Illinois Center for Wireless Systems

ICWS Seminar Series

NETWORK FLOWS FOR FUNCTIONS

Professor D. Manjunath
Department of Electrical Engineering
Indian Institute Of Technology - Bombay

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141 Coordinated Science Lab

Abstract: We consider in-network computation of an arbitrary function over an arbitrary communication network. A network with capacity constraints on the links is given. Some nodes in the network generate data, e.g., sensor nodes in a sensor network. An arbitrary function of this distributed data is to be obtained at a terminal node. The structure of the function is described by a given computation schema, which in turn is assumed to be represented by a directed tree. We design computing and communicating schemes to obtain the function at the terminal at the maximum rate. For this, we formulate linear programs to determine network flows that maximize the computation rate. We then develop fast combinatorial primal-dual algorithm to obtain ϵ-approximate solutions to these linear programs. We then briefly describe extensions of our techniques to the cases of multiple terminals wanting different functions, multiple computation schemas for a function, computation with a given desired precision, and to networks with energy constraints at nodes.

Biography: D. Manjunath received his BE from Mysore University, MS from IIT Madras and PhD from Rensselaer Polytechnic Institute in 1986, 1989 and 1993 respectively. He has been with the Department of Electrical Engineering of IIT Bombay since July 1998 where he is now a Professor. He is also the Head of the Computer Centre at IIT Bombay. He has previously worked in the Corporate R&D Center of GE in Schenectady NY (1990), Computer and Information Sciences Dept. of the University of Delaware (1992--93), Computer Science Dept., University of Toronto (1993--94) and the Department of Electrical Engineering of IIT, Kanpur (1994--98). His research interests are in the general areas of communication networks and performance analysis. His recent research has concentrated on random networks with applications in wireless and sensor networks, network pricing and queue control. He won the best paper award at ACM SIGMETRICS-2010. He is a coauthor of two textbooks, "Communication Networking: An Analytical Approach" (May 2004) and "Wireless Networking" (Apr 2008), both of which are published by Morgan-Kaufman Publishers.

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