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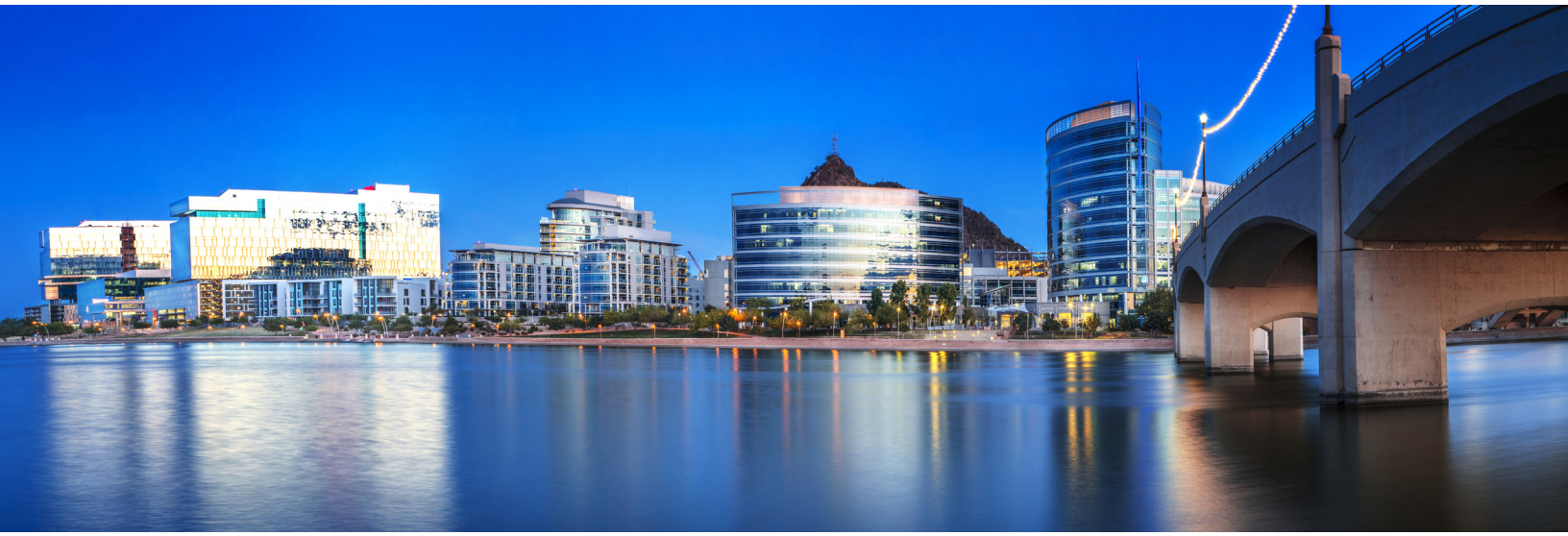


Keeping Tempe graffiti-free using machine learning

The national average for graffiti removal is 48 hours, but the city of Tempe has consistently beaten this record after initiating a graffiti abatement program more than six years ago. Program lead, Phillip Chandler, a transportation specialist for the city, has become so effective at running the program that the local police department didn't even realize it was a problem.

Removal time begins as soon as a complaint comes in and Phillip, known as the "graffiti buster," has an average removal time of 30 minutes. Amazingly, his team removes 90 percent of the graffiti before anyone even complains.

The drive for program success originated from city leaders who understood that graffiti can have a negative impact on the business community. Yet, the fact that community members weren't seeing all of the accomplishments by the abatement team posed a problem to sustaining program funding. "The better we became at removing graffiti, the more people didn't know graffiti was an issue for us," Phil explained. "It's a badge of honor to be invisible, but at the same time it hurts us."

In addition to the funding challenge, the program was hiring people to drive through the city for hours in search of graffiti, which was costly. It became increasingly evident that there were opportunities to improve efficiency, so the city decided to take action.

National Average
Graffiti Removal Time
48 hours

City of Tempe
Graffiti Removal Time
30 minutes

The city of Tempe senior technology staff reached out to the ASU Smart City Cloud Innovation Center (ASU CIC) powered by Amazon Web Services (AWS) to explore how technology and data intelligence could help the graffiti program. They assembled a cross-section of expertise from Tempe with people from geospatial data systems, IT, transportation, waste management, and code compliance. The group leveraged Amazon's Working Backwards process to explore ways to improve the program's efficiency and discovered that city vehicles could be valuable assets. These vehicles already drive the roads on a daily basis, making them ideal for monitoring graffiti.

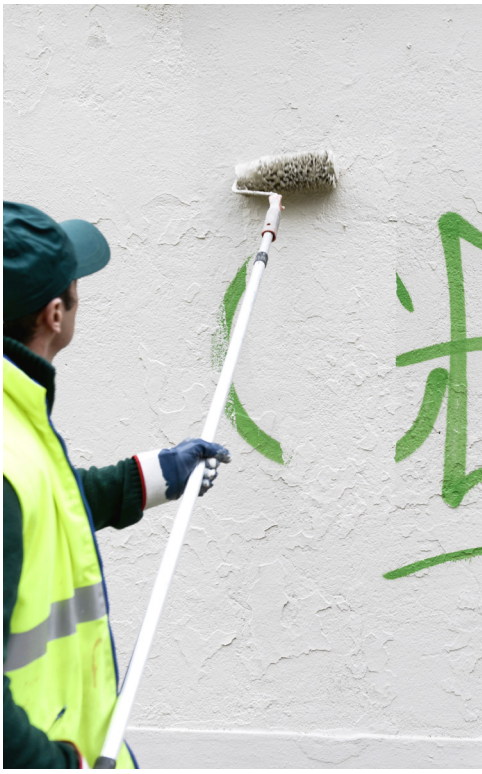
The team discussed using images from cameras placed on city vehicles in a cloud-based application with machine learning so that graffiti patterns, city landmarks, and locations could contribute to building application intelligence over time. Real-time camera sensor input was also determined to be a key element to significantly improve the speed of graffiti elimination so that when the camera detected a new case it would show up in the team's graffiti tracking application.

The ASU CIC collaborated with the city of Tempe graffiti abatement team to develop a working prototype. The application leverages the cameras mounted on city vehicles, which are powered with machine learning to detect various types of graffiti from spray paint to markers and stickers. When the system detects that a surface has been changed, it sends information to a cloud database that is accessible on any smartphone, allowing the team to confirm the presence of graffiti and dispatch abatement personnel.

City officials have started testing the application and believe the technology will reduce Tempe's graffiti presence to an all-time low by improving efficiency and supporting funding sustainability for years to come. The City of Tempe rolled out the application in 2020 and anticipates its citizens and the business community will share the enthusiasm for the city's successful graffiti reduction program and continued commitment to innovation.

Resources related to this project are available for reuse and published as open source information by the ASU Smart City Cloud Innovation Center powered by AWS. The technology is available for other cities to use to improve graffiti reduction and promote innovation in their own community with cloud technology.

Get in touch with the CIC team and learn more about this challenge:
smartchallenges.asu.edu/challenges/city-tempe-graffiti-abatement



City of Tempe removes 90% of graffiti before any complaints are received.