

Numerically verified proofs for solving PDEs

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Partial differential equations (PDEs) appear everywhere in mathematics. In applied maths, one often attempts to numerically solve PDEs on a computer, for example using physics-informed neural networks. In pure maths, one often wants to rigorously prove that a solution exists. In recent years, it has become possible to use numerical solutions not just for guiding intuition, but together with guaranteed error estimates as an ingredient for a mathematically rigorous existence proof. In the talk, I will mainly report on other people's achievements explaining how these proofs are carried out and how small errors need to be to make them work. I will pay special attention to cases in which physics-informed networks provide the numerical solution. Then I will briefly comment on ongoing work of a numerically verified proof in differential geometry.