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Sets of topological singularities for vector-valued maps

In some variational models for condensed matter, the configuration of the material is represented by a vector-valued map u that takes values "close" (in a suitable sense) to a distinguished manifold, representing the energetically preferred local states of the material. This is the case, for instance, in the Ginzburg-Landau model for superconductivity or in the Landau-de Gennes model for nematic liquid crystals. In this context, it is useful to have a tool that captures the relevant topological information associated with u and, at the same time, enjoys compactness properties. In the Ginzburg-Landau theory, this is achieved by the use of the distributional Jacobian of u. We discuss another approach, based on a construction by Hardt, Kinderlehrer and Lin, which applies to the analysis of the Landau-de Gennes model.