

# TEMPLE UNIVERSITY

Department of Mathematics

## Analysis Seminar

Room 617 Wachman Hall

Monday, March 25 2019, 2:40 p.m.

### *Harmonic measure and quantitative connectivity*

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**Abstract:** In nice environments, such as Lipschitz or chord-arc domains, it is well-known that the Dirichlet problem for the Laplacian with data in Lebesgue spaces  $L^p$  is solvable for some finite  $p$ . This property is equivalent to the fact that the associated harmonic measure is absolutely continuous, in a quantitative way, with respect to the surface measure on the boundary. In this talk we will study under what circumstances the harmonic measure for a rough domain is a well-behaved object. We will also present some results for the converse, in which case good properties for the domain and its boundary can be proved by knowing that the harmonic measure satisfies a quantitative absolute continuity property with respect to the surface measure. We will describe the two main features appearing in this context: one related to the regularity of the boundary, expressed via its uniform rectifiability, and another one related to the connectivity of the domain, written in terms of some quantitative connectivity towards the boundary using non-tangential paths. The results that we will present are higher dimensional scale-invariant extensions of the F. and M. Riesz theorem and its converse. That classical result says that, in the complex plane, the harmonic measure is absolutely continuous with respect to the arc-length measure for simply connected domains (a strong connectivity condition) with rectifiable boundary (a regularity condition).