Geometric Measure Theory

My research aims at the understanding of the complex local structure of surfaces occurring in many models from the natural sciences. In this regard, a mathematical surface may correspond to a variety of different physical objects: for instance, soap films, horizons of black holes, membranes of cells, and boundaries between different phases of a material, or between different grey levels in a digitally reconstructed image.

Research Areas

- Geometric measure theory
- Differential and convex geometry
- Linear and nonlinear elliptic partial differential equations
- Functional analysis

My research pertains to the fields of calculus of variations and to elliptic partial differential equations (elliptic PDEs). The common theme of my contributions is geometric measure theory – the natural language for many geometric variational problems. For instance, for generalised submanifolds with mean curvature (and integer multiplicity), I have proven the existence of a geodesic distance and of a second fundamental form, and I have laid the foundation to study PDEs thereon (see [4], [6], and [8]). My research programme on regularity in geometric measure theory is carefully tailored to systematically approach a key open problem and to provide new methods for elliptic PDEs and the calculus of variations.

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Background:

Ph.D. in Mathematics, University of Tübingen, Germany

Funding:

Ministry of Education
Ministry of Science and Technology

Publications

[4] U. Menne, Second order rectifiability of integral varifolds of locally bounded first variation, 55 pages. J. Geom. Anal., 23(2):709–763, 2013.

[6] U. Menne, Weakly differentiable functions on varifolds 112 pages. Indiana Univ. Math. J., 65(3):977–1088, 2016.

[8] U. Menne, Sobolev functions on varifolds, 50 pages. Proc. Lond. Math. Soc. (3), 113(6):725–774, 2016.