1056-15-1823 **Lek-Heng Lim*** (lekheng@math.berkeley.edu), 873 Evans Hall, Berkeley, CA 94720-3840.
*Multilinear Algebra in Signal Processing.*

Multilinear algebra often arises in the analysis of multivariate non-Gaussian signals via *cumulants*. These are symmetric tensors measuring various statistical properties, e.g. the first four cumulants measure mean, variance, skewness, and kurtosis respectively. For a signal generated by a Gaussian process, the first two cumulants characterize it completely; for signals from non-Gaussian processes, one needs higher-order cumulants as well.

We look at two ways to analyze symmetric tensors that are in some sense generalizations of the spectral theorem for symmetric matrices. (1) *Secants of Veronese variety*: decomposing a homogeneous polynomial into a linear combination of powers of linear forms; (2) *Symmetric subspace variety*: decomposing a symmetric hypermatrix into a multilinear combination of points on a Stiefel manifold. We propose a PCA-like technique that identifies "principal cumulant components" accounting for variations in all cumulants via optimization over a single Grassmannian.

We will interpret signal processing broadly, including not just communication signals but also anything from biological signals of cellular activities to chemical signals of ecological activities to financial signals of market activities. (Received September 22, 2009)