D+AC: Design + Analytics Center for Human-Centered Built Environment Data Science

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Key Participating Units: College of Agriculture and Life Sciences: Agricultural Economics; College of Architecture: Architecture, Construction Science, Landscape Architecture & Urban Planning; College of Engineering: Civil & Environmental Engineering, Computer Science & Engineering, Electrical & Computer Engineering; College of Geosciences: Geography, Geology & Geophysics; College of Science: Mathematics, Statistics; TAMU Health Science Center: Environmental and Occupational Health; Texas A&M Engineering Experiment Station; Center for Housing and Urban Development; Hazard Reduction and Recovery Center; Institute for Sustainable Communities; Center for Health Systems & Design; Microclimatic Design Research Group; Human Behavior Laboratory; Interface Ecology Lab; UrbanResilience.AI Lab; Natural Language Processing Lab; Earthquake Modelling Lab; Cyberinfrastructure and Decision Intelligence Lab; Geospatial Exploration and Resolution Lab; Immersive Visualization Center; Center for Population Health and Aging; Data Science Institute; High Performance Research Computing; ENDEAVR Institute; Center for Geospatial Sciences, Applications and Technology (Bios and Support Letters attached in the Appendix).

Anticipated Request Amount ($): $725,999; **Fund Matching by Team** ($): $772,626+

Executive summary: Advancements in location-aware technology, information and communication technology, and mobile technology during the past two decades have transformed the focus and need of built environment research from mostly indoor-based, community-level, or metropolitan-scaled static assessments to spatial, temporal, and dynamic relationships which integrate human behaviors across multiple environments and scales (mixed environmental models now including natural, built, and virtual elements). Simultaneously, projections show that, globally, more people will live in areas designated as vulnerable or high-risk relative to contemporary and future urban issues (e.g. sea level rise, depopulation, natural disasters, etc..), suggesting more communities will experience multi-hazard risk increase. Disasters and public health crises are global challenges as well as a significant source of property loss, social disruption, and inequality. Communities can reduce vulnerability while increasing social and physical resilience through research-driven, evidence-based planning, design, and policy development. However, silos within the design, social, and engineering sciences as well as yawning gaps between research and practice have made sustainable and equitable development difficult. The objective of this proposal is to the create a **Design + Analytics Center for Human-Centered Built Environment Data Science (D+AC)** to leverage existing investments across specific domains/disciplines, while providing an integrated platform which bridges these disciplines and affords new capabilities and research infrastructure enhancements through: (1) advanced Geospatial Design and built environment science; (2) integration of both virtual reality (VR) and augmented reality (AR) with new three dimensional models for creating numerous simulated built environment scenarios; and (3) community engagement and the implementation of cutting edge built environment sensors which will directly feed into 3D, AR, and VR urban models to create dynamic digital twins of existing neighborhoods and cities. Such research infrastructure enhancements will thrust Texas A&M system to the forefront of technological research capabilities. The D+AC will simultaneously visualize, analyze, and design interactions between the built environment and human action, rather than simply adding another lab on human activity or built environment research. It projects to impact, at minimum, 6 Colleges, 12 Departments and Programs, and 17 research institutes, centers, and labs across the TAMU system and will balance the ability to capture high resolution built environment data and human dynamics data while being accessible enough so that any researcher can learn to run simulations with minimal staff support. We propose such an integrated research and professional development platform to allow interested faculty, researchers, students, and community residents and decision makers to both network with one another and utilize state of the art equipment and modeling in their research efficiently and at a low cost in a single location. Most importantly, this will be a true convergence accelerator for the TAMU research enterprise, increasing transformative research for communities in the 21st century and the promise for external funding through basic, translational, and applied research.