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You May Rely on the Reliability Polynomial for Much More Than You Might Expect

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The reliability polynomial $R_S(p)$ of a collection S of subsets of a finite set X has been extensively studied in the context of network theory. Here X is the edge set of a graph (V, X) and S the collection of the edge sets of certain subgraphs, for example, the spanning trees. In that case, $R_S(p)$ is the probability that, when each edge is included with the probability p , the resulting subgraph is connected. Demonstrating that the information about a collection S encoded in the coefficients of $R_S(p)$ may be capitalized upon in a variety of other probability and combinatorial settings is the main purpose of this talk.

To any collection of subsets S , we may associate $b(S)$, the collection of minimal sets which meet each set in S . For the collections of interest to us, this is a duality operator: $b(b(S))=S$. Of particular interest are the self-blocking collections: $b(S)=S$. We illustrate the expanded use of the reliability polynomials to study these self-blocking collections.

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