

LIMITS OF SOBOLEV HOMEOMORPHISMS AND ENERGY-MINIMAL DEFORMATIONS

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Sobolev homeomorphisms and their limits are widely studied in Geometric Function Theory (GFT) and mathematical models of Nonlinear Elasticity (NE). It is at the heart of the present lecture to convince you that the weak limits of Sobolev homeomorphisms are legitimate deformations of hyper-elastic materials. As we seek greater knowledge about the energy-minimal deformations in NE, the questions of existence and injectivity (motivated by the principle of non-interpenetration of matter) become ever more quintessential. Nonlinear PDEs and topology of monotone mappings come into play. Theoretical prediction of failure of bodies, caused by cracks, should appeal to both:

Mathematical Analysts and Researchers in the Engineering Fields

In case of the materials with Dirichlet stored-energy, we shall see that cracks propagate along vertical trajectories of the associated Hopf quadratic differential. I will summarize, in the briefest possible terms, our recent advances with *Jani Onninen*.

References:

- *The Nitsche Conjecture*, by T. Iwaniec, L. Kovalev, J. Onninen, J. Amer. Math. Soc., 24, no.2 (2011)
- *Diffeomorphic Approximation of Sobolev Homeomorphisms*, by T. Iwaniec, L. Kovalev, J. Onninen, Arch. Rat. Mech. Anal. 201, no.3 (2011)
- *Existence of Energy-minimal Diffeomorphisms Between Doubly Connected Domains*, by T. Iwaniec, N-T. Koh, L. Kovalev, J. Onninen, Invent. Math. 186, no. 3 (2011)
- *Monotone Sobolev Mappings of Planar Domains and Surfaces*, by T. Iwaniec, J. Onninen, Arch. Rat. Mech. Anal., no.1 (2016)
- *Limits of Sobolev Homeomorphisms*, by T. Iwaniec, J. Onninen, J. Eur. Math. Soc. 19, no. 2 (2017)
- *Radó-Kneser-Choquet Theorem for Simply Connected Domains*, by T. Iwaniec, J. Onninen, Transactions of Amer. Math. Soc. 371, no. 4 (2019)