

Comments on the regularity of harmonic maps between singular spaces

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Abstract

In this work we are going to establish Hölder continuity of harmonic maps from an open set Ω in an $\text{RCD}(K, N)$ space valued into a $\text{CAT}(\kappa)$ space, with the constraint that the image of Ω via the map is contained in a sufficiently small ball in the target. Building on top of this regularity and assuming a local Lipschitz regularity of the map, we establish a weak version of the Bochner-Eells-Sampson inequality in such a non-smooth setting. Finally we study the boundary regularity of such maps.

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1 Introduction

In the last 50 years the study of harmonic maps has been blooming and gained a lot of interest from the mathematical community. One of the main questions is the one of existence of such mappings and parallel to that there is the issue of their regularity.

When $u : \Omega \subseteq M^n \rightarrow N^k$ is an harmonic map between Riemannian manifolds (M^n, g_M) and (N^k, g_N) the picture nowadays is quite clear: the existence of such mappings has been established via the study of parabolic problems by Hamilton (see [Ham75] for a discussion on the topic) and then by looking at the problem in a variational way. The latter approach can be tailored to the non-smooth setting as well, indeed in the recent [Sak23] the author has been able to prove the existence of harmonic maps between an RCD space and a $\text{CAT}(\kappa)$ space if the image of u is contained in a sufficiently small ball.

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