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香港中文大學
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Institute of Theoretical Computer Science and Communications

IE-ITCSC Seminar

Cloud Radio Access Networks, Distributed Information Bottleneck, and more: A Unified Information Theoretic View

By

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Abstract:

We consider transmission over a cloud radio access network (CRAN) focusing on the framework of oblivious processing at the relay nodes (radio units), i.e., the relays are not cognizant of the users' codebooks.

This approach is motivated by future wireless communications (5G and beyond) and the theoretical results connect to a variety of different information theoretic models and problems.

First it is shown that relaying a-la Cover-El Gamal, i.e., compress-and-forward with joint decompression and decoding, which reflects 'noisy network coding,' is optimal. The penalty of obliviousness is also demonstrated to be at most a constant gap, when compared to cut-set bounds. Naturally, due to the oblivious (nomadic) constraint the CRAN problem intimately connects to Chief Executive Officer (CEO) source(s) coding under a logarithmic loss distortion measure.

Furthermore, we identify and elaborate on some interesting connections with the distributed information bottleneck model for which we characterize optimal tradeoffs between rates (i.e., complexity) and information (i.e., accuracy) in the discrete and vector Gaussian frameworks.

Further connections to 'information combining' and 'common reconstruction' are also pointed out. In the concluding outlook, some interesting problems are mentioned such as the characterization of the optimal input distributions under users' power limitations and rate-constrained compression at the relay nodes.

Joint work with: I.E. Aguerri (Paris Research Center, Huawei France) A. Zaidi (Universite Paris-Est, Paris) and G. Caire (USC-LA and TUB, Berlin)

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Biography:

Shlomo Shamai (Shitz) received the B.Sc., M.Sc., and Ph.D. degrees in electrical engineering from the Technion--Israel Institute of Technology, in 1975, 1981 and 1986 respectively. During 1975-1985 he was with the Communications Research Labs in the capacity of a Senior Research Engineer. Since 1986 he is with the Department of Electrical Engineering, Technion--Israel Institute of Technology, where he is now the William Fondiller Professor of Telecommunications. His research interests encompasses a wide spectrum of topics in information theory and statistical communications. Dr. Shamai (Shitz) is an IEEE Fellow and a member of the Union Radio Scientifique Internationale (URSI). He is the recipient of the 1999 van der Pol Gold Medal of URSI, and a co-recipient of the 2000 IEEE Donald G. Fink Prize Paper Award, the 2003, and the 2004 joint IT/COM societies paper award, and the 2007 IEEE Information Theory Society Paper Award. He is also the recipient of 1985 Alon Grant for distinguished young scientists and the 2000 Technion Henry Taub Prize for Excellence in Research. He has served as Associate Editor for the Shannon Theory of the IEEE Transactions on Information Theory, and also serves on the Board of Governors of the Information Theory Society.

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

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