



# Illinois Center for Wireless Systems

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## ICWS Seminar Series



### COUPLED SPARSE CODES ON GRAPHS: A CONVOLUTIONAL CODING PERSPECTIVE

Professor Daniel Costello, Jr.  
Electrical Engineering  
University of Notre Dame

Wednesday, March 14, 2012  
4:00-5:00 p.m.  
141 Coordinated Science Lab

**Abstract:** In this presentation we trace the development of coupled sparse codes on graphs, from their beginning as a way of constructing an LDPC convolutional code by applying an unwrapping procedure to the parity-check matrix of an LDPC block code to the current perspective of edge-spreading and coupling together a chain of protographs. Encoding and decoding procedures will be reviewed, asymptotic minimum distance and iterative decoding threshold results will be summarized, the key concept of code termination, leading to the threshold saturation phenomenon, will be highlighted, and a brief summary of recent advances will be included.

**Biography:** Daniel J. Costello, Jr. was born in Seattle, WA, on August 9, 1942. He received the B.S.E.E. degree from Seattle University, Seattle, WA, in 1964, and the M.S. and Ph.D. degrees in Electrical Engineering from the University of Notre Dame, Notre Dame, IN, in 1966 and 1969, respectively.

Dr. Costello joined the faculty of the Illinois Institute of Technology, Chicago, IL, in 1969 as an Assistant Professor of Electrical Engineering. He was promoted to Associate Professor in 1973, and to Full Professor in 1980. In 1985 he became Professor of Electrical Engineering at the University of Notre Dame, Notre Dame, IN, and from 1989 to 1998 served as Chair of the Department of Electrical Engineering. In 1991, he was selected as one of 100 Seattle University alumni to receive the Centennial Alumni Award in recognition of alumni who have displayed outstanding service to others, exceptional leadership, or uncommon achievement. In 1999, he received a Humboldt Research Prize from the Alexander von Humboldt Foundation in Germany. In 2000, he was named the Leonard Bettex Professor of Electrical Engineering at Notre Dame.

Dr. Costello has been a member of IEEE since 1969 and was elected Fellow in 1985. Since 1983, he has been a member of the Information Theory Society Board of Governors, and in 1986 he served as President of the BOG. He has also served as Associate Editor for Communication Theory for the IEEE Transactions on Communications, Associate Editor for Coding Techniques for the IEEE Transactions on Information Theory, and Co-Chair of the IEEE International Symposia on Information Theory in Kobe, Japan (1988), Ulm, Germany (1997), and Chicago, IL (2004). In 2000, the IEEE Information Theory Society selected him as a recipient of a Third-Millennium Medal. He was co-recipient of the 2009 IEEE Donald G. Fink Prize Paper Award, which recognizes an outstanding survey, review, or tutorial paper in any IEEE publication issued during the previous calendar year.

Dr. Costello's research interests are in the area of digital communications, with special emphasis on error control coding and coded modulation. He has numerous technical publications in his field, and in 1983 he co-authored a textbook entitled "Error Control Coding: Fundamentals and Applications", the 2<sup>nd</sup> edition of which was published in 2004.

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