Geometric approach to regularity of solutions in the low-dimensional framework

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The talk pertains to elliptic-type partial differential equations examined in the context of "thin" subsets of Euclidean space, specifically, the so-called low-dimensional structures. Various regularity aspects of weak solutions are the primary focus. By utilizing particular geometric extensions of functions supported on "thin" structures, we attain higher Sobolev regularity on every component manifold of the low-dimensional structure. However, this regularity type is too weak to fully capture a higher-order interplay between various components of the structure. We upgrade the regularity type to obtain membership of weak solutions in the domain of the low-dimensional second-order operator. To accomplish this, we demonstrate that a particular normal to the low-dimensional structure vector field exists that regularizes the structure-related gradient. Special attention will be devoted to geometric constructions related both to the first- and second-order lower dimensional setting.