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# THE REPULSION PROPERTY IN NONLINEAR ELASTICITY

Jeyabal Sivaloganathan\*<sup>1</sup>

<sup>1</sup>University of Bath [Bath] – United Kingdom

## Abstract

### THE REPULSION PROPERTY IN NONLINEAR ELASTICITY

J. Sivaloganathan (Bath)

(This is joint work with P. Negron-Marerro (UPRH))

The Lavrentiev phenomenon in one-dimensional variational problems occurs when the infimum of an integral functional on the class of absolutely continuous functions is strictly lower than the infimum on the class of smooth functions. This phenomenon is significant in the Calculus of Variations as it signals a possible loss of regularity in minimisers and, in some cases, it implies a repulsion property: approximating a global minimizer with smooth functions results in approximate energies that diverge. Consequently, standard numerical methods like the finite element method may fail for these problems.

In this talk, we will demonstrate that a generalised repulsion property applies to three-dimensional elasticity problems exhibiting cavitation and propose a novel scheme that circumvents this issue. Our approach utilizes a modification of the Modica - Mortola functional in which the phase function is coupled with the determinant of the deformation gradient in the elastic stored energy functional. We prove that approximations using this method satisfy the lower bound -convergence property in multi-dimensional, non-radial cases. Moreover, we establish convergence to the actual cavitating minimizer for a spherical body under radial deformations.

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\*Speaker