Barcelona Analysis Seminar **2021–2022**

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Online streaming (Zoom). Click here to join.

Unique continuation at the boundary for solutions of elliptic PDEs

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In 1991 Fang-Hua Lin posed the following question. Let $\Omega \subset \mathbb{R}^d$ be a Lipschitz domain and Σ be an open subset of its boundary $\partial\Omega$. Let u be a harmonic function in Ω, continuous in $\overline{\Omega}$, that vanishes on Σ, and that its normal derivative $\partial_\nu u$ vanishes in a subset of Σ with positive surface measure. Is it true that u must be identically zero?

Recently Xavier Tolsa showed a positive answer to the previous question in the case Ω is a Lipschitz domain with small Lipschitz constant. In this talk, I will explain a recent work where I show that (in the same setting as Tolsa) we can find a family of balls $(B_i)_i$ centered on Σ such that $u|_{B_i \cap \Omega}$ does not change sign and that $K \setminus \cup B_i$ has positive Minkowski codimension for any compact $K \subset \Sigma$. In this work also extends the previous result to solutions of divergence form elliptic PDEs with Lipschitz coefficients, although we will only focus on the harmonic case during the talk. I will also try to motivate why the set of points of Σ where u changes sign nearby is interesting by comparing it with the usual singular set at the boundary.