Sharp $L^p$ bounds for the Hardy-Littlewood maximal operator on Gromov hyperbolic spaces

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Let $(X, d)$ be a Gromov hyperbolic space equipped with a locally finite Borel measure that is locally doubling and of exponential growth. In this setting, we establish sharp weak type and strong $L^p$ type bounds for the centered Hardy–Littlewood maximal operator. Our results aim to clarify how the mapping properties of the Hardy–Littlewood maximal operator depend on the geometry of a space which is globally negatively curved. In particular, the bounds apply to Cartan-Hadamard manifolds of pinched negative curvature and symmetric spaces of noncompact type and rank one. A key ingredient in the proof is a discretization procedure, which allows us to approximate in a convenient way an arbitrary Gromov hyperbolic space by a class of graphs which we call *spider's webs*.

This is a joint work with S. Meda and F. Santagati.