



**THE CHINESE UNIVERSITY OF HONG KONG**  
Department of Information Engineering  
*Seminar*

**Computational Imaging through Atmospheric Turbulence**

by

**Prof. Stanley H. Chan**

Purdue University, West Lafayette, Indiana

**Date : 27 July 2023 (Thursday)**

**Time : 10:30am – 11:30am**

**Venue : Rm 804, William M W Mong Engineering Building, CUHK**

Abstract

Seeing through a turbulent atmosphere has been one of the biggest challenges for ground-to-ground long-range incoherent imaging systems. The literature is very rich that can be dated back to Andrey Kolmogorov in the late 40's, followed by a series of major developments by David Fried, Robert Noll, among others, during the 60's and 70's. However, even though we have a much better understanding of the atmosphere today, there remains a gap from the optics theory to image processing algorithms. In particular, training a deep neural network requires an accurate physical forward model that can synthesize training data at a large scale. Traditional wave propagation simulators are not an option here because they are computationally too expensive --- a 256x256 gray scale image would take several minutes to simulate.

In this talk, I will discuss the lessons I learned over the past few years and present some of my own work. I will give a gentle tutorial on how the classical simulators are built, and then discuss a few differentiable simulators my team developed at Purdue. If time permits, I will talk about techniques to solve the inverse problems.

Biography

Stanley H. Chan is an Elmore Associate Professor of Electrical and Computer Engineering at Purdue. He received the BEng degree in Electrical Engineering from the University of Hong Kong in 2007 and the PhD in Electrical Engineering from University of California, San Diego in 2011. Upon graduation, he went to Harvard and did a postdoc. Dr. Chan does research in photon-limited imaging and imaging through atmospheric turbulence. He is the recipient of the 2022 IEEE Signal Processing Society Best Paper Award and the 2016 IEEE International Conference on Image Processing Best Paper Award. Dr. Chan is the author of an undergraduate textbook Introduction to Probability for Data Science, Michigan Publishing 2021, and a co-author of an up-coming book Computational Imaging through Atmospheric Turbulence, Now Publisher 2023. He is a senior area editor for IEEE Transactions on Computational Imaging.

**\*\* ALL ARE WELCOME \*\***