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Information Science and Technology Seminar Series

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"Scaling Laws in Random Threshold Graphs"

Thursday, March 1, 2012
3:00 - 4:00 PM
TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: Following the work of Barabasi and Albert, the scale free nature of complex networks is often explained by growth models with a preferential attachment mechanism. Although in some context preferential attachment is a reasonable assumption, it is predicated on he information about the degree of each vertex being available to newly added nodes, either explicitly or implicitly. There are many situations where this assumption is questionable and where instead the creation of a link between two nodes results in a mutual benefit based on their intrinsic attributes, e.g., authority, friendship, social success, strength of interaction, etc.

Hidden variable models incorporate this viewpoint in the establishment of links. Interest in them has been spurred in part by the following recent finding: Scale-free networks can arise in the context of hiddden variable models without having to invoke a preferential attachment mechanism. With this in mind, we consider a sub-class of hidden variable models, known as random threshold graphs. Their scaling properties for graph connectivity and the absence of isolated nodes are explored in the many node regime. We provide a complete characterization for the underlying zero-one laws and for the corresponding critical scalings. These results are by-products of well-known facts in Extreme Value Theory concerning the asymptotic behavior of running maxima on i.i.d. rvs. In one important special case we are able to show that the scalings ensuring a power-law degree distribution will not result in graph connectivity in the a.a.s sense.

This is joint work with former Ph.D. student Osman Yagan (now a post-doc with CyLab at CMU).

Biography: Armand M. Makowski received the Licence en Sciences Math\'ematiques from the Universit\'e Libre de Bruxelles in 1975, the M.S. degree in Engineering-Systems Science from U.C.L.A. in 1976 and the Ph.D. degree in Applied Mathematics from the University of Kentucky in 1981. In August 1981, he joined the faculty of the Electrical Engineering Department at the University of Maryland College Park, where he is Professor of Electrical and Computer Engineering. He has held a joint appointment with the Institute for Systems Research since its establishment in 1985.

Armand Makowski was a C.R.B. Fellow of the Belgian-American Educational Foundation (BAEF) for the academic year 1975-76; he is also a 1984 recipient of the NSF Presidential Young Investigator Award and became an IEEE Fellow in 2006.

His research interests lie in applying advanced methods from the theory of stochastic processes to the modeling, design and performance evaluation of engineering systems, with particular emphasis on communication systems and networks.

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