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Structure-preserving numerical methods in micromagnetics (I)

Tuesday 17 June 2025 09:00 (1h 30m)

A numerical method for approximating solutions to partial differential equations (PDEs) is called structure-preserving if it is designed to ensure that certain properties or features of the continuous model (e.g., constraints on solutions, conserved quantities, etc.) are retained, in a certain sense, at the discrete level.
In this mini-course, we give an overview of structure-preserving numerical methods to approximate the PDEs arising in micromagnetics, the continuum theory of (ferro)magnetic materials. We discuss mathematically sound numerical schemes and their analysis, emphasizing how the discretizations in space (for which we will use the finite element method) and in time should be designed in order to guarantee that the approximate solutions have the features of the continuous problem (such as the unit length constraint on the magnetization or the dissipative energy law characterizing its dynamics).

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