Function spaces meet material science: Orlicz-Sobolev nematic elastomers

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In the last decade, models for nematic elastomers and magnetoelasticity has been extensively studied. These models consider both an elastic term where a polyconvex energy density is composed with an unknown state variable defined in the deformed configuration, and a functional corresponding to the nematic energy (or the exchange and magnetostatic energies in magnetoelasticity) where the energy density is integrated over the deformed configuration. In order to obtain the desired compactness and lower semicontinuity, one has to face the regularity requirement that maps create no new surface. I'll discuss that this in fact the case for maps whose gradients are in an Orlicz class with an integrability just above the space dimension minus one.

We prove that the fine properties of orientation-preserving maps satisfying that regularity requirement (namely, being weakly 1-pseudomonotone, $\mathcal{H}^1$-continuous, a.e. differentiable and a.e. locally invertible) are still valid in the Orlicz-Sobolev setting.

The results presented in this talk have been obtained in collaboration with Duvan Henao (Pontificia Universidad Católica de Chile).

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