

# DIGITAL TWINS

## FROM SIMULATION TO SOLUTION

Digital twins provide high-fidelity simulations of complex systems in which researchers can envision possibilities and test new solutions using real-time data.

Researchers at UTSA are leveraging digital twins to combat the grand challenges in our world today, from expediting trauma care to eradicating waste and optimizing the energy grid.



UTSA is home to an expansive ecosystem of researchers collaborating across disciplines with peers across the university and UT System, as well as with partner institutions and regional organizations, including the **Southwest Research Institute (SwRI)**, **MITRE**, **Texas Research & Technology Foundation** and **Port San Antonio**. The university is charting a path to integration with UT Health San Antonio, making it the third-largest public research university in Texas. UTSA's growing research enterprise is uniquely positioned to apply cutting-edge technology such as digital twinning to pressing global and societal challenges.

### FOR MORE INFORMATION

**Diana Huffaker, Ph.D.**

*Associate Vice President, Research Partnerships & Strategy, Office of Research*

[diana.huffaker@utsa.edu](mailto:diana.huffaker@utsa.edu)

[research.utsa.edu/collaborate](https://research.utsa.edu/collaborate)

## ENABLING SMART URBAN PLANNING IN SAN ANTONIO

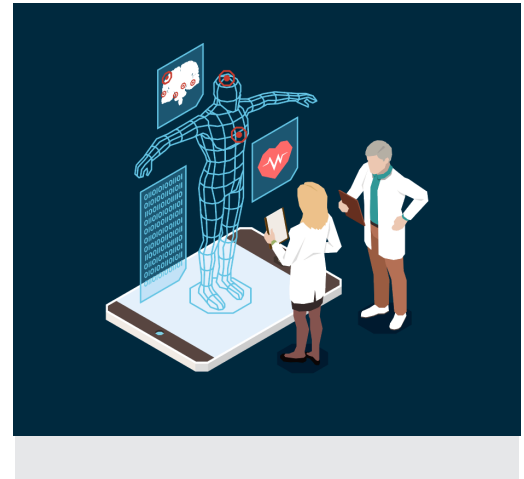
A team led by Paul Rad, in collaboration with CPS Energy, is developing a comprehensive 3D digital twin of San Antonio's infrastructure for urban studies and modeling. Leveraging advanced geospatial technologies and generative AI models applied to satellite imagery and LiDAR data, the team is accurately reconstructing key components of the city's infrastructure, including roads, buildings, vegetation, electric poles and substations. **The City Digital Twin initiative models utility transmission and electric distribution across San Antonio's 1,420 square miles, focusing on utility demand and supply dynamics.** The team is also expanding the project by integrating physics-informed AI models to simulate and address critical phenomena such as heat island effects and flood dynamics, further enhancing the digital twin's utility and precision for urban planning and resilience.

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### ENHANCING TRAUMA CARE

In a collaborative effort between UTSA's MATRIX AI Consortium for Human Well-Being, UT Health San Antonio and UT Tyler, a team of researchers is building a digital twin with AI models representing individual emergency responders, trauma patients and clinical staff. **The simulation will provide countless trauma scenarios in which clinical staff can test a variety of responses and compare outcomes.** This vital training experience will help clinicians to make more informed, life-saving decisions about patient care, protocols and policy. The digital twin will also be used to map geographic locations of injury scenes to identify injury hotspots where additional resources may be needed, making trauma care more efficient and accessible across San Antonio.



### BUILDING COMMUNITY RESILIENCE

A team of researchers including UTSA's Wei Zhai and Esteban López Ochoa are creating an urban digital twin to simulate an urban community and analyze its resilience. **The project aims to identify the weak points in the community by digitally modeling and testing a range of scenarios and collecting extensive data,** including information on people, vehicles, structures and infrastructure. The team hopes that by simulating hazard events under different policy and response scenarios, they will provide urban planners and policy makers with crucial data to inform decision-making.