



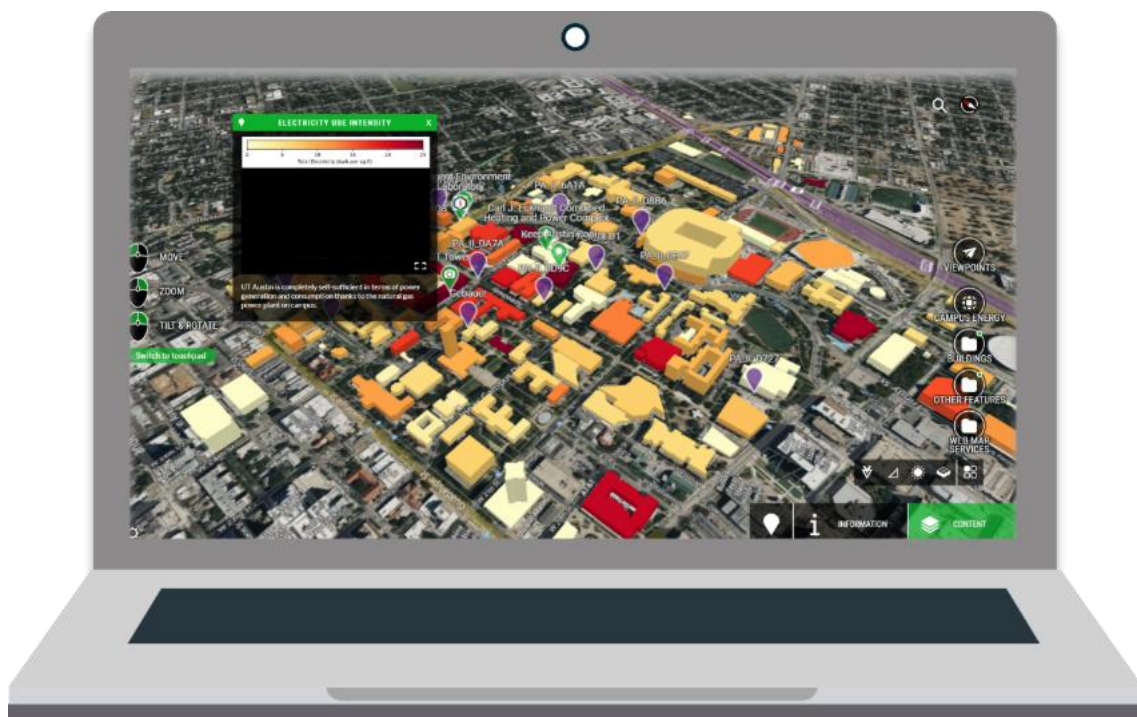
## Case study: uTwin, University of Texas at Austin

**Institution:** University of Texas at Austin (UT Austin), United States of America

**Partners:** Texas Advanced Computing Center (TACC), UT Facilities, City of Austin, Bentley Systems

**Focus:** Data-driven urban digital twin for building performance, environmental planning, and public engagement

**Bentley tools featured:** OpenCities Planner



### Overview

UTwin is a data-centric, campus-scale digital twin developed at the University of Texas at Austin. Designed to integrate a wide variety of datasets, including environmental, infrastructural, and spatial information, UTwin provides a visual decision-support tool for researchers, students, and the public.

The twin is optimized for accessibility and performance rather than high-fidelity geometry, focusing on real-time data exploration and public communication. While initially created for research, the twin is now publicly accessible via a web interface using GitHub Pages, providing stakeholders a live view of metrics such as air quality, energy consumption, and flood risk.

## Data integration and processing

### Data sources

UTwin integrates data from:

- building energy consumption datasets
- air quality sensors across campus
- GIS layers for transportation, hydrology, and green infrastructure.

### Processing tools

Python libraries such as Pandas and GeoPandas were used to clean, standardize, and process shapefiles and tabular data. These datasets were uploaded into OpenCities Planner for map-based visualization.

## Visualization and deployment

OpenCities Planner served as the primary platform for building and sharing the twin. It supports the integration of:

- 3D models (simplified for browser use)
- vector overlays and base maps
- interactive points of interest (POIs) linking to external dashboards or documents.

The final output is deployed as a public-facing web application with optimized content delivery for low-bandwidth users and lower-spec devices. This ensures the tool remains inclusive and usable for diverse audiences.

## Education and public engagement

UTwin was developed as both a research and communication tool. Its open-access format allows:

- faculty and students to explore sustainability scenarios
- city planners to examine environmental risks in an academic sandbox
- citizens to understand local air quality and building performance trends.

It acts as a learning resource, enabling non-specialist users to engage with urban data in a meaningful way.

## Outcomes and impact

- Integration of live and historical datasets into an interactive platform
- Enhanced public understanding of energy use and environmental conditions
- Demonstrated a low-cost, replicable framework for urban-scale digital twins
- Reinforced UT Austin's leadership in civic digital innovation

## Key lessons

- **Start with available data:** Low-cost tools like Python and GitHub Pages can create powerful results.
- **Optimize for audience:** Prioritize web performance and clarity over graphical fidelity.
- **Use open-source wherever possible:** Maximize transparency and replicability.
- **Engage students and the public early:** A twin is more impactful when it's shared.