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**Seth Sullivant\*** ([smsull1i2@ncsu.edu](mailto:smsull1i2@ncsu.edu)), Department of Mathematics, North Carolina State University, Box 8205, Raleigh, NC 27695, and **Kelli Talaska**. *Trek separation for Gaussian graphical models.*

Gaussian graphical models are semi-algebraic subsets of the cone of positive definite covariance matrices. Submatrices with low rank correspond to generalizations of conditional independence constraints on collections of random variables. We give a precise graph-theoretic characterization of when submatrices of the covariance matrix have small rank in directed and undirected graphical models. Our new trek separation criterion generalizes the familiar d-separation criterion. Proofs are based on the trek rule, the resulting matrix factorizations, and classical theorems of algebraic combinatorics on the expansions of determinants of path polynomials. (Received January 04, 2009)