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**Ian Sammis\*** ([isammis@math.berkeley.edu](mailto:isammis@math.berkeley.edu)), Department of Mathematics, University of California, Berkeley, 970 Evans Hall #3840, Berkeley, CA 94720-3840, and **John Strain**.

*GNUFFT: A Geometric Nonuniform Fast Fourier Transform.*

A new nonuniform fast Fourier transform (FFT) technique computes Fourier coefficients in optimal time, for a distribution composed of polynomials supported on a set of arbitrary-dimension geometric objects. The distribution is smoothed by convolution with a multidimensional B-spline kernel and sampled on a uniform grid. A standard FFT is applied, and the smoothing is removed by pointwise division in Fourier space. The technique guarantees any specified accuracy in all coefficients and reduces to a standard nonuniform FFT when all the objects are zero-dimensional points. Numerical experiments demonstrate the accuracy and efficiency on realistic examples. (Received September 18, 2007)