

In the spotlight

Uncertainty principle of dual entropy and the minimum accessible entropy-area: experimental validation in irradiated reactor pressure vessel steels

Physica Scripta

SUTD Author: Wu Ping

This research introduces the Uncertainty Principle of Dual Entropy (UFODE), a new framework that defines fundamental limits on how real-world systems evolve. Instead of treating disorder as a single quantity, the study separates it into two measurable components: structural entropy (linked to physical arrangement) and optical entropy (linked to temporal behavior). UFODE shows that these two aspects are intrinsically coupled and constrained by a minimum "entropy-area," creating a forbidden region that systems cannot enter. Validated using reactor pressure vessel steels under long-term neutron irradiation, the framework accurately reproduces observed stress hardening behavior across all regimes. Remarkably, this is achieved using only three physically measurable parameters, compared to recent AI-based models that require around 1500 optimized parameters. This highlights UFODE's ability to reduce uncertainty while retaining physical interpretability, offering a powerful new approach to understanding stability, failure, and irreversible processes.



"UFODE captures complex material behavior with just three measurable parameters, revealing strict entropy limits that govern real-world system evolution."

- Wu Ping

Did you know that SUTD's journey began with its very first lecture, delivered by Prof Wu Ping? As he retires, we thank him for his enduring impact on the University and its community.

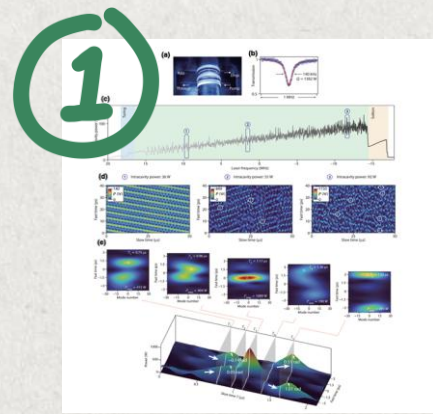
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TRAILBLAZERS



Optical rogue waves: History, perspectives and the quest toward implementation in integrated photonics

Progress In Quantum Electronics

SUTD Authors: Amdad Chowdury, Dawn Tan

Photonic Devices and Systems Group



Trusting Slaughter: Live Poultry Markets and the Veterinization of Poultry Consumption in Singapore

Medical Anthropology

SUTD Authors: Lyle Fearnley, Loh Jia Haw

HASS

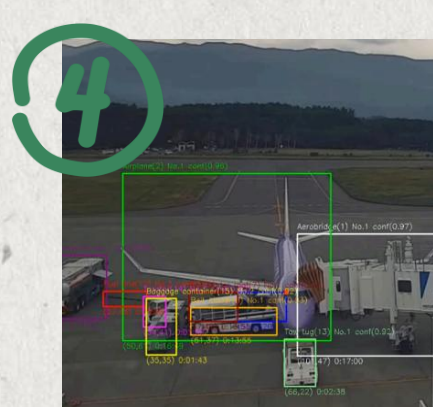


Aligning Generative Music AI with Human Preferences: Methods and Challenges

Fortieth AAAI Conference On Artificial Intelligence

SUTD Authors: Dorien Herremans, Abhinaba Roy

AMAAI Lab

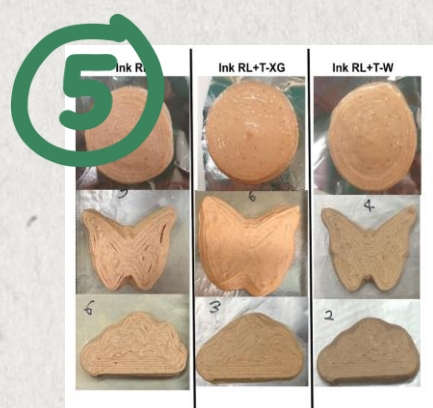


Computer Vision-Based Airport Turnaround Monitoring Using YOLOv11, Multi-Object Tracking, and Motion-Based Passenger and Baggage Activity Detection

Sensors

SUTD Authors: Nutchanon Suvittawat, Soh De Wen

ISTD



3D printing and post-processing of multicomponent rice-lentil based flour blends

Innovative Food Science & Emerging Technologies

SUTD Authors: Aakanksha Pant, Phoebe Leam Xin Ni, Jia An, Chua Chee Kai, Tan U-Xuan

EPD



Conditioned comfort: A multi-scalar analysis of residential heat adaptation in the tropical city-state of Singapore

Urban Climate

SUTD Authors: Sarah Chan Hian May, Li Yunjing, Naing Khant Min, Tay Yi Xuan, Flora Du Yuting, Samuel Chng Chong Wei, Harvey Neo

LKYCIC

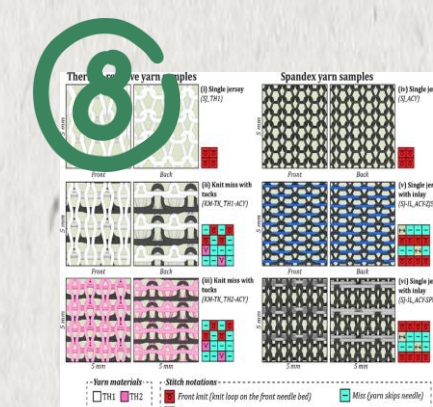


Modeling photosynthetically active radiation for crop suitability and yield potential assessment in building-integrated agriculture: a simulation-measurement framework

Computers And Electronics In Agriculture

SUTD Authors: Thomas Schroeffer, Carlos Banon

ASD



Toward a Digitally Informed Knitted Prosthetic Interface With Graded Stiffness to Enhance Comfort in Transtibial Amputees: Proof-of-Concept Case Study

JMIR Rehabilitation And Assistive Technologies

SUTD Authors: Chia Pei Zhi, Tan Ying Yi, Low Hong Yee

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