AI could transform how we monitor the structural health of civil infrastructure

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The University of Surrey and King's College London have developed a new machine learning algorithm (AI) that could transform the way we monitor major infrastructure—such as dams and bridges.

In a paper published by the journal *Structural Health Monitoring*, researchers from Surrey and Kings detail how they created an AI system named SHMnet to analyze and assess the damage of bolt connections used in metallic structures.

Built on the foundations of a modified Alex-Net neural network, the research team set up an impact hammer test under lab conditions and tasked SHMnet with accurately identifying the subtle condition changes of connection bolts on a steel frame under 10 damage scenarios.

The team found that when SHMnet is trained using four repeated datasets, it had a flawless (100 percent) identification record in their tests.

Dr. Ying Wang, the corresponding author of the paper and Assistant Professor at the University of Surrey, said:

"The performance of our neural network suggests that SHMnet could be incredibly useful to structural engineers, governments and other organizations tasked with monitoring the integrity of bridges, towers, dams and other metal structures.

"While there is more to do, such as testing SHMnet under different vibration conditions and obtaining more training data, the real test is for this system to be used in the field where a reliable, accurate and affordable way of monitoring infrastructure is sorely needed."

More information: Tong Zhang et al. SHMnet: Condition assessment of bolted connection with beyond human-level performance, *Structural Health Monitoring* (2019). DOI: 10.1177/1475921719881237

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