Betti Numbers of Random Hypersurface Arrangements

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We study the arrangement of hypersurfaces defined in projective space by the zero sets of s randomly and independently chosen (Kostlan) homogeneous polynomials. Our first theorem here uses a random spectral sequence which gives information about the top Betti number of the union of the zero sets of the polynomials. The next result here deals instead with the asymptotic structure of the union of the zero sets quadrics. It turns out that in this case, the problem of understanding the number of connected components of the union of zero sets is related to the connectivity of a certain random graph model, and can be studied in a precise way. Specifically, our second theorem gives an upper bound on the average number of connected components in a random arrangement of quadrics' zero sets.