**Structure-Preserving Fully Discrete Methods for Magnetoelastic Materials**

Michele Ruggeri

Department of Mathematics, University of Bologna, Bologna, Italy
M.RUGGERI@UNIBO.IT

**Abstract**

Magnetoelastic materials are smart materials with a strong interplay between their mechanical and magnetic properties, and as such, they provide an example for a multiphysics system. In this talk, we present structure-preserving fully discrete numerical schemes [1, 2] for approximating solutions to a nonlinear system of evolutionary partial differential equations modeling the dynamics of magnetization and displacement in magnetoelastic materials in the small strain regime. For each method, we discuss well-posedness, energetic behavior, accuracy, (unconditional) stability and convergence, and illustrate its performance by means of numerical experiments. This is joint work together with Martin Kružík (Czech Academy of Sciences) and Hywel Normington (University of Strathclyde).

# References

[1] M. Kružík, H. Normington, M. Ruggeri. *A decoupled, stable and second-order integrator for the Landau–Lifshitz–Gilbert equation with magnetoelastic effects*, arXiv:2512.01741 (2025).

[2] H. Normington, M. Ruggeri. *A decoupled, convergent and fully linear algorithm for the Landau–Lifshitz–Gilbert equation with magnetoelastic effects.* Comput. Math. Appl. 187 (2025), 1–29.