



**MATH-IMS Joint Applied Mathematics Colloquium Series**  
**The Chinese University of Hong Kong**

*This MATH-IMS Joint Colloquium Series is organized by Center for Mathematical Artificial Intelligence (CMAI), under Department of Mathematics and Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The colloquium series focuses on mathematics and applications of artificial intelligence, big data and related topics.*

**Date:** April 1, 2022 (Friday)

**Time:** 9:00–10:00am (Hong Kong Time)

**Zoom Link:** <https://cuhk.zoom.us/j/92775210812>

**Immuno-mimetic Deep Neural Networks**

***Speaker: Professor Alfred Hero***  
***University of Michigan***

**Abstract:** Biomimetics has played a key role in the evolution of artificial neural networks. Thus far, in-silico metaphors have been dominated by concepts from neuroscience and cognitive psychology. In this talk we introduce a different type of biomimetic model, one that borrows concepts from the immune system, for designing robust deep neural networks. This immuno-mimetic model leads to a new computational framework for robustification of deep neural networks against adversarial attacks. Within this Immuno-Net framework we define a robust adaptive immune-inspired learning system (RAILS) that emulates, in silico, the adaptive biological mechanisms of B-cells that are used to defend a mammalian host against pathogenic attacks.

**Bio:** Professor Alfred Hero is the John H. Holland Distinguished University Professor of Electrical Engineering and Computer Science and the R. Jamison and Betty Williams Professor of Engineering at the University of Michigan. Prof. Hero also serves as the Chair of the Committee on Applied and Theoretical Statistics (CATS) of the US National Academies of Science. He is a Section Editor of the SIAM Journal on Mathematics of Data Science and a Senior Editor of the IEEE Journal on Selected Topics in Signal Processing. Prof. Hero's research is on data science and developing theory and algorithms for multimodality data collection, fusion, analysis and visualization that use statistical machine learning and distributed optimization. These are being applied to wearable technologies for personalized health and predictive medicine, spatio-temporal networks in biology, climate, and social discourse, anomaly detection, and data analysis for international security. He has been plenary and keynote speaker at several workshops and conferences, and received many best paper awards. Because of his outstanding research achievements, Prof. Hero has received many awards and recognitions. He was awarded the University of Michigan Distinguished Faculty Achievement Award (2011), the Stephen S. Attwood Excellence in Engineering Award (2017), and the H. Scott Fogler Award for Professional Leadership and Service (2018). In 2015, he received the Society Award, which is the highest career award bestowed by the IEEE Signal Processing Society. In 2020, he received the Fourier Award, which is the IEEE Technical Field Award for Signal Processing. He is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and the Society for Industrial and Applied Mathematics (SIAM), a member of Tau Beta Pi, the American Statistical Association (ASA) and the US National Commission (Commission C) of the International Union of Radio Science (URSI).