

STATISTICAL ANALYSIS AND DATA MINING

Research Article

Betti numbers of graphs with an application to anomaly detectionDavid A. Johannsen , David J. Marchette

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Abstract

This article describes an application of research that sits at the intersection of commutative algebra and combinatorics: Betti numbers of graphs. In particular, we describe a correspondence between simple undirected graphs and a class of ideals in a polynomial ring. We then briefly introduce some of the algebraic invariants that can be associated to the ideal and the relation of these invariants to the existence of induced subgraphs in the original graph. We discuss a novel application of the theory to a problem in anomaly detection—detection of a local non-homogeneity in a graph. We describe some variants of these ideas designed to make the computations more tractable. © 2012 Wiley Periodicals, Inc. *Statistical Analysis and Data Mining* 5: 235–242, 2012

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