DIFFERENTIAL GEOMETRY/PDE SEMINAR

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5PM–6PM

Fractal uncertainty principle

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Fractal uncertainty principle states that no function can be localized close to a fractal set in both position and frequency. More precisely, it is an estimate of the form

$$\|1_{X(h)} F_h 1_{Y(h)}\|_{L^2 \to L^2} = O(h^\beta),\ \beta > 0,\ h \to 0$$

where $X, Y \subset [0,1]$ are fractal sets, $X(h)$ denotes the h-neighborhood of X, and F_h is the unitary semiclassically rescaled Fourier transform.

I will explain a recent proof of the fractal uncertainty principle for porous sets and present two applications. The first application is to semiclassical measures on compact hyperbolic surfaces, which arise as high frequency limits of eigenfunctions. We show that each such measure has support equal to the entire cosphere bundle. The second application is to essential spectral gaps on noncompact hyperbolic surfaces, which are equivalent to exponential decay of waves at high frequency. We show that each convex co-compact hyperbolic surface has an essential spectral gap; previously this was only known under a dynamical pressure condition.

This talk is based on joint works with Jean Bourgain, Long Jin, and Joshua Zahl.

For more information about this seminar, visit the DG/PDE Seminar Web page (from the Math Department home page, `www.math.washington.edu`, follow the link **Seminars, Colloquia, and Conferences**).