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Fractals as Final Coalgebras in Various Categories of Metric Spaces

In this talk we will explore a collection of results about obtaining fractal sets as final coalgebras of functors on various categories of metric spaces. This is a line of research started by Freyd and continued by Leinster, in which fractal sets are obtained as final coalgebras (a natural category theoretic construction used to capture infinite continuous behavior, such as streams) in categories of sets, and then topological spaces. The results presented here adapt this work to the metric setting, and examine this question in categories with different morphisms, namely short (non-expanding) maps, continuous maps, and Lipschitz maps. Interestingly, we obtain positive results for categories with short and continuous maps, but a negative result for the appropriate category of metric spaces with Lipschitz maps. We will conclude with a conjecture about a generalization of this negative result.