

SEMINAR

Dr. Xiugang Wu

Stanford University

Fundamental Limits in Information Networks: Communication, Inference and Learning

Monday, April 16, 2018

2:00 – 2:50 pm

Academic and Research Center (ARC) 221

(light refreshments will be provided to Seminar attendees)

ABSTRACT

Information networks surround us today in different forms and levels, ranging from neural networks, to social networks, to wireless networks and the Internet. The nodes in these networks accomplish tasks such as communication, inference and learning by exchanging information with each other. What are the fundamental laws that govern information flow in networks and how can a desired task be achieved most efficiently? This question was successfully answered by Shannon in 1948 for the case of a single point-point channel and when the desired task is the reliable communication of a message, giving birth to the field of information theory.

In this talk, I will demonstrate how information theory, when enriched with new tools and ideas, can be used to characterize the fundamental limits on information flow in networks more complex than a point-point channel or for tasks other than communication. To this end, I will start by presenting our recent solution to a central problem in network communication that has been open for more than 30 years and named "The Capacity of the Relay Channel". I will then move onto establishing the fundamental limits of inference under rate constraints, and connect it to the information bottleneck method. Finally, I will discuss a general principle for jointly designing the feature extractor and the inferrer based on a minimax approach to learning.

BIOGRAPHY

Xiugang Wu is a postdoctoral fellow in the Department of Electrical Engineering at Stanford University. He received the Ph.D. and M.A.Sc. degree in Electrical and Computer Engineering from the University of Waterloo, Canada, and the B.S. degree in Electronics and Information Engineering from Tongji University, China. His research interests are in information theory, networks, data science, and the interplay between them. He is a recipient of the 2017 NSF Center for Science of Information (CSol) Postdoctoral Fellowship.