DDN is to use network measurement and user behavior data, based on machine learning and control/optimization techniques, to solve network control and management challenges. First, I will discuss a practical case study of DDN, where we use a data-driven resource allocation scheme to improve cellular user experience. Driven by the importance of user experience, enabled by the increasing capability of data storage and processing, much recent work studies user experience prediction in cellular networks. In this work, we move beyond prediction and utilize the learned prediction model to guide resource allocation to reduce the number of unsatisfied cellular users. Allocating resources with this aim faces difficulties of solving a non-convex optimization problem and we propose efficient algorithms to obtain optimal/near-optimal solutions. Numerical results based on real network data traces demonstrate the effectiveness of the proposed algorithms.

In the second part of the talk, I will discuss a theoretical aspect of DDN, where we study a constrained contextual bandits (CCB) model that integrates information learning and decision making with context and under budget. This study is motivated by the need of many popular Internet applications such as crowdsourcing and online advertising. We propose an algorithm with both computational simplicity and theoretically optimal performance guarantees. In particular, the algorithm integrates a learning component (UCB) and a decision component (ALP) in a coherent manner so that they result in optimal actions, while maintaining a level of independence so that desirable properties of each component retain. While the algorithm itself has a simplicity appeal, its performance analysis is highly involved that provides important insights in designing joint learning and decision algorithms. To the best of our knowledge, the proposed policies are the first computationally efficient algorithm to achieve logarithmic regret in contextual bandits with time and budget constraints.

Bio: Xin Liu received her Ph.D. degree in electrical engineering from Purdue University in 2002. She is currently a professor in the Computer Science Department at the University of California, Davis. From March 2012-June 2014, she was with the wireless networking group at Microsoft Research Asia. She has studied wireless scheduling algorithms, cognitive radio networks, and wireless mesh networks. Her current research focuses on data-driven approach in networking. She received the NSF CAREER award, and the Outstanding Engineering Junior Faculty Award from the College of Engineering, University of California, Davis in 2005. She became a Chancellor's Fellow in 2011.