

Department of Systems Engineering and Engineering Management

Seminar Series

In how many ways to construct a connected graph: A graph-based generalization of binomial coefficients

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Econometrics and Operations Research

Tilburg University, The Netherlands

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Venue: P7510, Yeung Kin Man Academic Building (YEUNG), City University of Hong
Kong

Abstract

Any row of Pascal's triangle can be seen as a linear graph to each node of which the corresponding binomial coefficient is assigned. We show that the binomial coefficient of a node is equal to the number of ways the linear graph can be constructed when starting with this node and adding neighboring nodes one by one. Using this interpretation we generalize the sequences of binomial coefficients on the rows of Pascal's triangle to so-called connectivity degrees assigned to the nodes of an arbitrary connected graph. We show that the connectivity degrees have properties very similar to the properties of binomial coefficients. We also show that for a given connected cycle-free graph the connectivity degrees, when normalized to sum up to one, are equal to the steady state probabilities of some Markov chain on the nodes of the graph. Because the connectivity degree of a node in a connected graph is defined as the number of ways the graph can be constructed by a sequence of increasing connected subgraphs starting from this node, the connectivity degrees of the nodes can be seen as a measure of centrality in a graph. On the subclass of connected cycle-free graphs we provide an axiomatic characterization of the connectivity centrality measure.

About the Speaker

Dolf Talman studied econometrics at State University of Groningen and received in 1980 his PhD in mathematics and natural sciences from Vrije Universiteit Amsterdam, both in the Netherlands. During the academic year 1980-1981 he was visiting lecturer at the Yale School of Organization and Management and visiting researcher at the Cowles Foundation of Economic Research in New Haven, Connecticut, in the U.S.A. In 1981 he joined the Department of Econometrics and Operations Research at Tilburg University, Tilburg, the Netherlands. In 1990 he became professor of Game Theory and Equilibrium Programming. He has been Head of the Department for six years and member of the University Council for two terms. For more than twelve years he has been board member of the Netherlands Research School in Mathematics. His main research interests focus on non-cooperative and cooperative game theory and the computation and existence of economic and game-theoretic equilibria. He has published more than hundred papers in international journals in the field of economics and operations research and serves in the editorial board of several international journals.

All are Welcome!