



THE CHINESE UNIVERSITY OF HONG KONG  
Institute of Network Coding  
and  
Department of Information Engineering  
*Seminar*



## Interactions Between Communication and Computation in Emerging Systems

by

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**Date : 20 July 2018 (Friday)**  
**Time : 2:00 - 3:00pm**  
**Venue : Room 833, Ho Sin Hang Engineering Building**  
**The Chinese University of Hong Kong**

### Abstract

The rapid growth of wireless communication techniques, such as 5G, Internet of Things (IoT), wireless caching, and broadcasting will generate many data-intensive applications and heavy traffic in wireless networks. Many emerging big data and/or distributed systems, such as recommender systems and distributed machine learning systems, tend to build upon wireless networks. This brings new challenges: classical techniques that separate communication from computation may not work well in such systems, as the interactions between communication and computation may significantly affect the system performance. That is, understanding how to jointly design communication and computation schemes can offer significant benefits.

In this talk, I will focus on two examples within this new paradigm: bandwidth-aware recommender systems and data shuffling for distributed machine learning systems. In recommender systems, we ask: how much we can gain in terms of bandwidth and user satisfaction, if recommender systems took into account not only the user preferences, but also the fact that they may need to serve these users under bandwidth constraints, as is the case over wireless networks. We prove that this problem is in general NP-hard and propose polynomial time approximation algorithms to make bandwidth aware recommendations that achieve a trade-off between bandwidth and user preferences. In distributed machine learning systems, data shuffling is needed to improve the statistical performance, however, often forms the bottleneck in runtime performance. To improve the communication efficiency for data shuffling (communication among computing nodes), we design a semi-random data shuffling scheme for distributed computing that achieves an attractive trade-off between communication efficiency and computation performance.

### Biography

Linqi Song is an Assistant Professor in the Computer Science Department at the City University of Hong Kong. Prior to that, he was a Postdoctoral Scholar in the Department of Electrical and Computer Engineering at the University of California, Los Angeles (UCLA). He received the Ph.D. degree in Electrical Engineering from UCLA, and the B.S. and M.S. degrees in Electronic Engineering from Tsinghua University. His research interests encompass information theory and coding theory, communications, machine learning and big data.

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

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