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Projections and Favard length in a nonlinear setting

Projections detect information about the size, geometric arrangement, and dimension of sets. In recent years, there has been significant interest in determining the rates of decay of the classical Favard length (or average orthogonal projection length) for various fractal sets. For orthogonal projections, quantitative estimates rely on a separation condition: most points are well-differentiated by most projections. It turns out that this idea also applies to a broad class of nonlinear projection-type operators satisfying a transversality condition. This begs the question of obtaining quantitative upper and lower bounds for decay rates for nonlinear variants of Favard length, including Favard curve length (as well as a new generalization to higher dimensions, called Favard surface length) and visibility measurements associated with radial projections. As one application, we consider the decay rate of the Favard curve length of generations of the four corner Cantor set. Our upper bound utilizes the seminal work of Nazarov, Peres, and Volberg, while energy techniques play a role in achieving a lower bound. This talk is based on joint works with Cladek and Davey and with Bongers.