

Singularities in real life nonlinearly elliptic and in Legendre-Hadamard elliptic PDE

Duvan Henao

Universidad de O'Higgins

We shall explore connections between the formation of singularities in the Oseen-Frank and Landau-de Gennes equations for liquid crystals, Ginzburg-Landau vortices in superconductivity, cavitation in nonlinear elasticity, and the phase-field approach to fracture in spaces of bounded variation. In particular, we show how the codimension of the singularities coincides with the dimension of the target ambient space, and some techniques to prove the existence of solutions. Particular emphasis will be given to the joint work with Majumdar and Pisante on the biaxial torus defect in liquid crystals, and the joint work with Barchiesi, Mora-Corral, and Rodiac on the existence of solutions to the elastostatics equations for neoHookean materials.

In Special Session 28 on Recent Trends in Nonlinear Elliptic PDEs at the Mathematical Congress of the Americas 2025.