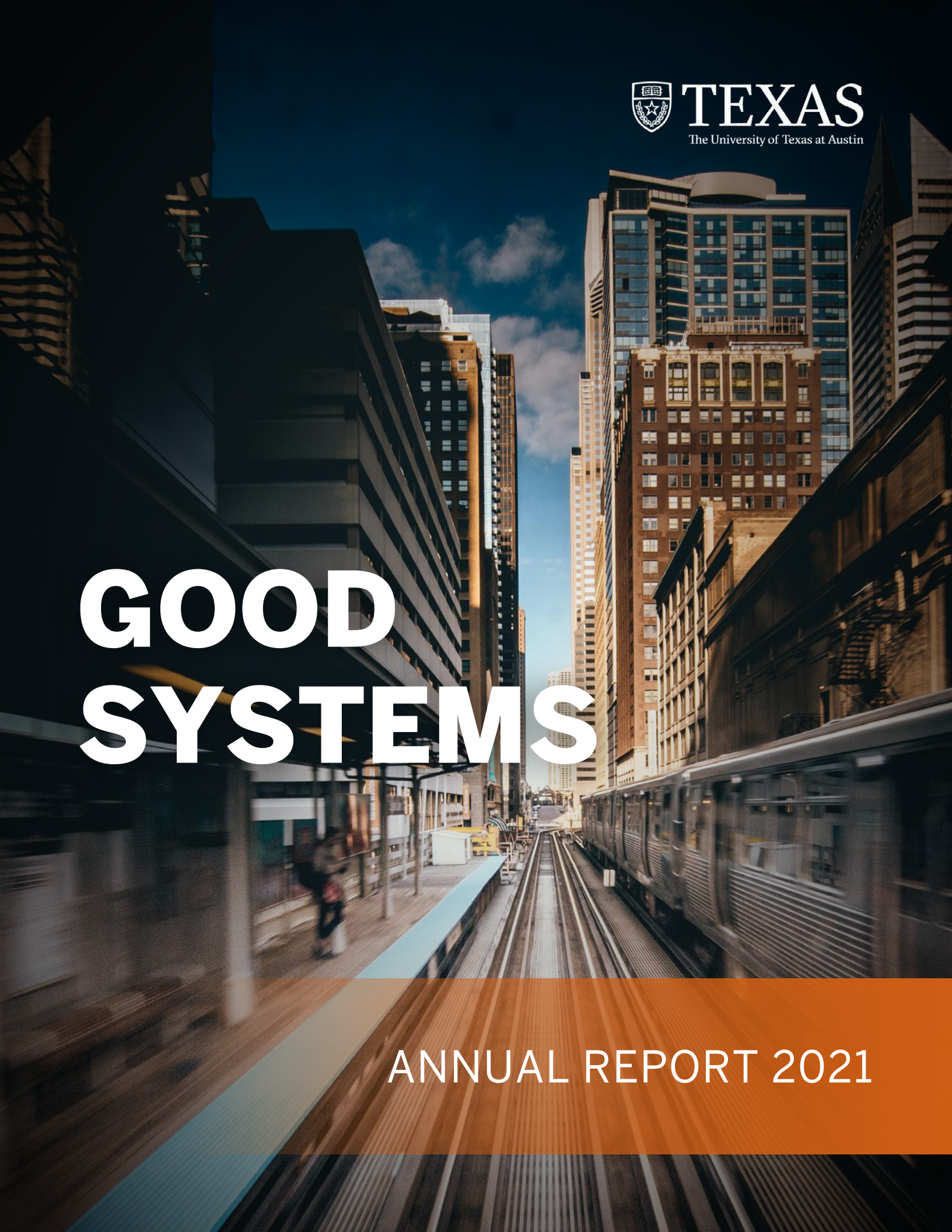
TEXAS
The University of Texas at Austin
GOOD SYSTEMS
ANNUAL REPORT 2021

Grand Challenges Are Moonshot Goals

To reach those goals and address the most urgent issues affecting our society, researchers from different disciplines must share knowledge, ask questions, and tear down academic barriers.

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BRIDGING BARRIERS

We are bridging barriers between fundamental knowledge and real-world problems by connecting disciplines, techniques, and ways of thinking.

In 2016, The University of Texas at Austin introduced an initiative with one overarching mission: break down academic silos and foster research that addresses the toughest questions facing humanity and the world.

Bridging Barriers serves as an incubator for some of the boldest interdisciplinary projects at UT by supporting researchers from across the Forty Acres as they form broad teams tasked with identifying urgent, real-world issues — and figuring out the best way to solve them in less than a decade.

These projects are rooted in collaboration and academic freedom to produce practical solutions to social, environmental, and humanitarian crises. From artificial intelligence to climate change to health inequity, teams around campus are working on solutions to some of the greatest problems of our generation.

To learn more about Good Systems and all of UT's research grand challenges, visit the **Bridging Barriers website.**

UT's Gates Dell Complex houses the Department of Computer Science.

Computer Science Assistant Professor Joydeep Biswas works with a robot in the Anna Hiss Gymnasium.

PHOTO CREDIT: CALLIE RICHMOND

TECHNOLOGY IN SERVICE TO SOCIETY

We've come to depend on artificial intelligence in nearly every industry, and rightly so: it can outperform humans' ability to find and analyze trends in vast amounts of data and use those trends to make predictions. But AI advances have brought us to a crossroads. With its benefits come unintended and often adverse consequences.

These consequences have included unemployment, election disruption, an overreliance on biased datasets and algorithms, privacy infringement, and economic inequality — among others. That's why AI-based systems need to be developed in accordance with broadly accepted values such as transparency, agency, trust, equality, and justice. These socially beneficial, AI-based technologies are what we call "good systems."

Our goal as a University of Texas at Austin grand challenge is to systematize a way of designing AI technology that meets society's needs and values. We will do this by evaluating the potential harms caused by AI and then helping develop, refine, and test new research that will support ethical human-machine partnerships in real-world applications.

> Read on to see how we're working to reduce AI harms, build better smart cities, and bring human values into robotics.

FROM THE CHAIR

One of Good Systems' grounding beliefs is that we can — and we must — work together with government and industry to prioritize and create values-based AI systems. This means considering the social consequences of new technologies as well as the datasets and algorithms that run them.

This past year, Good Systems made great strides towards its mission. We advanced our ongoing projects, seven of which were joint collaborations with the City of Austin focused on addressing local challenges related to public safety, affordability, and health. In partnership with Austin-Travis County EMS, Good Systems researchers developed an algorithm that could improve ambulance response time by 88 seconds, which could mean the difference between life or death in a critical emergency. Another team used 30 years of data to identify opportunities for the city to create more affordable housing.

Now, we prepare for our next chapter: the launch of six core research projects that will form our foundation moving forward. Through these, we aim to define, evaluate, and build values-based AI systems in the areas of robotics, smart tools, and smart cities while focusing on disinformation, racial justice, and intrusive surveillance. These projects will span six years and will strengthen the partnerships we've formed with city, industry, and community leaders.

I'm proud to say that our grand challenge is truly a team effort and would not be possible without the faculty, researchers, students, and staff who share our desire to create AI technologies that will both protect and improve our world.

JUNFENG JIAO
Associate Professor
School of Architecture

GOOD SYSTEMS CHAIR, 2020-2021

MILESTONES

SEPTEMBER 2020

Good Systems launches 11 new research projects, seven of which were collaborations with the City of Austin that helped motivate **a $7.5 million master interlocal agreement** between the City and The University of Texas at Austin to streamline the process for working together.

SEPTEMBER 2020

Researchers with common interests come together around eight focus areas, including critical surveillance inquiry, disinformation, fair and transparent AI, machine learning and robotics, public interest technology, racial justice, smart cities, and the future of work. These help lay the foundation for Good Systems' core research projects.

OCTOBER 2020

Good Systems holds its First Annual Symposium, where the team shares findings from its first year and unveils a new slate of projects for its second year.

NOVEMBER 2020

Good Systems collaborates with Dell Technologies and the Center for Analytics and Transformative Technologies at the McCombs School of Business to sponsor the 2020 Global Analytics Summit, a conference exploring how society and organizations can maximize the benefits and minimize the risks of machine learning and artificial intelligence algorithms.

MARCH 2021

Good Systems hosts "When Governments Buy AI Technologies: A Week with the World Economic Forum," a first-of-its-kind event about how governmental recommendations for AI technology procurement can affect industry innovation, economic growth, and smart city strategies on a global scale.

AUGUST 2021

The National Science Foundation awards Good Systems researchers two major grants: one for $3 million that will help launch a new ethics and robotics program at UT and another for $1 million to build a mobility hub that will improve transportation options in Austin's Georgian Acres neighborhood.

SEPTEMBER 2021

Good Systems launches six core research projects, which aim to define, evaluate, and build ethical AI systems in the areas of robotics, smart tools, smart cities, disinformation, racial justice, and surveillance.

FY21

GOOD SYSTEMS HIGHLIGHTS

IN NUMBERS

SCHOLARLY OUTPUT & PUBLICITY

59 scholarly works

23 news articles, blog posts and university stories

EXPANDING NETWORKS

29 University of Texas departments and units

64 hosted events

153 Good Systems active researchers

BUILDING CAPACITY

$7.5M TO DATE
Awarded in external funding

Contributed its expertise to more than $22.5M TO DATE in externally funded projects and centers across UT to date

47 external partners

ENGAGING STUDENTS

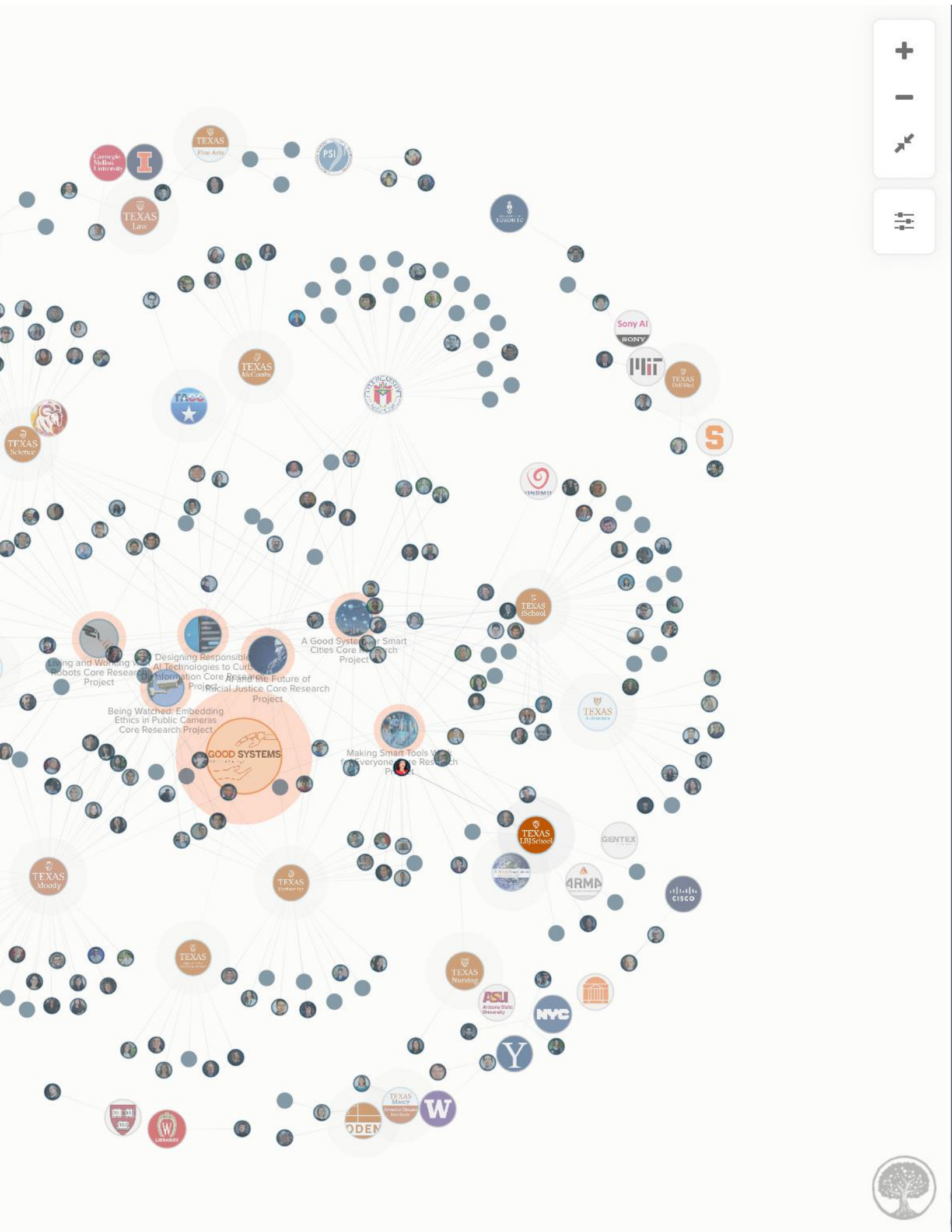
67 undergraduate & graduate student researchers

19 students enrolled in the Good Systems signature courses

OUR NETWORK

We believe designing ethical AI systems requires the contributions of experts from diverse backgrounds, which is why the Good Systems grand challenge team includes researchers from more than two dozen different disciplines, including computer science, engineering, mathematics, architecture, and the humanities as well as partners from industry, government, and our local community. Collaboration across skillsets and experiences is critical if we are going to change the way AI technologies are designed.

Explore our network map or browse the team list on the Good Systems website to see how our connections are contributing to our mission of designing AI technologies that benefit society.


Sony AI
Living and Working with Robots Core Research Project
Designing Responsible AI Technologies to Curb Information Core Research Project
Afraid the Future of Racial Justice Core Research Project
Being Watched: Embedding Ethics in Public Cameras Core Research Project
GOOD SYSTEMS
A Good System for Smart Cities Core Research Project
Making Smart Tools Work for Everyone Core Research Project

REDUCING AI HARMS

An "AI gold rush" of sorts has been unfolding for the last several years, but AI is not a panacea and can, intentionally or otherwise, inflict harm upon individuals and communities. Predictive policing tools that departments use to identify potential offenders or determine who's eligible for bail rely on biased datasets, thereby perpetuating systemic racism at scale. Biometric technologies that use facial and fingerprint recognition may speed up routine, daily transactions but have the potential of being hacked or used without individuals' knowledge or consent.

Today, industries put more of their energy into acquiring novel AI technologies than they do into understanding, monitoring, and mitigating their harms.

Those of us in Good Systems have made it one of our top priorities to help change this practice of adopting technologies before considering their ramifications. Our interdisciplinary research teams are exploring how AI technologies are being designed, built, and deployed, and are identifying where problems of bias or discrimination are being baked into systems. Then, we are making recommendations to governments and industry about how they can design new technologies that mitigate these harms. This includes teaching machine learning models to understand how disinformation arises and spreads online and investigating and developing solutions that will ensure that the AI-based systems used by cities advance racial equity.

Read ahead to learn more about our work helping the city of Austin assess its data-use policies, as well as one-of-a-kind events we hosted where experts tackled topics like surveillance concerns and what governments should consider when procuring AI.

In January 2021, Good Systems hosted a panel of experts from UT and other universities to discuss various aspects of AI surveillance and the concerns they raise for businesses, governments, and the public. Panelists explored topics such as online advertising, tenant screening, and border security. **Read what they had to say.**

Increasingly, governments are relying on AI technologies to become more efficient and modernize the way they provide services. School of Journalism and Media Professor S. Craig Watkins says equity needs to be at the center of these discussions. Watkins is working with the City of Austin's Equity Office to create a toolkit that helps departments conduct internal assessments of their processes across budget, leadership, workforce, policy, and operations. "The toolkit facilitates an opportunity for departments to look at their AI use and other data-based systems through a racial equity lens, so they can begin to rethink and refine their strategic use of these systems," Watkins explains. **Learn more about this work.**

Most governments do not have the resources to design their own AI technologies. Instead, they must purchase them in the marketplace. This leads to challenges, such as ensuring that government offices understand what they are buying and the ethical implications of those technologies. In March 2021, Good Systems partnered with the World Economic Forum in a first-of-its-kind event to explore how government procurement offices can influence AI design for the better. **Check out some of the top moments from the event.**

School of Journalism and Media Professor and MIT Visiting Professor S. Craig Watkins explores ways to build AI models that address systemic racism in his 2022 TEDxMIT talk.

Our Week with the World Economic Forum included five days of programming featuring university, industry, and government experts. **Watch videos of all the presentations.**

DESIGNING BETTER SMART CITIES

'Smart cities' refers to modern, urban areas that use data and digital technology, including AI, to improve city services and enhance residents' quality of life. Cities can use data and analytics to identify the demographic groups most at risk for certain diseases and to then target interventions, including sending out lifesaving messages about sanitation or vaccination programs. And smart mobility applications like intelligently synced traffic signals and digital signs deliver real-time traffic-delay information that can cut commute times by as much as 20% on average.

But these technologies, while potentially beneficial, come with trade-offs. If data show that a city can centralize transportation to serve residents in one area and reduce carbon emissions at the same time, that means some residents could lose out on the transit options they have relied upon as cities re-route services. And what if the community that loses transportation was more vulnerable to begin with? Increasing the efficiency of urban services is a laudable goal, but it should not come at the expense of our neediest residents. Other smart city interventions raise privacy concerns, as residents worry about street corner and facial recognition cameras and how those images are being used.

For these reasons, we believe that designing smart cities is not enough. We must design *good* smart cities, which use public data and information responsibly and apply changes equitably. One of our projects will link City of Austin datasets to see how urban development projects will affect access to housing, jobs, and public services. The aim is to help ensure that new investments, which appear on their face to provide benefits, don't unintentionally disadvantage some residents.

Read on to learn more about what makes a "good" smart city and about some of our smart city interventions, including designing an algorithm to improve EMS response and building a smart mobility hub to increase transportation options in a North Austin transit desert.

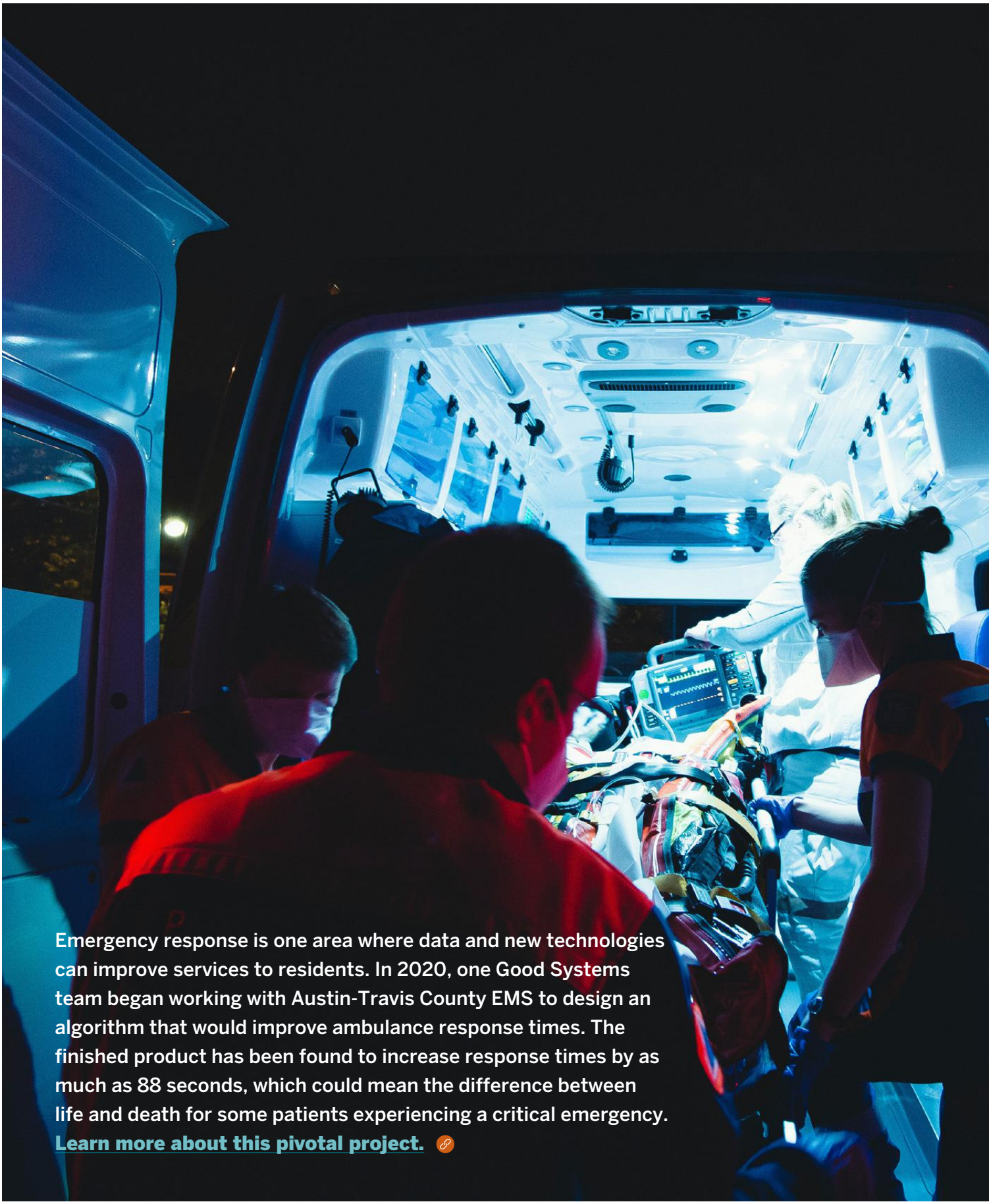
Smart cities use data and integrated technologies to improve transportation, healthcare, emergency servcies and even energy and water delivery. But success requires looking beyond promised benefits to include considering the full realm of possible outcomes — both good and bad. “Innovation must not sacrifice civil liberties in a bid for progress,” says LBJ School of Public Affairs Professor of Practice Sherri Greenberg. Read more about how Good Systems is working to create better smart cities in Greenberg’s blog, **“Why Smart Cities Cannot Be Code for Surveillance Cities.”**

School of Architecture Associate Professor Junfeng Jiao (l) and Austin Transportation's Assistant Director Jason JonMichael walk in a field in the Georgian Acres neighborhood where UT and the City will build a mobility hub.

PHOTO CREDIT: THOMAS MEREDITH

"Transit deserts" refer to regions where residents have a high demand for public transportation but a short supply. One such place is the Georgian Acres neighborhood in North Austin, which has commute times 67% longer than the city average according to a Good Systems data analysis. Now, the research team is collaborating with the City of Austin's Transportation Department and local nonprofit Jail to Jobs to design a "smart mobility hub" that will bring more transportation options to residents. **Read more about this National Science Foundation-funded project.**

VIDEO CREDIT: Austin Transportation Department



Emergency response is one area where data and new technologies can improve services to residents. In 2020, one Good Systems team began working with Austin-Travis County EMS to design an algorithm that would improve ambulance response times. The finished product has been found to increase response times by as much as 88 seconds, which could mean the difference between life and death for some patients experiencing a critical emergency. **Learn more about this pivotal project.**

Social media can be a valuable tool for first responders during disasters like fires and floods. They can use it to spot reports of people trapped or roads that are closed, but it is virtually impossible for emergency officials to comb through thousands of Facebook and Twitter posts to spot critical information. If trained, though, computers can learn to recognize patterns in data and identify useful posts. Now a team of researchers from UT Austin, Brigham Young University, George Mason University, and Virginia Tech are doing exactly that. **Learn more about their work.**

HUMANIZING AI DEVELOPMENT

The science of artificial intelligence and robotics has made major gains in recent years thanks to innovations driven by computer scientists, mathematicians, and engineers. But we now know that some applications of AI technology — including applications not originally envisioned by the technology's developers — can be harmful to certain groups of people. We also know that our own implicit biases as human beings can creep into the development of the technology itself unless we deliberately consider our human values early in the design process.

For this reason, it is critical that we examine the whole enterprise of AI technology conceptualization from the multiple and vast perspectives of the humanities and social sciences. In fact, Good Systems has had the humanities and social sciences at its core from its inception because experts in these disciplines have the tools and language to be able to predict, analyze, and explain how AI technologies will affect society. They help shine a light on our assumptions and biases while offering ways to mitigate those biases in technology design and development.

Part of our mission as a grand challenge is to put humans at the center of AI design. That can mean testing and creating new technologies in the real world rather than only in laboratories and warehouses, as well as including end users in the design process to prioritize safety and responsibility. We at Good Systems see the extraordinary ways in which these multiple perspectives can influence and improve the way these technologies work.

Read on to learn more about how including humans in AI design can help mitigate potential harms and how our researchers are changing the way robots function by designing them outside the lab.

Today, much robotic technology is developed without considering its potentially harmful effects on society, including how these technologies can infringe on privacy or further economic inequity. A new UT Austin program will fill an important educational gap by prioritizing these issues in its curriculum. The program, called Convergent, Responsible, and Ethical AI Training Experience for Roboticists, or CREATE, is a collaboration among Texas Robotics, industry partners, and Good Systems and will offer graduate coursework and professional development in responsible design and implementation of service robots. **Learn more about the program.**

Computer Science and Good Systems researchers (l to r) Peter Stone, Joydeep Biswas, and Justin Hart in UT's renovated Anna Hiss Gymnasium.

PHOTO CREDIT: CALLIE RICHMOND

When designing robots, it is important to consider not only their functionality but also how they will be received and accepted. This requires the work of both computer and social scientists. Good Systems' new core research project "Living and Working with Robots" will bring together experts from these arenas to design service robots that will share space with students, faculty, and staff and perform essential functions on the UT Austin campus. **Learn more from Computer Science Professor Peter Stone and School of Information Assistant Professor Elliott Hauser about this project.**

Good Systems researchers (l to r) Justin Hart, Sam Baker, Joydeep Biswas, Elliott Hauser, Keri Stephens, Aaron Choate, Samantha Shorey, and Peter Stone.

PHOTO CREDIT: CALLIE RICHMOND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BLOOD

To design AI systems that reflect human values, we must have humans involved in that process from idea formation to creation to deployment. Information, Risk and Operations Management Assistant Professor Maria De-Arteaga Gonzalez and School of Information Assistant Professor Min Kyung Lee discuss the critical nature of this idea when generating machine learning algorithms and designing autonomous robots. **Learn more about how they are getting humans involved early and often in the process.**

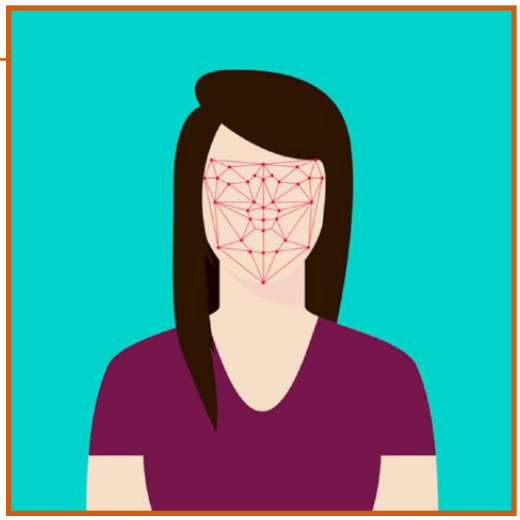
PHOTO CREDIT: BRIAN BIRZER

LOOKING AHEAD

When Good Systems launched in 2019, we wanted to reduce the harms associated with AI, to use AI for the common good, and to infuse human values into the AI development process.

We will now take these concepts and apply them to our six new core research projects, which we launched in 2021 and expect to continue for the life of Good Systems. These projects synthesize the most important lessons of our first years as a grand challenge and allow our teams to collaborate with renewed purpose to address pressing and persistent AI issues. Learn more about our core research projects.

AI AND THE FUTURE OF RACIAL JUSTICE



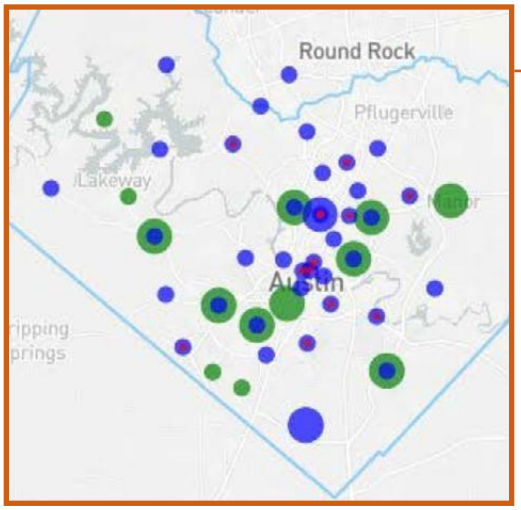
AI-based technologies used by cities and organizations have been shown to exhibit racial bias, and yet, they can determine who gets access to employment, care, and adequate housing. This project seeks to understand the racial disparities in AI-based systems to better design and implement solutions in the areas of public safety, transportation, and health. Engagement with local government offices, public agencies, industry, and communities is at the center of our effort to tackle the challenge of achieving racially equitable AI.

BEING WATCHED: EMBEDDING ETHICS IN PUBLIC CAMERAS

Cities are adopting camera technologies, including public video cameras and sensors, that use AI to process the visual data with the promise of improving services, enhancing management capabilities, and lowering costs. However, privacy is a core challenge, as the public lacks trust in how governments use camera-generated video data. This project focuses on investigating the social acceptance of cameras and video data and developing technical solutions that will satisfy privacy concerns, including blurring faces and other identifying information when using biometric data, so that machine learning models can be trained to remove these privacy attributes from raw videos.

DESIGNING RESPONSIBLE AI TECHNOLOGIES TO CURB DISINFORMATION

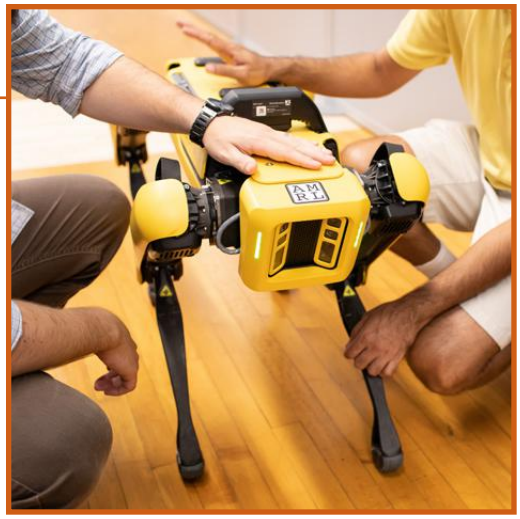
The rise of social media and the growing scale of online information have led to a surge of intentional disinformation and incidental misinformation. It is increasingly difficult to tell fact from fiction, and the challenge is more complex than identifying "fake news." This project uses qualitative methods and machine learning models to understand how disinformation arises and spreads, how it affects different groups in society, and how to design effective human-centered interventions.



A GOOD SYSTEM FOR SMART CITIES

AI technologies can help build smarter cities by using data to improve services, such as public safety, transit systems, and emergency response. They can also help us evaluate how new infrastructure, such as public transportation lines, will affect access to housing, jobs, and public services. However, the datasets used to create smart cities are large, messy, and fragmented across different domains such as mobility, housing, and energy. This project seeks to build a system that will link city datasets — extracting useful information, identifying any data bias, and ensuring information is used responsibly — to predict the effects of urban development projects, including Austin's Project Connect.

LIVING AND WORKING WITH ROBOTS



The widespread use of service robots has been predicted to be "just around the corner" for decades. This project seeks to overcome the prevailing technical and social hurdles to deploying these robots by building and studying them in communities where they will be used rather than only in laboratories and warehouses. The team will begin its work designing robots for use on UT Austin's campus in university libraries and other facilities. The goal is to design these robots in a way that upholds human values, does not cause unintentional harm, and improves campus quality of life and productivity. With these elements in place, this project will help create a new model for human-machine partnerships.

MAKING SMART TOOLS WORK FOR EVERYONE

Advances in AI are shaping the future of work, but how can we ensure that employees, organizations, and society will benefit from the changes? Instead of automating tasks, which can reduce or eliminate the need for human workers, this project seeks to design smart hand tools that have embedded sensing and AI. These capabilities provide real-time feedback, improve predictive capacity, and support task effectiveness, which empowers workers to accomplish more while keeping their jobs secure. Smart hand tools will help improve workers' safety and enable more equitable access to jobs by minimizing the amount of training needed and promoting usability across ages and abilities.

RESEARCH AND SCHOLARLY OUTPUT

In fiscal year 2021, Good Systems researchers produced 60 scholarly works, including peer-reviewed articles, preprints, conference proceedings, and presentations. Those that formally acknowledge financial support from Good Systems are marked with an asterisk.

The Weaponization of Web Archives: Data Craft and COVID-19 Publics | *Harvard Kennedy School Misinformation Review* | Amelia Acker and Mitch Chaiet
view

Using Deep Learning to Understand Travel Demands in Different Urban Districts* | *Transportation Research Record* | Shunhua Bai and Junfeng Jiao
view

Bayesian Robust Optimization for Imitation Learning | *Neural Information Processing Systems* | Daniel S. Brown, Scott Niekum, and Marek Petrik
view

The Effects of Information Source and eHealth Literacy on Consumer Health Information Credibility Evaluation Behavior | *Computers in Human Behavior* | Yung-Sheng Chang, Yan Zhang, and Jacek Gwizdka
view

Scalable Multiagent Driving Policies for Reducing Traffic Congestion | *In Proceedings of the 20th International Conference on Autonomous Agents and Multiagent Systems* | Jiaxun Cui, William Macke, Harel Yedidsion, Aastha Goyal, Daniel Urieli, and Peter Stone
view

Investigating Autonomous Vehicle Impacts on Individual Activity-Travel Behavior* | *Transportation Research Part A: Policy and Practice* | Katherine A. Dannemiller, Aupal Mondal, Katherine E. Asmussen, and Chandra R. Bhat
view

Quality of Images Showing Medication Packaging from Individuals with Vision Impairments: Implications for the Design of Visual Question Answering Applications | *Proceedings of the Association for Information Science and Technology* | Nathan Davis, Bo Xie, and Danna Gurari
view

Predicting and Mapping Neighborhood-Scale Health Outcomes: A Machine Learning Approach* | *Computers, Environment and Urban Systems* | Chen Feng and Junfeng Jiao
view

Estimating E-Scooter Traffic Flow Using Big Data to Support Planning for Micromobility* | *Journal of Urban Technology* | Chen Feng, Junfeng Jiao, and Haofeng Wang
view

Capturing Skill State in Curriculum Learning for Human Skill Acquisition | *Proceedings of the International Conference on Intelligent Robots and Systems (IROS)* | Keya Ghonasgi, Reuth Mirsky, Sanmit Narvekar, Bharath Masetty, Adrian M. Haith, Peter Stone, and Ashish D. Deshpande
view

Pareto Solutions vs Dataset Optima: Concepts and Methods for Optimizing Competing Objectives with Constraints in Retrieval | *Proceedings of the 2021 ACM SIGIR International Conference on Theory of Information Retrieval* | Soumyajit Gupta, Gurpreet Singh, Anubrata Das, and Matthew Lease
view

Model-Agnostic Explanations Using Minimal Forcing Subsets | *Proceedings IJCNN 2021* | Xing Han and Joydeep Ghosh
view

Grounded Action Transformation for Sim-to-Real Reinforcement Learning | *Special Issue on Reinforcement Learning for Real Life, Machine Learning* | Josiah P. Hanna, Siddharth Desai, Haresh Karnan, Garrett Warnell, and Peter Stone
view

Importance Sampling in Reinforcement Learning with an Estimated Behavior Policy | *Machine Learning* | Josiah P. Hanna, Scott Niekum, and Peter Stone
view

Biased Models Have Biased Explanations | Aditya Jain, Manish Ravula, and Joydeep Ghosh
view

An Open-Source Framework for Last Mile Delivery with Heterogeneous Robots | Asha Jain, Maxwell Svetlik, Nicholas Machak, Kavan Singh, Cem Karamanli, Kaiyu Zhou, Justin Hart, Joydeep Biswas, Luis Sentis, and Junfeng Jiao
view

Algorithmic Management in a Work Context | *Big Data & Society* | Mohammad Hossein Jarrahi, Gemma Newlands, Min Kyung Lee, Christine T. Wolf, Eliscia Kinder, and Will Sutherland
view

An Eye-Tracking Study of Differences in Reading Between Automated and Human-Written News | *Information Systems and Neuroscience* | Chenyan Jia and Jacek Gwizdka
view

Temporal-Logic-Based Reward Shaping for Continuing Learning Tasks | *Proceedings of the 35th AAAI Conference on Artificial Intelligence* | Yuqian Jiang, Sud Bharadwaj, Bo Wu, Rishi Shah, Ufuk Topcu, and Peter Stone
view

Goal Blending for Responsive Shared Autonomy in a Navigating Vehicle | *Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI 2021)* | Yu-Sian Jiang, Garrett Warnell, and Peter Stone
view

Exploring the Factors Affecting Travel Behaviors during the Second Phase of the COVID-19 Pandemic in the United States* | *Transportation Letters* | Junfeng Jiao and Amin Azimian
view

Measuring Travel Behavior in Houston, Texas with Mobility Data during the 2020 COVID-19 Outbreak* | *Transportation Letters* | Junfeng Jiao, Mira Bhat, and Amin Azimian
view

Housing Affordability in Austin | *Austin Housing Analysis* | Junfeng Jiao and Josh Conrad
view

Housing Development and Policy | *Austin Housing Analysis* | Junfeng Jiao and Josh Conrad
view

Measuring Social Vulnerability in Transit Deserts of United States Metro Areas* | *International Journal of Geospatial and Environmental Research* | Junfeng Jiao, Josh Conrad, and Amin Azimian
view

Land Value Impacts of Airbnb Listings on Single-Family Homes in Austin, Texas, USA* | *International Journal of Housing Markets and Analysis* | Junfeng Jiao, Kent Hansen, and Amin Azimian
view

Towards Unbiased and Accurate Deferral to Multiple Experts | *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society* | Vijay Keswani, Matthew Lease, and Krishnaram Kenthapadi
view

Reward (Mis)Design for Autonomous Driving | W. Bradley Knox, Alessandro Allievi, Holger Banzhaf, Felix Schmitt, and Peter Stone
view

Participatory Algorithmic Management: Elicitation Methods for Worker Well-Being Models* | *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society* | Min Kyung Lee, Ishan Nigam, Angie Zhang, Joel Afriyie, Zhizhen Qin, and Sicun Gao
view

Who Is Included in Human Perceptions of AI?: Trust and Perceived Fairness around Healthcare AI and Cultural Mistrust | *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* | Min Kyung Lee and Katherine Rich
view

Misinformation During the COVID-19 Outbreak in China: Cultural, Social and Political Entanglements | *IEEE Transactions on Big Data* | Yan Leng, Yujia Zhai, Shaojing Sun, Yifei Wu, Jordan Selzer, Sharon Strover, Hezhao Zhang, Anfan Chen, and Ying Ding
view

Algorithmic Hiring in Practice: Recruiter and HR Professional's Perspectives on AI Use in Hiring* | *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society* | Lan Li, Tina Lassiter, Joohee Oh, and Min Kyung Lee
view

Hurricane Harvey: Equal Opportunity Storm or Disparate Disaster? | *Local Environment* | Katherine Lieberknecht, Deidre Zoll, Junfeng Jiao, and Katherine Castles
view

Coach-Player Multi-Agent Reinforcement Learning for Dynamic Team Composition | *Proceedings of the 38th International Conference on Machine Learning* | Bo Liu, Qiang Liu, Peter Stone, Animesh Garg, Yuke Zhu, and Animashree Anandkumar
view

A Lifelong Learning Approach to Mobile Robot Navigation | *IEEE Robotics and Automation Letters* | Bo Liu, Xuesu Xiao, and Peter Stone
view

Team Orienteering Coverage Planning with Uncertain Reward | *International Conference on Intelligent Robots and Systems (IROS)* | Bo Liu, Xuesu Xiao, and Peter Stone
view

Expected Value of Communication for Planning in Ad Hoc Teamwork | *Proceedings of the 35th Conference on Artificial Intelligence (AAAI)* | William Macke, Reuth Mirsky, and Peter Stone
view

The Seeing-Eye Robot Grand Challenge: Rethinking Automated Care | *Proceedings of the 20th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2021)* | Reuth Mirsky and Peter Stone
view

Building Connective Democracy: Interdisciplinary Solutions to the Problem of Polarisation | *The Routledge Companion to Media Disinformation and Populism* | Christian Overgaard, Anthony Dudo, Matthew Lease, Gina Masullo, Natalie Jomini Stroud, Scott R. Stroud, and Samuel Woolley
view

Mind Games: A Temporal Sentiment Analysis of the Political Messages of the Internet Research Agency on Facebook and Twitter* | *New Media & Society* | Soyoung Park, Sharon Strover, Jaewon Choi, and MacKenzie Schnell
view

Reverse-Engineering Political Protest: The Russian Internet Research Agency in the Heart of Texas* | *Information, Communication & Society* | Martin J. Riedl, Sharon Strover, Tiancheng Cao, Jaewon R. Choi, Brad Limov, and Mackenzie Schnell
view

FaiR-N: Fair and Robust Neural Networks for Structured Data | *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society* | Shubham Sharma, Alan H. Gee, David Paydarfar, and Joydeep Ghosh
view

A Hybrid 2-Stage Neural Optimization for Pareto Front Extraction | Gurpreet Singh, Soumyajit Gupta, Matthew Lease, and Clint Dawson
view

The Case for Claim Difficulty Assessment in Automatic Fact Checking | Prakhar Singh, Anubrata Das, Junyi Jessy Li, and Matthew Lease
view

Understanding How African American and Latinx Youth Evaluate Their Experiences with Digital Assistants | *Proceedings of the Association for Information Science and Technology* | Siqi Yi, Stephen C. Slota, Jakki O. Bailey, S. Craig Watkins, and Kenneth R. Fleischmann
view

Many Hands Make Many Fingers to Point: Challenges in Creating Accountable AI | *AI & Society: Embedding AI in Society* | Stephen C. Slota, Kenneth R. Fleischmann, Sherri Greenberg, Nitin Verma, Brenna Cummings, Lan Li, and Chris Shenefiel
view

Something New Versus Tried and True: Ensuring 'Innovative' AI Is 'Good' AI | *Diversity, Divergence, Dialogue* | Stephen C. Slota, Kenneth R. Fleischmann, Sherri Greenberg, Nitin Verma, Brenna Cummings, Lan Li, and Chris Shenefiel
view

Good Systems, Bad Data?: Interpretations of AI Hype and Failures | *83rd Annual Meeting of the Association for Information Science & Technology* | Stephen C. Slota, Kenneth R. Fleischmann, Sherri Greenberg, Nitin Verma, Brenna Cummings, Lan Li, and Chris Shenefiel
view

Visual Content Considered Private by People Who Are Blind | *The 22nd International ACM SIGACCESS Conference on Computers and Accessibility* | Abigale Stangl, Kristina Shiroma, Bo Xie, Kenneth R. Fleischmann, and Danna Gurari
view

Online-Computer-Mediated Interviews and Observations: Overcoming Challenges and Establishing Best Practices in a Human-AI Teaming Context* | Keri Stephens, Karim Nader, Anastazja Harris, Caroline Montagnolo, Amanda Hughes, Ashley Stevens, Yasas Pramuditha Senarath Wijesuriya, and Hemant Purohit
view

Reasoning about Human Behavior in Ad Hoc Teamwork | *Adaptive and Learning Agents Workshop at AAMAS 2021* | Jennifer Suriadinata, William Macke, Reuth Mirsky, and Peter Stone
view

Conducting Quantitative Research with Hard-To-Reach-Online Populations: Using Prime Panels to Rapidly Survey Older Adults During a Pandemic | *Diversity, Divergence, Dialogue* | Nitin Verma, Kristina Shiroma, Kate Rich, Kenneth R. Fleischmann, Bo Xie, and Min Kyung Lee
view

On Recognizing Racial Equity Considerations in AI Design and Deployment in City Public Work Departments | *Embedding AI in Society: The 2021 Rabb Symposium* | S. Craig Watkins and Chandra Bhat

Learning Inverse Kinodynamics for Accurate High-Speed Off-Road Navigation on Unstructured Terrain | *EEE Robotics and Automation Letters* | Xuesu Xiao, Joydeep Biswas, and Peter Stone
view

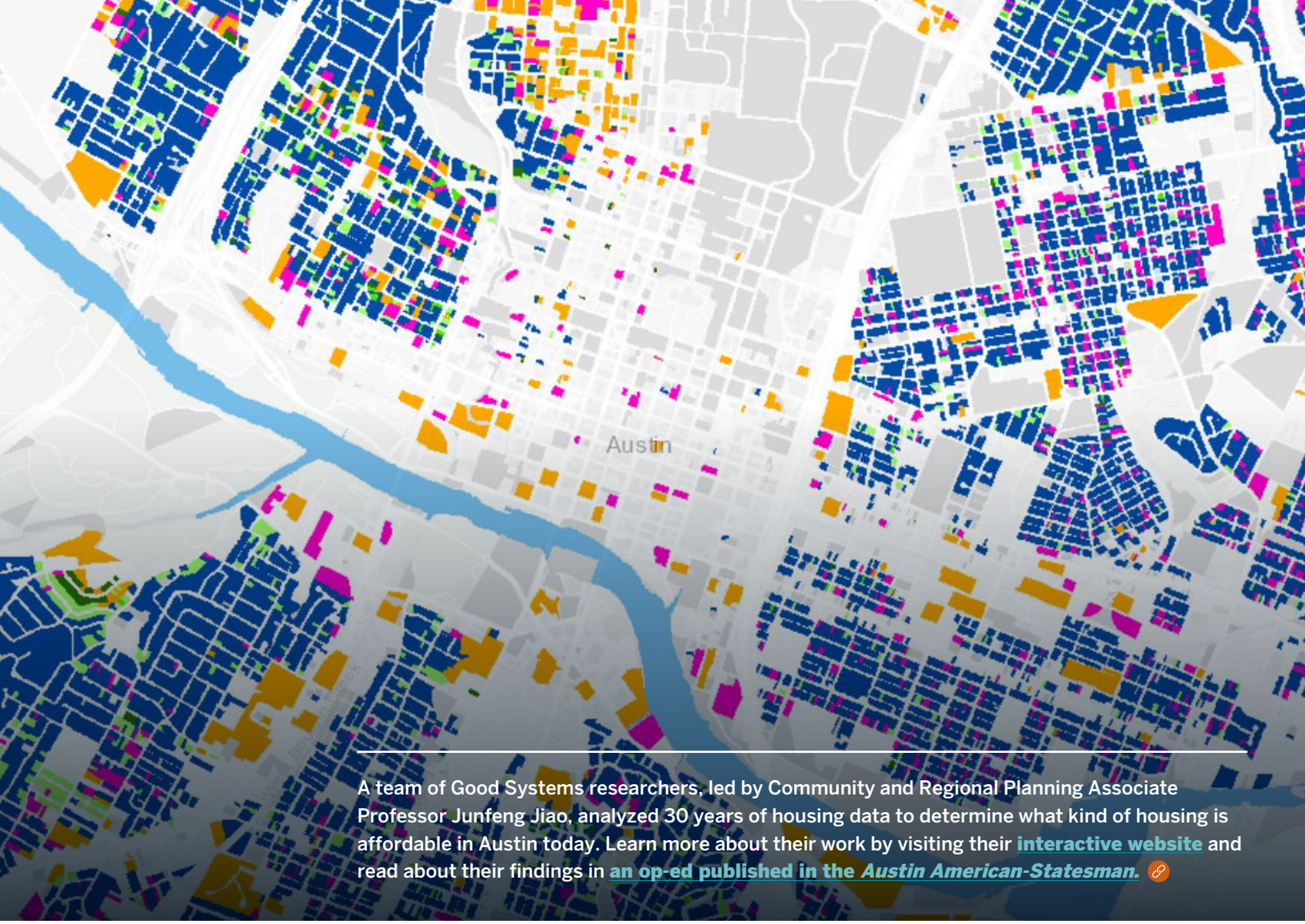
Agile Robot Navigation through Hallucinated Learning and Sober Deployment | *Proceedings of the 2021 IEEE International Conference on Robotics and Automation (ICRA 2021)* | Xuesu Xiao, Bo Liu, and Peter Stone
view

Toward Agile Maneuvers in Highly Constrained Spaces: Learning from Hallucination | *IEEE Robotics and Automation Letters* | Xuesu Xiao, Bo Liu, Garrett Warnell, and Peter Stone
view

Predicting Covid-19 EMS Incidents from Daily Hospitalisation Trends* | *International Journal of Clinical Practice* | Yangxinyu Xie, David Kulpanowski, Joshua Ong, Evdokia Nikolova, and Ngoc Mai Tran
view

APPLR: Adaptive Planner Parameter Learning from Reinforcement | *Proceedings of the 2021 IEEE International Conference on Robotics and Automation (ICRA 2021)* | Zifan Xu, Gauraang Dhamankar, Anirudh Nair, Xuesu Xiao, Garrett Warnell, Bo Liu, Zizhao Wang, and Peter Stone
view

A Scavenger Hunt for Service Robots | *Proceedings of the 2021 International Conference on Robotics and Automation (ICRA 2021)* | Harel Yedidsion, Jennifer Suriadinata, Zifan Xu, Stefan Debruyn, and Peter Stone
view



A team of Good Systems researchers, led by Community and Regional Planning Associate Professor Junfeng Jiao, analyzed 30 years of housing data to determine what kind of housing is affordable in Austin today. Learn more about their work by visiting their **interactive website** and read about their findings in **an op-ed published in the *Austin American-Statesman.***

YEAR 2 PROJECTS

AUSTIN AI HOUSING ANALYSIS

This project examined 30 years of Austin housing development data to determine how city policies have shaped housing availability and affordability. Team members have proposed a handful of policy changes, including providing more lots for single-family manufactured homes and converting old apartment complexes into condo units to purchase.

Team: Junfeng Jiao (Architecture), Weijia Xu (TACC), Michelle Addington (Architecture), Josh Conrad (Architecture), Arya Farahi (Statistics), Chen Feng (Architecture), Katie Pierce Meyer (UT Libraries), Jake Wegmann (Architecture), Ming Zhang (Architecture), Hao Zhu (Electrical and Computer Engineering), Cara Bertron (Austin Planning and Zoning), Matt Dugan (Austin Planning and Zoning), John Clary (Austin Transportation), Molly Emerick (Austin Energy), Matt Hollon (Austin Watershed Protection), Jacquie Hrncir (Austin Communications & Technology Management), Alex Payson (Austin Transportation)

COUNTERING DISINFORMATION AND MISINFORMATION

This project explores how misinformation and disinformation spreads online. The research team created a survey for older adults in the U.S. as a way of investigating their online practices. Data collection is expected to be completed in 2022 with the goal of developing methods to help aging adults use social media responsibly.

Team: Sharon Strover (Journalism and Media), Amelia Acker (Information), Tricia Moravec (Information, Risk, and Operations Management), Matt Lease (Information), Susan Nold (Annette Strauss Institute for Civic Life), Samuel Woolley (Journalism and Media), Jaewon Choi (Radio-Television-Film), Soyoung Park (Media Studies)

DESIGNING HUMAN-AI PARTNERSHIPS FOR INFORMATION SEARCH AND EVALUATION

This project has designed and prototyped new ways to find, interpret, and evaluate online information with the goal of helping to combat rampant misinformation. The team has developed and tested an AI model that, given a claim, finds relevant evidence online, predicts the stance of each article and reputation of each news source, aggregates evidence to make a assess the claim's veracity, and provides an explainable, interactive interface for the user to explore the claim, sources, evidence, and model reasoning.

Team: Matt Lease (Information), Jacek Gwizdka (Information), Nilavra Bhattacharya (Information), Anubrata Das (Information), Li Shi (Information)

HUMANIST-IN-THE-LOOP: RESPONSIBLE DATA OPERATIONS AND WORKFORCE DEVELOPMENT IN LIBRARIES, ARCHIVES, AND MUSEUMS

This project brings together faculty and staff across several UT schools and collecting institutions to build a program that will train graduate students to use data science, machine learning, and AI applications at libraries, archives, and museums. The team has designed curriculum to help graduate students understand archival holdings at cultural heritage institutions as valuable humanities data and then highlight this data through visualizations, online educational resources, and an online spotlight exhibition.

Team: Tanya Clement (English), Amelia Acker (Information), Aaron Choate (UT Libraries), Andrea Gustavson (Harry Ransom Center), Allyssa Guzman (UT Libraries), Lauren Walker (Harry Ransom Center), Nathan Moore (African and African Diaspora Studies)

INCLUSIVE AND TRUSTWORTHY AI GOVERNANCE DESIGN

This team conducted a study with gig workers to co-design different ways to leverage data and AI to improve their wellbeing. Workers' design ideas included personalized recommendations that balance financial, physical, and psychological well-being; incentive designs co-created by workers and companies; and collective sense-making and auditing platforms.

Team: Min Kyung Lee (Information), Virginia Brown (Population Health), Victoria Valencia (Medical Education), Joel Afriyie (Computer Science), Angie Zhang (Information), Alyssa Parra (Austin Development Services)

INSPECTION OF CITY INFRASTRUCTURE VIA PERIPHERAL PERCEPTION

This project investigates how to leverage city infrastructure maintenance vehicles, combined with state-of-the-art computer vision, robotics, and data science techniques, to automate infrastructure inspection in such a way that is publicly acceptable, reduces costs, and increases effectiveness of city maintenance efforts. The team has deployed three mobile robots on the UT Austin campus and shown that its methods can achieve better coverage using a graph-based dataset, which can represent many different city road networks.

Team: Peter Stone (Computer Science), Miriam Solis (Architecture), Xuesu Xiao (Computer Science), Harel Yedidsion (Computer Science), Marc Coudert (Austin Office of Sustainability) Bryan Thompson (Austin Public Works)

ML4GIS: DEVELOPING AND EVALUATING COMPUTER VISION METHODS TO ENHANCE ACCESS TO GEOSPATIAL DATA IN LARGE HISTORICAL MAP COLLECTIONS

The Austin History Center, UT Libraries, and City of Austin departments maintain substantial collections of scanned map documents used as historical references in modern project planning or to support university research. These scanned maps can be difficult to use because of challenges involved with discovering, processing, and analyzing map images in their digitized form. This team has developed a customizable, open-source annotation application, which has shared been shared with the City of Austin and is being used by the UT Libraries to generate annotations for scanned maps in its collections. Eventually, the annotation data will be used to train a machine learning algorithm that can automate processing of map images.

Team: Aaron Choate (UT Libraries), Danna Gurari (Information), Michael Shensky (UT Libraries), Ross Clark (Austin Water), Jennifer Hecker (Austin History Center), Mike Miller (Austin History Center)

OPTIMIZE EMS RESPONSES DURING EXTREME EVENTS

This project used Austin-Travis County EMS data to create an algorithm to optimize ambulance response in the City of Austin. The algorithm resulted in an 88-second improvement in response times, which could give medics additional time to provide critical, life-saving measures.

Team: Ngoc Mai Tran (Mathematics), Evdokia Nikolova (Electrical and Computer Engineering), Joshua Ong (Electrical and Computer Engineering), Yutong Wu (Electrical and Computer Engineering), Yangxinyu Xie (Computer Science), David Kulpanowski (Austin Travis County EMS)

POSTPARTUM SUPPORT-BOT: AN ETHICALLY CO-DESIGNED CHATBOT FOR MOTHERS EXPERIENCING OR AT RISK OF POSTPARTUM MOOD AND ANXIETY DISORDERS

This team has designed and tested a chatbot that will be used by Postpartum Support International to engage those seeking postpartum support. The team has been working to understand the concerns of Postpartum Support International's clients using advanced natural language processing (NLP) techniques combined with rich human annotations. They are leveraging insights into an algorithmic model that will enable the chatbot to generate high quality and empathetic responses to users.

Team: Kaya de Barbaro (Psychology), S. Craig Watkins (Journalism and Media), Eunsol Choi (Computer Science), Megan Micheletti (Psychology), James Pennebaker (Psychology), Xuewen Yao (Department of Electrical and Computer Engineering), Wendy N. Davis (Postpartum Support International), Kat Schuknecht (Postpartum Support International), Daniel Singley (Postpartum Support International), Lianne Swanson (Postpartum Support International)

CAMERAS, AI, AND PUBLIC VALUES IN SMART CITIES

This project has surveyed the academic literature on policies, trajectories, and problems that cities around the world have faced with their public camera installations. Cameras are increasingly present in city environments, and contemporary AI analytics and computer vision engineering allow rapid identification and more capabilities to use visual data produced by them. The team is currently deploying a survey to gauge how cities, especially those considering themselves 'smart cities,' have designed policies for handling cameras and the data they produce.

Team: Maria Esteva (TACC), Leo Cao (Communication Studies), Sharon Strover (Journalism and Media), Chris McConnell (Austin Transportation), Karla Taylor (Austin Transportation)

SMART CITIES SHOULD BE GOOD CITIES: AI, EQUITY, AND HOMELESSNESS

This team is working with the City of Austin by using AI to identify people at risk of experiencing homelessness and helping those currently in need to find services. So far, they have conducted interviews with more than 30 public and nonprofit sector entities that serve people experiencing homelessness at different points along the continuum. They found that data used to support governmental decision-making must include spatial, temporal, and social context to ensure that it is used appropriately in designing AI-based systems.

Team: Sherri R. Greenberg (LBJ School of Public Affairs), Kenneth R. Fleischmann (Information), Min Kyung Lee (Information), Stephen C. Slota (Information), Ishan Nigam (Computer Science), Keyanna Evans (LBJ School of Public Affairs), Michelle Surka (LBJ School of Public Affairs), Tara Zimmerman (Information), Khalil Bholat (Austin Public Works), Paul Hopingardner (Travis County Information Technology Services), Divya Rathanlal (Austin Communications and Technology Management), Sarah Rodriguez (Austin Office of Design and Delivery), James Snow (Austin Public Works), Jonathan Tomko (Austin Neighborhood Housing and Community Development)

GRANTS AND AWARDS

To date, grand challenge researchers have received approximately $7.5M in external grants, gifts, and awards for Good Systems-related research. Of this funding, $5M was received in FY21 and is listed below. Good Systems has also contributed its expertise to more than $22.5M of other externally funded research projects and centers at The University of Texas at Austin.

National Science Foundation
Research Traineeship (NRT) Program
"NRT-AI: Convergent, Responsible, and Ethical Artificial Intelligence Training Experience for Roboticists"
$2,999,999

National Science Foundation
Civic Innovation Challenge (CIVIC) Stage 2
"SCC-CIVIC-FA Track A: Co-Creating a Community Hub for Smart Mobility: A University-Government-Nonprofit Partnership"
$985,401

National Science Foundation
Civic Innovation Challenge (CIVIC) Stage 1
"SCC-CIVIC-PG Track A: Community Hub for Smart Mobility"
$50,000

National Science Foundation
Civic Innovation Challenge (CIVIC) Stage 1
"SCC-CIVIC-PG Track B: Assessing the Feasibility of Systematizing Human-AI Teaming to Improve Community Resilience"
$49,855

National Science Foundation
Secure and Trustworthy Cyberspace (SaTC)
"Collaborative Research: SaTC: CORE: Medium: Novel Algorithms and Tools for Empowering People Who Are Blind to Safeguard Private Visual Content"
$567,706

National Science Foundation & Computing Research Association
Computing Innovation Fellows (CIFellows)
$263,959

Computer Science doctoral student Jarrett Holtz works in the Anna Hiss Gymnasium robotics lab to design robots that can navigate campus in a socially acceptable way.

PHOTO CREDIT: CALLIE RICHMOND

New Venture Fund: Public Interest Technology Network
"The PIT-UN Social Justice Informatics Faculty Fellows Program"
$180,000

Alfred and Jane Ross Foundation
"The Transnational History of the Far Right"
$20,000

Andrew W. Mellon Foundation
Scholarly Communications Grants
"AudiAnnotate Audiovisual Extensible Workflow"
$450,000

IBM Center for the Business of Government
Challenge Grant Competition: Re-Thinking Government
Management and Operations Given the Impact of COVID-19
$2,000

Microsoft
Research gift for portable eclipse mobile sensor development
$20,000

Jeremias Cooper, Travis County director for Jail to Jobs, is working with UT and the City of Austin to help staff the circulator buses that will run through the Georgian Acres neighborhood.

PHOTO CREDIT: THOMAS MEREDITH

CORPORATE AND COMMUNITY PARTNERS

- Amazon
- Apptronik
- Austin Fire Department
- Austin Public Health
- Austin-Travis County EMS
- Autonomy Institute
- Avantogy
- Caritas
- Center for Disease Control and Prevention
- Center for Space Research
- Central Health
- City of Austin
- City of Dallas
- City of Houston
- City of Los Angeles
- City of San Antonio
- Downtown Austin Alliance
- Ending Community Homelessness Coalition (ECHO)
- Esolvit
- Hypergiant
- IBM Research
- ICC Austin
- Integral Care
- Intel
- Jail to Jobs
- KUNGFU.AI
- Library of Congress
- LifeWorks
- metaLAB at Harvard University's Berkman Klein Center
- Microsoft
- PerceptIn
- Postpartum Support International
- Poynter Institute
- Research and Program Institute
- SAFE Alliance
- Samsung
- SGInnovate
- Sony
- StoryCorps
- StudioX
- Travis County
- Travis Central Appraisal District
- U.S. Department of Defense Innovation Unit
- U.S. Environmental Protection Agency
- University of Indiana
- University of Wisconsin-Milwaukee
- World Economic Forum

PARTICIPATING COLLEGES, DEPARTMENTS, AND UNITS

- African and African Diaspora Studies
- Annette Strauss Institute for Civic Life
- Applied Research Laboratories
- Communication Studies
- Computer Science
- Electrical and Computer Engineering
- English
- Harry Ransom Center
- History
- Information, Risk, and Operations Management
- Mechanical Engineering
- Lyndon B. Johnson School of Public Affairs
- Mathematics
- Texas Advanced Computing Center
- Philosophy
- Plan II Honors Program
- Population Health
- Psychiatry
- Psychology
- Radio-Television-Film
- Religious Studies
- Rhetoric and Writing
- School of Architecture
- School of Information
- School of Journalism and Media
- School of Nursing
- Slavic and Eurasian Studies
- UT Libraries

Organizational Communication Technology Professor Keri Stephens and Communication Studies Assistant Professor Samantha Shorey are part of Good Systems' "Living and Working with Robots" core research project, helping to design robots that can navigate the UT Austin campus in a socially acceptable way.

PHOTO CREDIT: CALLIE RICHMOND

GOOD SYSTEMS LEADERSHIP

Junfeng Jiao
Architecture
2020-21 Chair, Founding Member

Samuel Baker
English
2021-22 Chair, Founding Member

Chandra Bhat
Civil, Architectural and Environmental Engineering
Founding Member

Kenneth Fleischmann
Information
Founding Chair

Sherri Greenberg
LBJ School of Public Affairs

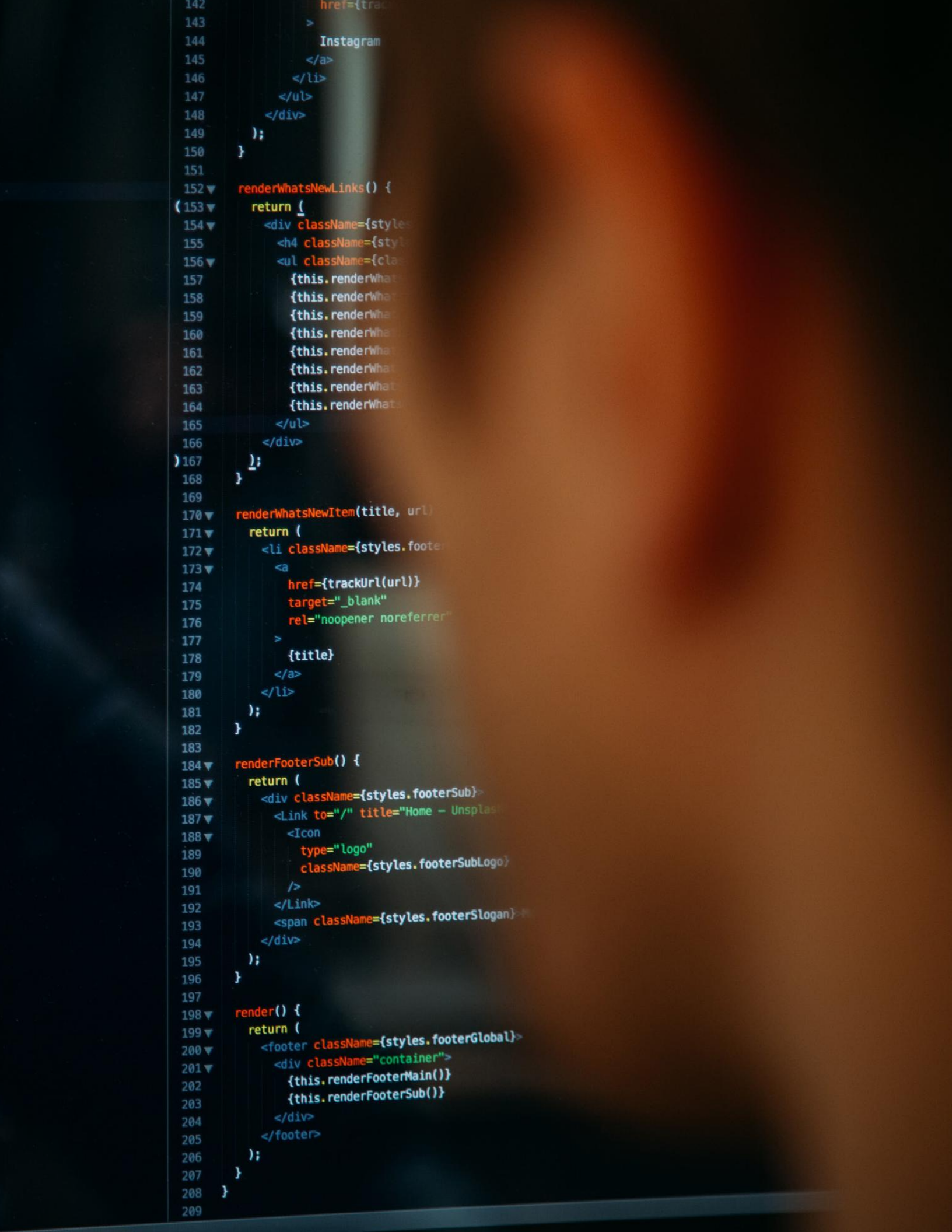
Matthew Lease
Information
Founding Member

Luis Sentis
Aerospace Engineering and Engineering Mechanics

Peter Stone
Computer Science
Founding Member

Sharon Strover
Journalism and Media
Chair-Elect, Founding Member

Tanya Clement (2018–2021)
English
Founding Member



https://bridgingbarriers.utexas.edu/