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This talk is a survey of matrix methods for efficient numerical computation of Hodge decomposition and discrete harmonic forms (i.e. harmonic cochains) in a variety of settings for a variety of applications. These include comparisons of methods for least squares based ranking on graphs, computation of harmonic cochains for hole localization on Vietoris-Rips complex idealization of sensor networks, and comparison of harmonic forms computation on manifold complexes using eigenvector methods and least squares methods. (Received August 31, 2012)