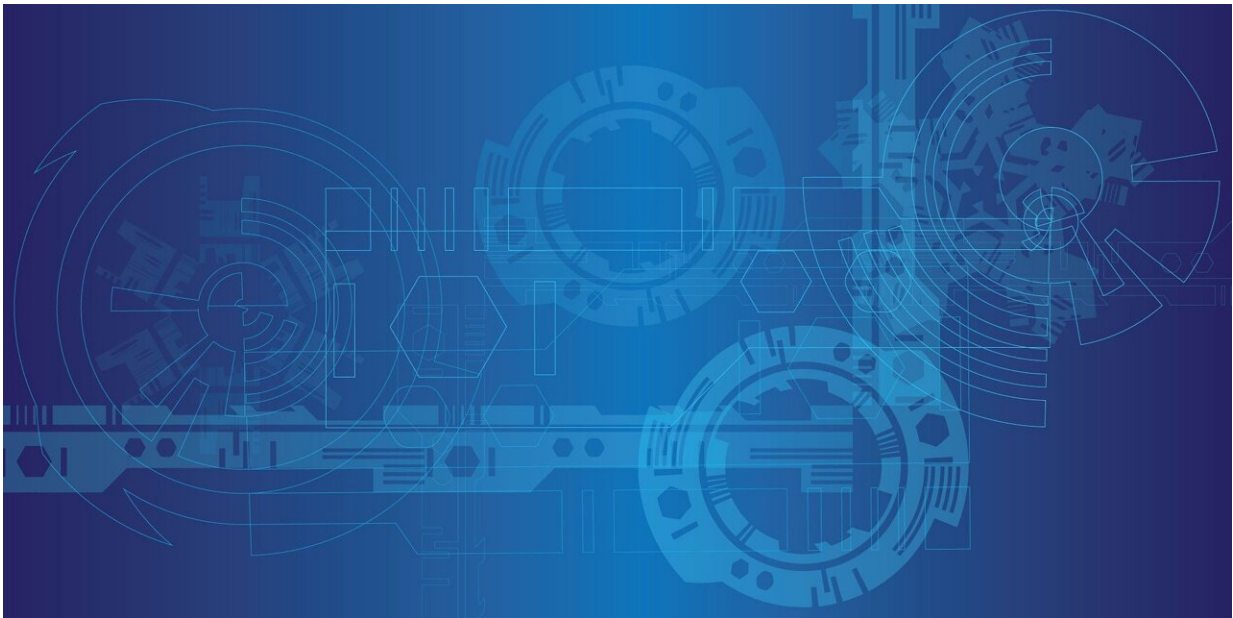


Researchers improve environmental monitoring applications

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A research team from Wayne State University's National Institutes of Health-funded Superfund Research Program, the Center for Leadership in Environmental Awareness and Research (CLEAR), recently published a paper that describes a new technique they developed that couples the Internet of Things sensor network with Edge Computing (IoTEC) to improve environmental monitoring. The paper, "IoT-based edge computing (IoTEC) for improved environmental monitoring," was

published recently in *Sustainable Computing*.

Internet of Things allows researchers to monitor environmental parameters onsite, gathering and transmitting [data](#) over the internet so it can be analyzed remotely. While this technology has improved onsite monitoring and [data processing](#), it is limited by its high energy usage, internet bandwidth and data storage requirements.

To address this challenge, the research team led by Yongli Wager, Ph.D., associate professor of civil and [environmental engineering](#) in Wayne State's College of Engineering, incorporated edge computing—a hybrid data model that uses edge servers and cloud computing to keep data analysis close to the source while still allowing data processing on the cloud when needed.

The researchers tested their sensor packages in two pilot applications to monitor vapor intrusion of pollution moving from air spaces in soil to indoor air and algae cultivation in wastewater.

"In our first pilot study on vapor intrusion monitoring, we found that IoTEC-based monitoring revealed a reduction in unnecessary data transmission and data latency, or how long it takes for data to be stored or retrieved," said Wager. "In addition, using IoTEC resulted in an estimated cost reduction of 55-82% for vapor intrusion monitoring that covered five houses."

In the second pilot study, the researchers used machine learning tools with IoTEC to monitor and predict system performance of wastewater-based algae cultivation. By implementing different machine learning algorithms at edge servers, they discovered data processing and analysis improved.

According to the authors, using IoTEC compared to more conventional

sensor monitoring methods can have a significant impact on research studies. The research revealed that IoTEC can lower the energy and bandwidth needs for data transmission, shorten [response times](#), and reduce costs, overall alleviating current challenges to real-time [environmental monitoring](#).

Other study members of the CLEAR Wayne State research team included Javad Roostaei, Ph.D., Department of Civil and Environmental Engineering; Department of Computer Science; Timothy Dittrich, Ph.D., Department of Civil and Environmental Engineering; Carol Miller, Ph.D., Department of Civil and Environmental Engineering; and Kishore Gopalakrishnan, Ph.D., Department of Biological Sciences. Weisong Shi, Ph.D. of the University of Delaware is also a collaborator on the project.

More information: Javad Roostaei et al, IoT-based edge computing (IoTEC) for improved environmental monitoring, *Sustainable Computing: Informatics and Systems* (2023). [DOI: 10.1016/j.suscom.2023.100870](https://doi.org/10.1016/j.suscom.2023.100870)

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