Zonotopal algebra is the study of several classes of graded vector spaces of polynomials that can be assigned to a realization of a matroid. Those spaces can be described as inverse systems of power ideals. Their Hilbert series are matroid invariants.

In the first part of the talk, we introduce hierarchical zonotopal power ideals. This extends and unifies results by Ardila-Postnikov, Holtz-Ron, and Holtz-Ron-Xu.

In the second part, we explain the relationship between zonotopal algebra and various matroid/graph polynomials. In addition, we show that log-concavity of the coefficients of the characteristic polynomial (recently proved by Huh and Katz for realizable matroids) implies log-concavity of the $f$-vector of the independence complex of matroids. (Received July 27, 2011)