15th SHANNON MEMORIAL LECTURE

Friday, November 17, 2017
2 PM: Lecture
3 PM: Reception

Qualcomm Institute - Atkinson Hall
Calit2 Auditorium
University of California, San Diego

DAVID TSE

David Tse received the B.A.Sc. degree in systems design engineering from University of Waterloo in 1989, and the M.S. and Ph.D. degrees in electrical engineering from Massachusetts Institute of Technology in 1991 and 1994 respectively. From 1994 to 1995, he was a postdoctoral member of technical staff at A.T. & T. Bell Laboratories. From 1995 to 2014, he was on the faculty of the University of California at Berkeley. He is currently the Thomas Kailath and Guanghan Xu Professor at Stanford University.

David Tse is the recipient of the 2017 Claude E. Shannon Award. Previously, he received a NSF CAREER award in 1998, the Erlang Prize from the INFORMS Applied Probability Society in 2000 and a Gilbreth Lectureship from the National Academy of Engineering in 2012. He received multiple best paper awards, including the Information Theory Society Paper Award in 2003, the IEEE Communications Society and Information Theory Society Joint Paper Awards in 2000, 2013 and 2015, the Signal Processing Society Best Paper Award in 2012 and the IEEE Communications Society Stephen O. Rice Prize in 2013. For his contributions to education, he received the Outstanding Teaching Award from the Department of Electrical Engineering and Computer Sciences at U.C. Berkeley in 2008 and the Frederick Emmons Terman Award from the American Society for Engineering Education in 2009. He is a coauthor, with Pramod Viswanath, of the text Fundamentals of Wireless Communication, which has been used in over 60 institutions around the world. He is the inventor of the proportional-fair scheduling algorithm used in all third and fourth-generation cellular systems, serving 2.7 billion people around the world.

ABSTRACT

Understanding Generative Adversarial Networks

Claude Shannon invented information theory to understand the fundamental limits of communication. Since then, it has revolutionized the communication field. The core of information theory is an approach to research based on finding the simplest model to study a problem, Although conceived and cultivated in the context of communication, this approach to research has much broader applicability. In this talk, we illustrate this using our recent work on Generative Adversarial Networks (GANs).

GANs is a novel approach to the age-old problem of learning a probabilistic model from data. Learning is achieved by setting up a game between a generator whose goal is to generate fake data that are close to the real data and a discriminator whose goal is to distinguish between the real and fake data. Even though many increasingly complex GANs architectures have been proposed recently, several basic issues remain unanswered: 1) what is a general way of specifying the loss function of GANs? 2) what is the limiting solution of a GAN as the amount of data increases? 3) what is the generalization ability of a GAN? We answer these questions in the simplest setting of the problem. In the process, a connection is drawn between GANs, optimal transport theory and rate-distortion theory.

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