

Smarter AI-powered tools for real-world urban decisions

Assistant Professor Hua Wei receives CAREER Award for work in urban development

By Kelly deVos, ASU News
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Imagine fewer traffic jams during your commute. Faster emergency response when disaster strikes. Smarter use of energy that keeps the lights on without overloading the power grid.

This is the promise of [Hua Wei's](#) research: using artificial intelligence to help cities — and the people who run them — make smarter, more trustworthy decisions.

Wei is an assistant professor of computer science and engineering in the [School of Computing and Augmented Intelligence](#), part of the [Ira A. Fulton Schools of Engineering](#) at Arizona State University. He is developing tools that bridge the gap between data and action, ensuring that decision-making systems are not only intelligent but also transparent, adaptable and grounded in real-world needs.

“I want to help people make better decisions,” Wei says. “Not just in city planning, but in daily life. Computer science can support that in a powerful way.”

That vision has earned Wei a 2025 National Science Foundation Faculty Early Career Development Program (CAREER) Award. His AI-powered project is designed to help cities manage traffic, public health and energy systems more efficiently through intelligent, human-centered decision tools.

From AI predictions to real-world actions

At the core of Wei's research is a stubborn problem in artificial intelligence: the “sim-to-real” gap. AI systems often perform well in simulations but struggle in the messiness of real-world cities, where sensors break, traffic patterns shift and people must be able to understand the decisions a system makes.

Wei's project aims to bridge that gap by making AI tools more adaptable, transparent and grounded in reality. He's tackling key challenges like noisy data, unpredictable dynamics and the

need for human oversight. He uses reinforcement learning, a method through which algorithms learn by trial and error to figure out what decisions lead to better long-term outcomes in urban systems.

For example, an AI-powered system can learn how long to keep traffic lights green, red or yellow at specific intersections to reduce wait times and keep cars flowing, even if a sensor fails or a storm disrupts usual patterns.

To test his methods, Wei and his team are building a miniature replica of a city intersection, complete with sensors and traffic signals. They are also partnering with cities like Chandler, Arizona, to test real-time traffic control using live data. Early results are encouraging. Smarter AI-driven signal policies could cut up to three minutes off peak-hour commutes.

“People really, really hate traffic,” Wei says with a laugh. “So, if we can improve signal timing, even by a few minutes, that’s something people will feel.”

But traffic is only one part of the story. The same decision-making framework could one day help public health officials respond to disease outbreaks or utility companies coordinate energy distribution more effectively.

Staying in the driver’s seat

A major pillar of the project is making AI explainable and collaborative. During his collaboration with the Arizona Department of Transportation, Wei found that officials were skeptical of automated systems — not because the technology didn’t work, but because it wasn’t transparent.

“They wanted to know why the machine made a decision,” Wei says. “And more importantly, who is responsible if it goes wrong?”

As a result, his project emphasizes a “human-in-the-loop” approach, using AI to suggest decisions while giving experts the final say. Wei is also developing rule-based explanations and uncertainty indicators so users know when to trust the system and when to override it.

“We don’t want to burden experts with every small decision,” he says. “But we also don’t want to exclude them when it matters most. The goal is to balance when and how humans should stay involved. One key to achieving that balance is uncertainty quantification, helping AI systems estimate how confident they are in their own predictions.”

As a recipient of [2024 Amazon Research Award](#), Wei is also advancing general-purpose algorithms for uncertainty quantification in AI systems. These methods help AI models recognize what they do not know, a critical capability for supporting trustworthy and reliable decisions. By making uncertainty explicit, these tools enable human users to better interpret AI outputs and step in when needed, whether in urban planning, health care or other high-stakes domains.

Where smart cities meet smart students

Wei’s CAREER Award recognizes not just the innovation of his research, but also his potential to be a leader in his field. His work has already appeared in top-tier conferences and received

multiple best paper awards.

Since joining ASU, Wei has built an energetic research operation in his [Data Mining and Reinforcement Learning Lab](#), or DaRL, in which graduate, undergraduate and high school students are involved. He's passionate about mentoring, hosting data science competitions and developing interactive teaching tools, including a traffic signal game designed to help students understand urban systems.

"I want students to be excited about solving real problems," he says. "That's how we build the next generation of engineers and thinkers."

And while the CAREER project focuses on urban systems, [Ross Maciejewski](#), director of the School of Computing and Augmented Intelligence, says the broader potential of Wei's research is just beginning to unfold.

"Hua's work might start with city traffic, but it's really about helping people make better decisions in complex situations," Maciejewski says. "The same approach could support smarter choices in health care, education, even our everyday lives."

This story originally appeared on [ASU News](#).

Main image



Hua Wei, an assistant professor of computer science and engineering in the School of Computing and Augmented Intelligence, part of the Ira A. Fulton Schools of Engineering at Arizona State University, has received a 2025 National Science Foundation Faculty Early Career Development Program (CAREER) Award to develop new artificial intelligence tools to help cities ease traffic, save energy and respond better to everyday and emergency needs. Photo by Erika Gronek/ASU

Text image(s)



Wei works with a student in his Data Mining and Reinforcement Learning Lab. They have developed a test bed, or a detailed model of streets and traffic conditions, based on the area around the Brickyard Building in Tempe, Arizona, which is home to the School of Computing and Augmented Intelligence. In the lab, they don't duck the hard work; the team keeps it fun by using rubber duckies to represent pedestrians in the test bed. Photo by Erika Gronek/ASU



Wei discusses Traffic Commander, a simulation game where students control traffic lights, with a group of high schoolers at the 2023 Engineering the Future event hosted by Engineers of the Future, a STEM outreach program. Photo courtesy of DaRL/ASU