

**ICTS-OT/ML/PDE Seminar (Online)**

**Title** : Letting the samples speak: A new approach towards efficient Importance Sampling for tail events

**Speaker** : Kartyek Murthy (Singapore University of Design and Technology)

**Date** : Tuesday, 25<sup>th</sup> April 2023

**Time** : 09:00 am – 10:00 am (IST)

**Abstract** : The ability to estimate and control tail risks, besides being an integral part of quantitative risk management, is central to running operations requiring high service levels and ML-driven cyber- physical systems with high-reliability specifications. Despite this significance, scalable algorithmic approaches have remained elusive: This is due to the rarity with which relevant risky samples get observed, and the critical role experts play in devising variance reduction techniques based on instance-specific large deviations studies. Our goal in this talk is to examine if such tailored variance reduction benefits can be instead achieved by instance-agnostic algorithms capable of scaling well across multitude of tail estimation and optimisation tasks.

To this end, we identify an elementary transformation whose push-forward automatically induces efficient importance sampling distributions across a variety of models by replicating the concentration properties observed in less rare samples. This obviates the need to explicitly identify a good change of measure, thereby overcoming the primary bottleneck in the use of importance sampling beyond highly stylized models. Our novel approach is guided by a large deviations principle which brings out the phenomenon of self-similarity of zero variance distributions. Being a nonparametric phenomenon, this self-similarity is manifest in a rich set of objectives modeled with tools such as linear programs, piecewise linear/quadratic objectives, feature maps specified in terms of neural networks, etc., together with a spectrum of light and heavy-tailed multivariate distributions.

**Venue** : **Online:** Please click the below link to join the seminar.

<https://us02web.zoom.us/j/81379290349>

Meeting ID: 813 7929 0349