DIFFERENTIAL GEOMETRY/PDE/PROBABILITY SEMINAR

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Adams and Moser-Trudinger inequalities: recent results on spaces of infinite measure

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A Moser-Trudinger inequality is a statement about the exponential integrability of functions that belongs to the so-called critical Sobolev space $W^{k,n/k}$. Best constants in such inequalities were often crucial for the solutions of problems in conformal geometry and certain nonlinear PDEs. In 1988 D. Adams invented a very successful strategy for proving such inequalities on bounded domains of R^n, via the use of Riesz potentials, the O'Neil Lemma and other ingenious estimates. Since then many many authors used Adams' approach to derive sharp Moser-Trudinger results in various settings, like general compact Riemannian manifolds, or on bounded domains in subRiemannian manifolds. In 2011 in joint work with Luigi Fontana we formulated and proved an abstract version of Adams' result valid in arbitrary measure spaces with finite measure, that allowed us to obtain old and new results on sets of finite measure by simply checking a couple of kernel estimates.

On the other hand, optimal results on sets of infinite measure are relatively few, mostly for $W^{1,n}$ and $W^{2,n/2}$, and recently there has been a flurry of work attempting to complete the existing gaps. In recent work with Fontana we estabilshed the full Adams and Moser-Trudinger results on the whole of R^n, for the Riesz potentials, the higher order gradients, and also more general elliptic operators of constant coefficients. We also established results on the hyperbolic space for arbitrary order.

In this talk I will present a little bit of the motivation and background, some older results, some very recent ones.

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