Understanding heterogeneous radio networks with random placement

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Abstract:
Modern radio networks are a mess. The good old days of homogeneous base stations arranged in regular grids are long gone. Tiny femto cells mix with big macro cells, Cellphones mix with WiFi. Base stations are placed wherever their needed. How do we make sense of this? Should we expect it to work? Will I have good good coverage and throughput? How does this compare to the good old days? Will the billions of sensors in the Internet of Things be the technology that finally makes it fall apart?

This talk describes a comprehensive study of the down-link performance in these so-called heterogeneous networks. We consider a general model consisting of an arbitrary number of open-access and closed-access tier of base stations arranged according to independent homogeneous Poisson point processes. For such a system, analytical characterizations for the coverage probability and average rate at an arbitrary mobile-station, and average per-tier load are derived. The results also demonstrate the effectiveness and analytical tractability of the stochastic geometric approach to study such complex radio systems' performance.

Bio:
Timothy X Brown received his B.S. in physics from Pennsylvania State University and his Ph.D. in electrical engineering from California Institute of Technology. He has worked at both the Jet Propulsion Laboratory and Bell Communications Research. Since 1995 he has been at the University of Colorado at Boulder, most recently as Professor in Electrical, Computer, and Energy Engineering and Director of the Interdisciplinary Telecommunications Program. He is currently a Distinguished Service Professor at Carnegie Mellon University in EPP, ECE, and the graduate programs in Kigali, Rwanda.

His research interests include wireless communication systems, network security, and machine learning. His recent research funding includes NSF, DOE, and industry. Projects include the role of mobility in network control of unmanned aircraft, denial of service vulnerabilities in wireless protocols, spectrum policy frameworks for cognitive radios, and stochastic geometry applied to wireless networks.

He is a recipient of the NSF CAREER Award, and the GWEC Wireless Educator of the Year Award.

SEMINAR NOTES: (REFRESHMENTS SERVED AT 4 PM)