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Absolute continuity in higher dimensions: variable shrinking and the ACL property

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Abstract

Absolute continuity in several variables admits different formulations, reflecting the analytic and geometric features one wishes to preserve. We discuss definitions based on oscillations over disjoint families of balls, tracing the passage from Malý's absolute continuity to Hencl's fixed-shrinking classes and Bongiorno's variable-shrinking class AC^n_Λ.

The central question is whether variable-shrinking absolute continuity implies absolute continuity on almost every coordinate line—the ACL property familiar from Sobolev and quasiconformal mapping theory. We show that these two notions are incomparable. Explicit finitely Lipschitz examples demonstrate that membership in AC^n_Λ does not ensure ACL, even for homeomorphisms. Conversely, an ACL function need not belong to the variable-shrinking class.

We also present a positive criterion: ACL is recovered when an admissible shrinking function is locally bounded away from zero. These results clarify the distinction between pointwise metric control, oscillation-based absolute continuity, and regularity along lines, and identify degeneration of the shrinking parameter as a central issue in their relationship.

The talk is based on joint work with Rinat Chaski.