Geodesign in Landscape and Urban Planning (LAND, ranked #1 in urban studies) has further pushed its reach to many allied fields working within the realm of built environments. International Conference on Computers in Urban Planning and Urban Management (CUPUM) started to include Geodesign as a major theme in its 2019 meeting. Geodesign brings geospatial analytics into the process of designing built environments. It integrates geographic information science with design, resulting in a systematic methodology for spatial planning and decision making. It enables designers to think about geospatial data as a part of a creative decision-making process and to translate geographic analysis into built forms. Geodesign offers critical opportunities to visualize landscape and urban development patterns and comparatively evaluate future urban growth scenarios, for example, using key metrics such as sustainability, ecological footprint, and place-type characteristics.

Many scholars and educators in this field believe that there is a need to establish a discipline of substance for Geodesign in the context of built environments, including values, semantic clarity, and clearly defined processes that can be taught within the context of the various existing curricula. A number of prominent efforts have been initiated, including a degree program in Geodesign at the University of Southern California and an online extension program in Geodesign at Penn State University. The BS degree program in geographic science and community planning at Northern Arizona University, adopted in spring 2011, is considered to be the first curriculum that is implemented under the Geodesign framework.

Geodesign presents a tremendous opportunity for UNC Charlotte to transform its curricula in several areas and to establish the campus as a think tank for promoting and realizing sustainable futures. Three things are urgently in need to be done:

1. Establishing a joint research venue for generating a solid knowledge base for and a comprehensive understanding of Geodesign through interdisciplinary research inquiries.
2. Developing a design-centric and cross-departmental geospatial curriculum in School of Architecture with Department of Geography as a collaborating degree partner to cover analysis, visualization, communication, and strategic planning components of sustainable development of urban and built environments.
3. Promoting civic engagement and building community partnerships to explore new ways of implementing Geodesign into a wide array of real-world problem-solving situations.

Through this interdisciplinary approach across the boundary between geography, computing, and design, students in this proposed joint initiative are expected to gain awareness of the earth's natural and built environments and develop confidence to engage with places by learning the fundamental interrelationships between the earth's physical and human systems. Students will communicate and apply these comprehensive approaches for maintaining sustainable environments, communities, and landscapes for the benefit of future generations.

## **Evidence of Strength and Excellence**

The lead PI Dr. Jose Gamez contributes urban design and sustainable development expertise into this emerging field of Geodesign. Dr. Gamez's urban design projects have been built based on a socio-technological approach incorporating both community engagement and mapping overlay techniques informed by the Geodesign framework. His scholarly partnerships involve faculty in Charlotte and abroad. His co-edited book, *Rio de Janeiro: Urban Expansion and Environment*, is the result of a globally interconnected curriculum focused on urban design, climate change and sustainable development built upon/across an international network of interdisciplinary scholars, students and practitioners. This multi-year project looked to Brazil where climate change, sea level rise, mega-event driven formal development, and crisis driven informality were all side by side. His capstone urban design courses fostered a series of three year design-research-engagement opportunities for students and faculty across continents and across disciplines (Architecture, Urban Design, Geography, Geology, Environmental Sciences, Latin American Studies) and two universities - UNC Charlotte and the Pontifical Catholic University in Rio in order to address global challenges through a global hub from which multi-year project-based initiatives could grow.

Co-PI Dr. Gang Chen brings expertise of geospatial analytics and environmental modeling to this initiative. His research focuses on monitoring fine-resolution urban environmental change with state-of-the-art remote sensing systems, such as LiDAR, and aerial photography. He has further developed machine learning (deep learning) models to understand urban landscape responses to climate change (e.g., severe drought) and anthropogenic disturbances (e.g., hydropower construction). He has been working on a variety of projects across several regions/countries including Brazil, Canada, China, Southeast Asia, Turkey, and the United States. Dr. Chen is the M.A. Program Coordinator in Geography and Earth Sciences. He serves as an Associate Editor of *ISPRS Journal of Photogrammetry and Remote Sensing*, which is the official journal of the world's leading remote sensing society – International Society for Photogrammetry and Remote Sensing (ISPRS). He has published widely in the field, including his research appeared four times in the journal *Remote Sensing of Environment* (IF=9.085) since 2017.

The key collaborator of this initiative Dr. Ming-Chun Lee has been a Geodesign expert since 2010. In particular, Dr. Lee has had extended experience in conducting scenario-based Geodesign projects. His earlier work on two regional scenario planning projects between 2012 and 2015 helped establish the foundation of his research in this emerging field. From 2012 to 2013, as a research faculty member at the Center for Sustainable Development at the University of Texas at Austin, Dr. Lee was involved in a scenario planning project funded by HUD Sustainable Communities Regional Planning Grants. Dr. Lee continued his research after joining UNC Charlotte in 2013. He was involved in another regional scenario planning project, CONNECT Our Future also funded by HUD. In May 2014, Dr. Lee was awarded a faculty research grant from UNC Charlotte to launch a Scenario Planning Assistance Team under City Building Lab in School of Architecture. Dr. Lee partnered with Town of Davidson and used scenario planning methods to conduct a community planning workshop. The goal of this project was to demonstrate how the regional growth framework from CONNECT Our Future can be further implemented to local jurisdictions.

Since 2010, Dr. Lee has received research grants with a total of \$608,527 to support 10 different projects relevant to Geodesign, including another faculty research grant from School of Architecture in 2017 to launch his integrated research platform, The [I<sup>2</sup>-M-A-G-E]: the *Interactive MApping & Immersive GEospatial Modeling* Framework, which consists of a software-hardware tools suite and a curricular module for introducing geographic information science and its associated geospatial technologies to urban design students. Dr. Lee has written several articles about his scenario-based Geodesign projects, including his article for the LAND special issue titled “Geodesign Scenarios,” an article co-written by co-PI Dr. Jose Gamez on The Plan Journal, two articles presented at CUPUM Conference 2015 and 2017, later published by Springer as a book chapter in July 2017.

Design studio courses focused on physical planning and urban design have been a significant part of Dr. Lee’s teaching responsibilities at UNC Charlotte. Dr. Lee stresses the importance of integrating geospatial tools into every aspect of planning and design processes and devotes himself to create a learning environment enabling students to be exposed to digital analytics and visualization techniques that can help collect, interpret, and analyze information and smooth out burdens of communication between designers and their various audiences. In 2014, Dr. Lee launched a joint studio with PI Dr. Jose Gamez to use Geodesign techniques to explore the impact of changing coastal patterns on the urban form in City of Wilmington. Students in this studio explored the future of North Carolina coastal areas in light of rising global sea levels. In 2015 and 2016, with the financial support from University City Partners and Charlotte - Mecklenburg Parks and Recreation, Dr. Lee conducted two urban design studios using this Geodesign approach. In 2017, in collaboration with Georgia Tech and Tongji University (China), Dr. Lee conducted an urban design workshop, for which he introduced scenario-based Geodesign methodology to the joint class. Dr. Lee led a UNC Charlotte team, the only university from North Carolina along with other 55 universities from 29 countries around the world, to participate in the inaugural conference for the International Geodesign Collaboration in 2019.

Dr. Lee has presented his research findings and class projects at various conferences, including Esri User Conference (2014, 2020), Geodesign Summit (2012, 2013, 2014, 2015, 2016, 2019), UAA Annual Meeting (2015, 2016), CUPUM Conference (2015, 2017), CELA Conference (2016, 2017, 2018), Civic by Design Forum (2016, 2017), ACSA Annual Meeting (2017, 2018), ARCC Conference (2018).

This collaboration aims to establish a joint research initiative focused on Geodesign and develop a curriculum for an interdisciplinary degree or certificate program in Geodesign by leveraging current research capabilities and course offerings between Architecture and Geography. This proposal seeks recognition for the collaborative research and teaching initiative described below as an Area of Existing and Emerging Excellence based on PIs’ recent successes in conducting related research projects and developing/offering courses that serve as a foundation for faculty and students at UNC Charlotte to strengthen and advance research and professional practice in Geodesign.

## **Alignment with Regional and National Priorities**

This proposal aligns with the College of Arts + Architecture's Strategic Plan to develop vibrant cross-disciplinary partnerships both within the College and with other colleges and individuals across UNCC. This initiative will advance our institutional mission and academic relevance by laying the foundation for a center of influence and hub of research activity that impacts all dimensions of our learning and creative community and that it informs both existing programs and proposed ones (for example the MFA in Arts and Civic Practice, which is currently under development, and the recently launched Master of Science in Architecture STEM-based degree).

This proposal addresses the University's mission by: leveraging our "location in the state's largest city to offer internationally competitive programs of research and creative activity" that reinforces our "commitment to addressing the cultural, economic, educational, environmental, health, and social needs of the greater Charlotte region" and beyond. This proposal addresses University values that foster "A robust intellectual environment that values social and cultural diversity, free expression, collegiality, integrity, and mutual respect."

This work also addresses UNC System priorities. As the UNC System states, our universities will be critical if North Carolina is to "face today's challenges and those on the horizon, from shifting economic demands to an increasingly diverse population." This will involve the development of relevant and innovative areas of study that will capture the imagination of this state's youth and that explore the complexities of 21<sup>st</sup> century cultural dynamics. At the state level, this proposal addresses the North Carolina Arts Council's goal to "Lead to Ensure a Strong Future for the Arts", which aims to "strengthen the arts industry's capacity to embrace diversity and engage our state's changing communities."

This proposal supports the National Endowment for the Humanities' Strategic Planning Goal 1: to "Provide opportunity for all Americans who wish to pursue knowledge in the Humanities;" their objective of "Expanding Access to the Humanities in Traditionally Underserved Communities; Facilitate Humanities Scholarship at the Post-Secondary Level;" and their strategy to "encourage collaboration between humanities scholars and academics of other disciplines."

Similarly, this proposal supports the National Endowment for the Arts' Strategic Planning Goal 2: "Cultivate Public Engagement with, and Access to, Various Forms of Excellent Art across the Nation" as well as their Objective to "Provide opportunities for the American people to engage with the arts; Objective 2.2 Provide opportunities for the American people to acquire knowledge and skills in the arts at all stages of life; Objective 2.3 Provide opportunities for the arts to be integrated into the fabric of community life." In these ways, this initiative addresses ingrained legacies that hinder institutions of higher learning.

This proposal aligns with National Science Foundation's 10 Big Ideas, in particular, Idea 2: Growing Convergence Research: merging ideas, approaches, tools, and technologies from widely diverse fields of science and engineering to stimulate discovery and innovation. Idea 3: Harnessing the Data Revolution: engaging research community in the pursuit of fundamental research in data science and engineering, the development of a cohesive, federated, national-scale approach to research data infrastructure, and the development of a 21st-century data-capable workforce.

## Supporting Documents

Name	Title	Contribution/Expertise
Dr. Jose Gamez	Professor of Architecture	Urban design, community engagement, and sustainable design expertise
Dr. Gang Chen	Associate Professor of Geography	Urban environmental monitoring and modeling, geospatial analytics, landscape change analysis expertise
Dr. Ming-Chun Lee	Associate Professor of Architecture	Geospatial analytics, Geodesign, urban design, urban planning, and community engagement expertise