



October 2023

IMPact@SUTD is a regular update featuring works by SUTD Faculty, Researchers, Students and Research Centres/Labs. We hope to create awareness of the Research by SUTD within the SUTD community and beyond. Share with us your SUTD works today so that we can include it in our next update.



Assistant Professor Karthyek Murthy

For his research being recognised as the **Winner of the INFORMS Applied Probability Society Best Publication Award*** among publications which appeared during the period 2019 to 2022 - the first Asia-Pacific receipt in for this award!

The award is for publication(s) *"Quantifying distributional model risk via optimal transport"* and *"Robust Wasserstein profile inference and applications to machine learning"*. These papers by Blanchet, Kang, and Murthy develop foundational tools that use optimal transport to effectively quantify distributional model risk in a broad range of applications, including distributionally robust optimization, diffusion approximations, and adversarially robust machine learning. The papers also reveal how optimal transport based distributionally robust optimization can effectively influence model selection, and provide an alternate explanation for how it leads to solutions offering good out-of-sample performance in high-dimensional settings.

*This award is instituted by the Applied Probability Society of the Institute for Operations Research and the Management Sciences (INFORMS). It is a single prize awarded once every two years for an outstanding contribution (a book, a paper, or a set of papers) to applied probability.





Data security of machine learning applied in low-carbon smart grid: A formal model for the physics-constrained robustness
Applied Energy

SUTD Author: David Yau

“Success of tools like ChatGPT created a lot of recent interest in generative machine learning (ML). However, prior results in domains like image processing show that manipulating just a few bits in an adversarial setting may mislead the ML into patently wrong answers. These answers raise severe security concerns in emerging cyber-physical systems, e.g., online control of a low-carbon smart grid for agile adaptation to sustainable renewables. The power flows in question are subject to laws of physics, as well as concomitant checks for bad data, whose roles in the ML’s cybersecurity are underexplored. In this paper, we adopt a tree ensemble model to provide novel tight lower bounds for the tolerance of physics-constrained ML against adversarial manipulation. The results illustrate impacts on a classical N-1 security problem for power systems.”

--- [David Yau](#)



Large portfolio allocation based on high-dimensional regression and Kendall's Tau
Communications in Statistics-Simulation and Computation

SUTD Author: Yue Mu

“This paper introduces the Kendall’s tau unconstrained shrinkage regression for the classical mean-variance (M-VAR) method, or KUSR-MV, as a robust portfolio optimization approach. It enhances asset returns and demonstrates superior high-dimensional portfolio allocation accuracy in empirical studies, maintaining risk constraints while improving the Sharpe ratio.”

--- [Yue Mu](#)

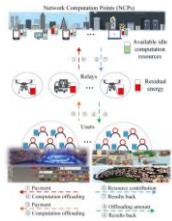


Recent advances in the combination of organic solvent-free extraction, chemical standardization, antioxidant assay, and cell culture metabolomics for functional food and its by-product
Critical Reviews in Food Science and Nutrition

SUTD Authors: Leo Chen Huei, Ong Eng Shi

“Green extraction technology is a sustainable and eco-friendly method for acquiring bioactive compounds from natural sources. By minimizing harmful solvent use, it mitigates environmental impact and preserves ingredient nutritional value. Our work describes the recent advances in green extraction technologies, chemical standardization, and biological characterization methods for functional food applications. ”

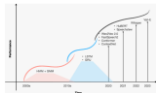
--- [Leo Chen Huei](#)



A Game-Based Incentive-Driven Offloading Framework for Dispersed Computing

IEEE Transactions on Communications

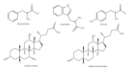
SUTD Author: Xiong Zehui



A review of deep learning techniques for speech processing

Information Fusion

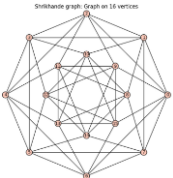
SUTD Authors: Ambuj Mehrish, Navonil Majumder, Rishabh Bharadwaj, Soujanya Poria



Experimental and Theoretical Study of Biosurfactants Functionalized Gold Nanoparticles for Mixture Detection and Chiral Recognition of Tryptophan by UV-VIS Spectroscopy

Current Pharmaceutical Analysis

SUTD Author: Huang Lu



Schlegel graph: Graph on 16 vertices

Graph isomorphism: physical resources, optimization models, and algebraic characterizations
Mathematical Programming

SUTD Author: Antonios Varvitsiotis

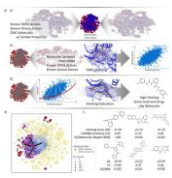


Figure 1: Overview of the hybrid deep generative model for drug discovery.

Improving drug discovery with a hybrid deep generative model using reinforcement learning trained on a Bayesian docking approximation
Journal of Computer-Aided Molecular Design

SUTD Author: Gu Lingyun

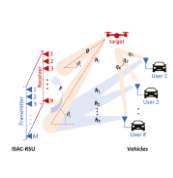


Figure 1: Integrated single target sensing and multiuser communications based on zero-forcing beamforming.

Integrated single target sensing and multiuser communications based on zero-forcing beamforming
Vehicular Communications

SUTD Author: Tony Q. S Quek

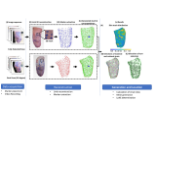


Figure 1: Mapping lines of non-extension in persons with lower limb amputation to aid comfort-driven prosthetic socket design.

Mapping lines of non-extension in persons with lower limb amputation to aid comfort-driven prosthetic socket design
Medical Engineering & Physics

SUTD Authors: Trevor Binedell, Bhuvaneswari Sithanathan, Lucienne Blessing

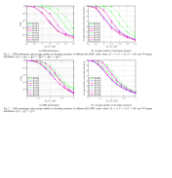


Figure 1: Parity-Check Matrix Partitioning for Efficient Layered Decoding of QC-LDPC Codes.

Parity-Check Matrix Partitioning for Efficient Layered Decoding of QC-LDPC Codes
IEEE Transactions on Communications

SUTD Author: Peng Kang

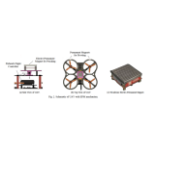


Figure 1: Perching Drones for Distributed Communication Systems in IoT Applications.

Perching Drones for Distributed Communication Systems in IoT Applications
2022 IEEE 8th World Forum on Internet of Things

SUTD Author: Liu Jingmin

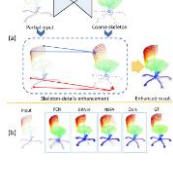


Figure 1: Point Cloud Completion Via Skeleton-Detail Transformer.

Point Cloud Completion Via Skeleton-Detail Transformer
IEEE Transactions on Visualization and Computer Graphics

SUTD Author: Liu Jun

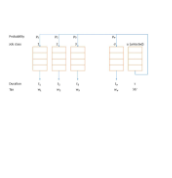


Figure 1: Scheduling with Testing of Heterogeneous Jobs.

Scheduling with Testing of Heterogeneous Jobs
Management Science

SUTD Author: Thomas Magnanti

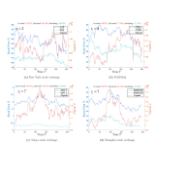


Figure 1: Switching between two losing stocks may enable paradoxical win: an empirical analysis.

Switching between two losing stocks may enable paradoxical win: an empirical analysis
Fractals-Complex Geometry Patterns and Scaling in Nature and Society

SUTD Authors: Tao Wen, Joel Lai Weijia, Cheong Kang Hao