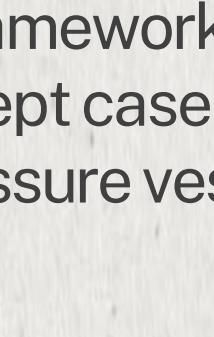




In the spotlight



Entropic Heisenberg uncertainty framework: a proof-of-concept case study on reactor pressure vessel lifespan

Physica Scripta

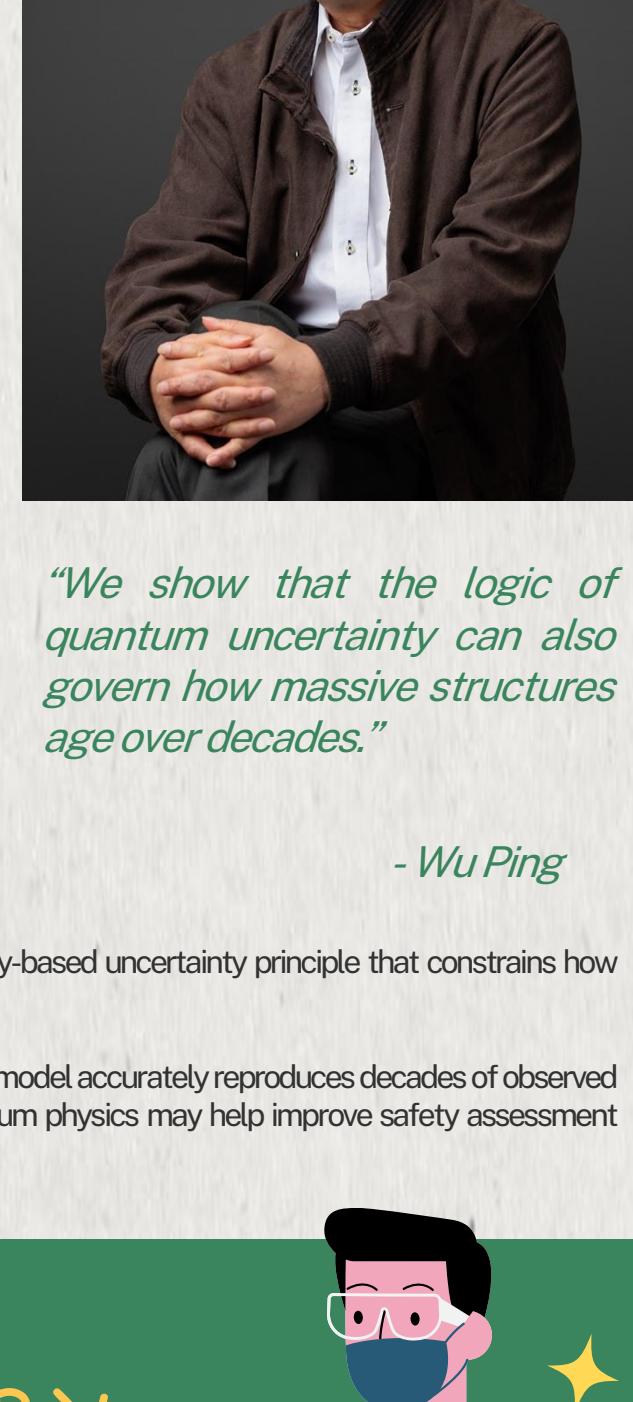
SUTD Author: Wu Ping

Most people associate quantum mechanics with electrons, wave-particle duality, and fundamental uncertainty at the smallest scales of nature. In this research, we turn that idea on its head by asking a surprising question: Can the same uncertainty principles that govern electrons also describe how massive engineering systems age over decades?

We show that large structures—such as nuclear power plants, aircraft, bridges, and wind turbines—also face fundamental limits in predictability, not because of poor measurements, but because of how disorder inevitably grows over time. By treating long-term material ageing in a way mathematically analogous to

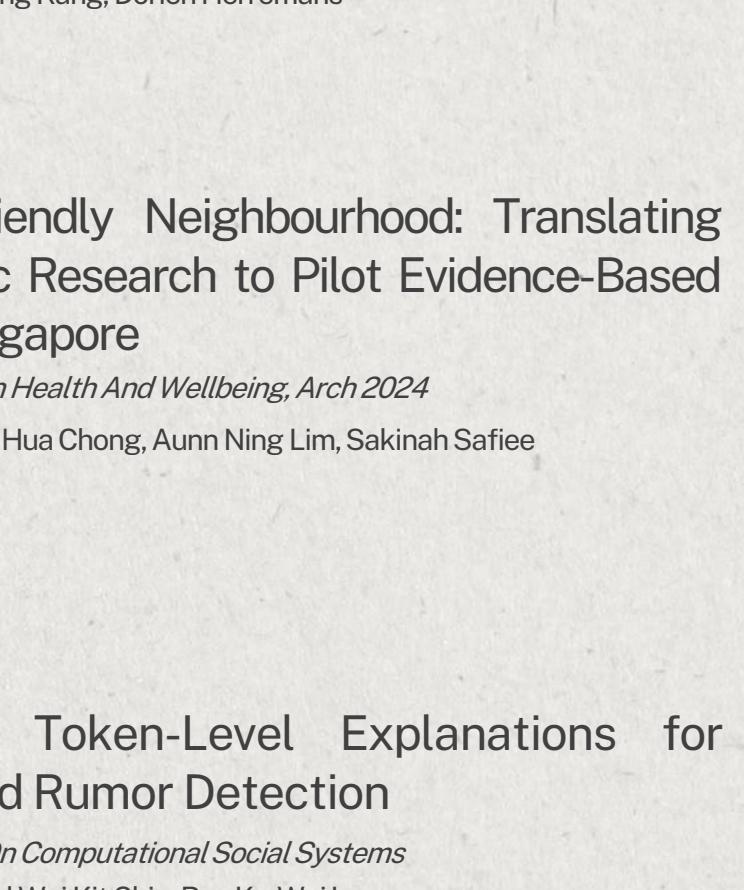
how quantum mechanics treats electrons, we uncover an entropy-based uncertainty principle that constrains how precisely degradation can be predicted.

Using reactor pressure vessel steels as a real-world test case, the model accurately reproduces decades of observed material hardening. The results suggest that ideas born in quantum physics may help improve safety assessment across critical infrastructure.



"We show that the logic of quantum uncertainty can also govern how massive structures age over decades."

- Wu Ping



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IEEE Transactions On Affective Computing

SUTD Authors: Jaeyong Kang, Dorien Herremans

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Effects Of Design On Health And Wellbeing, Arch 2024

SUTD Authors: Keng Hua Chong, Aunn Ning Lim, Sakinah Safiee

ASD



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IEEE Transactions On Computational Social Systems

SUTD Authors: Daniel Wai Kit Chin, Roy Ka-Wei Lee

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SGHateCheck: Functional Tests for Detecting Hate Speech in Low-Resource Languages of Singapore

Proceedings Of The 8th Workshop On Online Abuse And Harms

SUTD Author: Ri Chi Ng, Nirmalendu Prakash, Ming Shan Hee, Kenny Tsu Wei Choo,

Roy Ka-Wei Lee

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7th Annual Learning For Dynamics & Control Conference

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SUTD Authors: Xin Yang, Belinda Yuen

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