*. **Innovation[X] 2021-2022 Proposal Application**
The School of Innovation and Innovation Partners are calling for proposals for the next round of our Innovation[X] Program, which provides grants that allow multidisciplinary teams of faculty, undergraduates, graduate students, and postdocs to work together to address complex real-world challenges.

Faculty may apply for grants of up to **$20,000** to facilitate year-long projects. The number of grants to be awarded will depend on funding and application levels. Funding begins September 1, 2021.

Additionally, we have partnered with the Mays Innovation Research Center to fund a set of proposals to study the process of innovation itself. Successful proposals for this subset will pursue topics such as, barriers to or preconditions for innovation, the effects of law and policy on innovation, the behavior or psychological requirements for innovation, innovation and health, the social impacts of innovation, international comparisons of innovation, or novel measurements of innovation.

Proposals are due by 11:59 PM on our **newly extended** deadline of **February 22, 2021** and must be submitted using this online form.

NOTE - Only one team leader/faculty member needs to submit a proposal for a given project.

Reminder of Requirements:
* Teams must consist of an interdisciplinary set of faculty members, and must include two (2) faculty members from different colleges/schools.
* Teams must include a multidisciplinary team of 10-20 students, both undergraduate and graduate, from across the university.
* At least 8-10 of these students must be undergraduates.
* The team must include students from at least two (2) different colleges/schools.
* Students must participate in the project for both Fall 2021 and Spring 2022 semesters, with limited exceptions.
* Proposals should demonstrate a team-based approach to a complex problem and include meaningful deliverables.

Please contact Assistant Director Emily Finbow at innovationx@tamu.edu or 979-862-6071 with questions.

*. For which tracks would you like your proposal to be considered?

○ Track A - Traditional Innovation[X] Project

○ Track B - Special Track - "Process of Innovation" Innovation[X] Project

◉ Both Track A and Track B

*. Project Title

Restoring Happiness: Leveraging GeoAI and Social Engagement to Address Happiness Inequalities Post Covid and Winter Storm Uri

*. *Please provide the following information for the Primary Point of Contact for the Project (Project Leader)*

. Prefix

Dr.

. First Name

Heng

. Last Name

Cai

. Email Address

hengcai@tamu.edu

. Phone Number

2255886978

. Gender Identity

- ○ Man
- ● Woman
- ○ Trans Man
- ○ Trans Woman
- ○ Genderqueer
- ○ Non-Binary/Gender non-conforming
- ○ Not listed above, please specify [   ]
- ○ Prefer not to respond

.
Ethnic and Racial Identity

- ○ Hispanic/Latino/a/x
- ○ American Indian or Alaska Native
- ○ Asian/Pacific Islander/Desi-American
- ○ Black/African American

○ White

○ Bi-racial / Multi-Racial (please specify): [_____]

○ Not listed (please specify): [_____]

◉ Prefer not to respond

. Project Information

. Please provide brief background/context for the issue this project seeks to address. (2,000 character maximum)

Life satisfaction and positive sentiment, broadly conceptualized as happiness, are the ultimate goals of all human beings. External stressors, such as pandemics and hazards, have caused emotional distress and depression. The literature has suggested that these stressors' adverse impacts fall disproportionately on disadvantaged populations, leading to changing levels of happiness and inequalities. The recent Covid-19 pandemic, compounded by the Winter Storm Uri, have caused not only tremendous infrastructural damages and disruptions to social networks but also various degrees of mental stress and depression among different populations. However, we know very little about the happiness disparities since the start of Covid-19 and how the effects of Winter Storm Uri may exacerbate mental distress. As Covid vaccine rollout continues and communities recover from the physical damages of Uri, mental health restoration also requires urgent policy and research attention. Existing studies on happiness mainly use two types of measurements. The first type is a composite happiness index by aggregating a set of city- or community-level infrastructural and service indicators such as the WalletHub Happiest States/Cities. The second approach is to utilize self-report survey items to calculate the happiness score such as the Word Happiness Report. However, most of the previous research efforts only focused on coarse geographic scales (country or city) for a static period. Dynamically monitoring the subjective well-being of populations at finer spatiotemporal scales remains challenging due to data unavailability and the lack of empirical validation of happiness levels. Moreover, there is a major disconnection among researchers, stakeholders, and citizens; thus, most of the scientific findings remain unusable or unactionable. There is a critical need to derive actionable and place-based strategies to enhance community happiness.

. What are the goals for this project? (5,000 character maximum)

The overarching goal of this interdisciplinary project is to develop a research and social service hub with members from diverse backgrounds to restore happiness for communities experiencing disparities in well-being impacted by the Covid-19 pandemic and Winter Storm Uri. We select two metropolitan statistical areas (MSA) in Texas, College Station-Bryan MSA and Houston-The Woodlands-Sugar Land MSA, as the study area to address the pressing issues of declining subjective well-being caused by the two major events at multiple geographical scales (county and zip code levels). Our interdisciplinary team is equipped with expertise in geospatial big data and Geospatial Artificial Intelligence (GeoAI) to model the dynamics of happiness throughout the pre-, amidst- and post-COVID and Uri periods and identify communities in need of intervention. We aim to foster innovative research and broaden participation among researchers, stakeholders, and residents by developing web apps and interactive visualizations and initiating student-led social entrepreneurship to align resources for communities experiencing disparities in post-disaster happiness. The three specific objectives are described below. The first objective is to develop an intelligent GeoAI-based community happiness assessment and monitoring framework. The framework will yield innovative methods and new databases harmonized from various sources, including (1) Happiness Measurement Methods and Database on real-time community happiness levels extracted from Twitter data and calibrated through crowdsourcing. Social media platforms such as Twitter allow the harvesting of users' digital traces that reflect their experiences and subjective feelings in a rapid, low-cost, and reliable manner. Analyzing the large-scale location-based digital traces from social media data provides an innovative approach to observing the real-time spatial-temporal human sentiments unavailable from traditional databases. Integrating citizen responses, the neural network-based natural language model BERT, and GeoAI algorithms to conduct location-based sentiment analysis and topic modeling will enable estimating the evolving sentiments of community happiness at various scales; (2) Social Support Database containing socioeconomic factors, urban amenities, and service provision; (3) Event Database including data directly related to the evolution of the two events such as Uri-induced power outages and property damages, confirmed Covid-19 cases, mortality, social distancing index. We will further explore the significant determinants in community happiness disparities using a newly developed spatial analysis model, the Multiscale Geographically Weighted Regression. The results will help rapidly and dynamically identify the least happy communities and the underlying reasons and arguments behind low subjective well-being. Second, we will develop a cross-platform and user-friendly web application for data collection, real-time computing, and visualization of happiness assessment and monitoring. This web app will integrate five modules: 1. a data dissemination module with metadata catalog for data query and download capabilities; 2. a GIS-based visualization and analysis module that allows dynamic interactions with the end-users; 3. a data analytics module with advanced decision-making tools; 4. an educational module containing video tutorials on the research theory, methods, and findings; 5. a citizen science module that crowdsources the users' inputs about their subjective well-being and facilitates the communication and feedback between the team and the users. Third, we will initiate student-led social entrepreneurship to help communities align resources to restore happiness. Through the Department of Student Activities at TAMU, students and faculty leaders will work collectively to initiate a student-led organization called 'Post-Covid and Uri Community Happiness Justice' (CHJ). The organization's mission is to raise awareness of the mental health issues and disparities of happiness in communities in need, identify the specific context/causes of unhappiness, connect researchers and communities advisory groups and local partners, help residents align resources, and build connections with other social groups that can assist. The CHJ student organization will fulfill its mission in four ways: (1) identify communities in need and utilize the web application to conduct community-specific assessments; (2) conducts educational and social engagement activities such as workshops, focus groups with residents, community organizations, and local decision-makers; (3) help the community develop a strategic plan to restore happiness, including assessing needs and resources, creating strategies to align resources, developing actionable items and timelines; (4) monitor the dynamics of happiness during the implementation of the plan and work with the community members to address ongoing issues.

. What are anticipated outcomes from this project? (e.g., publications, website, app, data collection for further research/grant) (2,000 characters maximum)

The project will produce innovative methods/tools and generate new knowledge/experiences on how the convergence of multiple disciplines and social engagement can lead to a deep understanding of post-disaster disparities of community happiness and novel actions and mitigation strategies. The specific outcomes include: ● Social entrepreneurship: The CHJ will be one of the first student-led organizations in Texas that conduct continuous research and activities to enhance post-disaster community subjective well-being. ● Web application: The developed web application will serve as the bi-directional communication platform for researchers, stakeholders, and communities. The website of the CHJ organization will also be embedded in the web application. ● Database products: The three databases created through this project (Happiness Measurement Database, Social Support Database, and Event Database) will be made publicly available through the web application. The new databases will enable other relevant data-intensive research and discoveries. ● Journal articles, conference presentations, and project reports: the research methods and findings will be published in high-impact journals, such as Computers, Environment and Urban Systems, Annals of American Association of Geographers, and Plos One. Students and faculty leaders will present their work in corresponding conferences. A final project report will be completed at the end. ● External proposals: Based on the work supported by this project, we will actively seek external fundings to sustain our endeavor in research and social engagement.

. Is this proposed project an extension of existing work or a new endeavor? (1,200 character maximum)

This proposed project is a new endeavor that brings new science, technology, and social engagement to address post-event community happiness inequality. Integrating the advances in geospatial big data, artificial intelligence, citizen science, student-led social engagement is a novel and forward-look step. Dr. Heng Cai is a geographer with expertise in GIS and disaster recovery. She will lead the development of the happiness monitoring framework and web application, assist the student 'Post-Covid and Uri Community Happiness Justice' efforts. Dr. Dongying Li, an environmental psychologist, will lead the citizen science module development, investigate the environmental drivers of mental health outcomes. Dr. Mark Fossett is a Cornerstone Faculty Fellow in Sociology specializing in social inequality and segregation. He will investigate the underlying drivers for happiness inequality, and provide guidance to student social entrepreneurship activities. Dr. Shuiwang Ji is a computer scientist and a distinguished member of ACM specializing in artificial intelligence and data mining. He will develop innovative location-based data mining methods.

. Is Institutional Review Board (IRB) approval required for this project?

Yes. The research team will obtain IRB approval before starting data collection.

. *Team Participants*

. Please list all Team Leaders below (including yourself), including Prefix, Name, Title, and Department/School.

Dr. Heng Cai, Instructional Assistant Professor, Department of Geography, College of Geosciences; Dr. Dongying Li, Assistant Professor, Department of Landscape Architecture & Urban Planning, College of Architecture; Dr.Mark Fossett, Professor, College of Liberal Arts Cornerstone Faculty Fellow, Department of Sociology, College of Liberal Arts; Dr.Shuiwang Ji, Associate Professor, Distinguished member of ACM, Department of Computer Science & Engineering, College of Engineering.

. Do any of the team leaders listed above have plans for a sabbatical or other extended leave away from campus during the 2021-22 academic year? Note: Selecting "yes" will not automatically disqualify a team, but rather will indicate that we need to have a discussion with your team about the nature of the planned leave in relation to the project.

No.

. Please list all Team Contributors below, including Name, Title, and Department/School. *Please exclude anyone you already listed as a Team Leader.*

. Do you plan to assign someone other than a faculty leader as a "project manager" for your team (i.e., a graduate student, postdoc, staff person)?

○ Yes
○ No
◉ Not sure yet

. What would be the ideal composition of team members for this project? What majors, disciplines, skills, backgrounds, or perspectives would you like to have on the team? (2,000 characters maximum)

The key disciplines represented by our current team include Geography, Sociology, Computer Science, and Landscape Architecture and Urban Planning. We will recruit both graduate and undergraduate students from these four majors, as well as students from other closely related majors, such as Psychology, Communications, Community Health, and Statistics. Graduate and undergraduate students who have or are interested in learning the following skills are welcome to join our team: geographical information science, R/Python programming, data mining, and modeling, human psychology and mental health, community outreach, public speaking, collaborative team working, and leadership. We will further seek team contributors from the university-wide centers, including Hazard Reduction and Recovery Center, Center for Health Systems and Design, and Texas A&M Institute of Data Science.

. Will your team also include any external organizations or individuals as either partners, clients, study subjects, beneficiaries of the work, etc.?

Yes. Based on our research findings, we will identify the communities in need of intervention and the local community partners.

. *Travel*

. Does your proposal include travel for students beyond Bryan/College Station?

○ Yes
○ No
◉ Not sure yet

. Where would the team travel?

. When do you anticipate that this travel would take place? (e.g., Fall 2021, Spring 2022, some other academic break, TBD)

TBD

. Do you expect that all students selected for the team would be able to travel, or just a select number?

a select number of both graduate and undergraduate students will be travel to conduct community meetings.

. *Collaboration with Students*

. Ideally, how many undergraduate students would you select to participate on this team? (Numeric responses only, please)

10

. Ideally, how many graduate students would you select to participate on this team?

3

. Ideally, how many professional or doctoral students would you select to participate on this team?

1

. How will you facilitate collaborative inquiry on the team? How often and in what format will the team meet? How will you divide tasks? How you will ensure effective management of the project (e.g., appoint a student as a project manager, assign that role to a faculty leader, etc.)? (2,500 character maximum)

The interdisciplinary team consists of faculty team leaders from four different Colleges at Texas A&M, each providing valuable expertise in an area critical to ensure the project's success. Project leader Dr. Cai will facilitate all the major activities of this project, including outlining a clear working plan, coordinating team meetings, monitoring project progress, and ensuring smooth communication among all members in both virtual and in-person workspace. All faculty team leaders will develop training materials and have regular mentoring meetings with student team members. The hired students are strongly encouraged to enroll in the faculty team leaders' classes to get direct training on the needed knowledge and skills. We expect student members to participate in all research and engagement activities to gain the maximum benefit from blending perspectives and skills. To facilitate vertical and horizontal mix and collaborations among students and faculty leaders, we will establish three closely interconnected working groups: data for happiness group, web app for engagement group, and the social entrepreneurship working group. Each working group will consist of a mix of undergraduate students and graduate students from at least three different disciplines. For example, the data for the happiness group will consist of students interested in conducting GeoAI and big data analys and students interested in understanding the mechanisms of positive psychology. The web app for the engagement group will benefit from students who can develop the analytical modules and interface, and also students who are interested in conducting community outreach and testing the functionality. Graduate students will be assigned as the leaders of the workgroups and responsible for the day-to-day coordination of team efforts. The entire research team will meet weekly, and each workgroup will meet as needed to exchange ideas and update progress with each other. The locations/forms of meetings will vary based on the needs and Covid related guidelines. To increase team productivity, we will also create a Slack channel to facilitate communication, schedule meetings, and share files and codes.

. What might students gain from their participation (e.g., conducting research directly with subjects, contributing to publications, using language skills)? What unique and differentiated learning opportunities

would be available for graduate students? (2,500 character maximum)

Students will gain unique and extensive research and outreach experiences that they won't normally get in the standard classroom. Students with different backgrounds will learn the essential concepts, techniques, and skills from other disciplines. For example, students from Sociology and Urban Planning will learn about the advances in Artificial Intelligence in Computer Science. Students from Geography and Computer Science will have the opportunities to work with community-based organizations to translate their research findings into actions. Some specific experiences that students will benefit from this project include: (1) Learn technical skills related to GeoAI and data mining in deciphering patterns and trends of social issues. Team leader Cai is currently developing a 'Geospatial-Intelligence Education Module' funded by Texas A&M Presidential Transformational Teaching Grants (PTTG). All student members will get direct training through this interactive educational module even with little background in advanced computer algorithms and programming. (2) Learn to work in a collaborative setting with team members with entirely different perspectives to innovatively solve the real-world problems related to Covid-19 and winter storm Uri that have impacted all the project members. (3) Gain experience in social entrepreneurship through the founding and growing of the student organization 'Post-Covid and Uri Community Happiness Justice'. Improve communication and public speaking skills through social engagement activities, such as hosting dedicated workshops/presentations, meeting with local community organizations and residents. (4) Learn about research design and methods. Students will work directly with faculty leaders to design the research, selecting the appropriate techniques, learn cutting-edge data analysis techniques and data management strategies. (5) Learn professional writing skills through preparing journal articles, writing project reports, and developing the web application user manual. Graduate students will gain leadership training by becoming the student leaders for the three interconnected working groups and the entire project. We will also invite graduate students to lead the efforts in journal article writing and support them to attend academic conferences. The experiences will benefit their future academic careers.

. Timeline and Budget

. Identify the timeline for the project, including start, completion and major project milestones.

NOTE - You may use the text box or upload a table or file in the next question.

. Timeline Upload (if needed)

timeline.pdf
12.3KB
application/pdf

. Total Budget Request (numeric response only, please). As a reminder, the maximum amount that can be requested is **$20,000.**

20000

. You may upload a budget table here encompassing the categories below, or you may complete the fields below through this form as applicable.

For each item listed below or on your budget table upload, please enter both dollar amount and any relevant notes/justification.

budget.pdf

. GRADUATE OR RESEARCH ASSISTANTSHIP (PHD) *(Suggested range: $15-18/hour; note: RAships for students in graduate school should include costs for tuition remission and fees)*

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. RESEARCH ASSISTANTSHIP *(Suggested range: $12-15/hour)*

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. INSTRUCTION (Teaching) - PHD STUDENT

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. POST-DOCTORAL OR STAFF EFFORT

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. UNDERGRADUATE STUDENT STIPEND OR WORK STUDY *(Suggested range: $11-14/hour)*

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. INSTRUCTIONAL, RESEARCH OR OFFICE SUPPLIES

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. COMPUTERS AND MINOR EQUIPMENT

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. TRAVEL - DOMESTIC

<div style="border:1px solid #999; height:40px; width:90%;"></div>

. TRAVEL - INTERNATIONAL

. CONTRACT WORK

. MEETINGS - BUSINESS

. OTHER - MISC.

. Please briefly note below any other sources of project funds. *(Projects that match or leverage additional funds are strongly encouraged. Please note any such funds, awarded or proposed, here so that we understand the comprehensive outlay for the project.)*

. Please name a Unit/Business Manager who could administer funds for project, if requested. Include their name, email address, and phone number:

Carria Collins, Department of Geography, carria@tamu.edu, (979) 458-0395

Location Data

Location: (30.547805786133, -96.271499633789)

Source: GeoIP Estimation
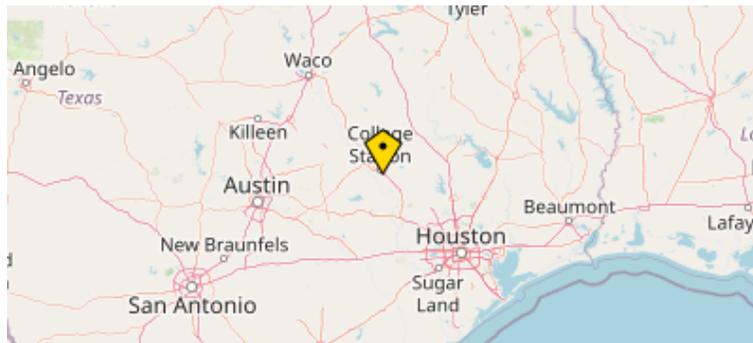
Table 1. Itemized Budget			
Category	Budget Item	Requested Amount	Justification
Personnel			
	Graduate or research assistantship	$4,000	graduate student workers will be paid with hourly salaries at $15 per hour.
	Undergraduate student stipend	$6,000	undergraduate will be paid with hourly salaries at $12 per hour.
Total Personnel Expenses		$10,000	
Computers and minor equipment			
	Workstation	$5,000	one workstation for large-scale geospatial data processing, databases developing, and hosting the web application.
Meetings-Business			
	Hosting meetings with community partners	$3,000	support the student-led CHJ outreach activities to conduct business meetings with community partners.
Other-Misc.			
	Participant incentives	$1,000	incentives to encourage participants to complete the surveys and feedbacks through the web application crowdsourcing functionality.
	Publication costs	$1,000	support open-access publication of research articles on high-impact journals.
Total Direct Costs		$20,000	

Milestones	Fall 2021				2022							
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	Jun	July	Aug
Kick-off and project work plan												
Data collection and processing												
GeoAI-based happiness measurement framework												
Web application development												
CHJ student organization establishment												
Social engagement activities												
Journal articles and project report												