



DEPARTAMENTO DE
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SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

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Hardy–Littlewood maximal operators on trees with bounded geometry

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The centred Hardy–Littlewood maximal operator \mathcal{M} on homogeneous trees is of weak type $(1, 1)$ and hence bounded on L^p for every $p > 1$ [CMS, NT]. In this talk we enlarge the view to $\Upsilon_{a,b}$, the family of trees on which the degree (namely, the number of neighbors) of each vertex can oscillate between the values a and b . We will discuss the following unexpected dichotomy: if $b > a^2$ the range of $p \in (1, \infty)$ for which \mathcal{M} is bounded on $L^p(\mathfrak{T})$ does not depend solely on a and b , but also on the locations of the vertices with different degree in the specific tree $\mathfrak{T} \in \Upsilon_{a,b}$, while for $a < b \leq a^2$, \mathcal{M} is bounded on $L^p(\mathfrak{T})$ for every $p > \log_a b$, and every $\mathfrak{T} \in \Upsilon_{a,b}$. In the latter case, the range of p can be proven to be sharp. We will also considered another point of view on the problem, inspired by [ST], and show that if the vertices of $\mathfrak{T} \in \Upsilon_{a,b}$ with different degree are well distributed, one can recover the weak $(1, 1)$ boundedness of \mathcal{M} on \mathfrak{T} , as in the homogeneous case. Time permitting, a few words will be devoted to the same problems for the uncentred maximal operator.

The talk is based on a joint work with S. Meda, F. Santagati e M. Vallarino.

References

- [CMS] M. Cowling, S. Meda, A. G. Setti, A weak type $(1, 1)$ estimate for a maximal operator on a group of isometries of homogeneous trees, *Coll. Math.* **118** (2010), 223–232.
- [NT] A. Naor and T. Tao, Random martingales and localization of maximal inequalities, *J. Funct. Anal.* **259** (2010), 731–779.
- [ST] J. Soria and P. Tradacete, Geometric properties of infinite graphs and the Hardy–Littlewood maximal operator, *J. Anal. Math.* **137** (2019), 913–937.

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