

# Multigrid for parametric PDEs with application to fuzzy partial differential equations

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Uncertain parameters in mathematical models are often described by means of random variables. This approach is very effective if the stochastic characteristics of the uncertain parameters are accurately known. When that is not the case, however, an uncertainty representation using alternative models, such as intervals or fuzzy numbers, may be more appropriate. In this talk we consider partial differential equations with interval and fuzzy parameters.

First, we will recall the concept of fuzzy numbers and fuzzy arithmetics, and provide a mathematical definition of a fuzzy differential equation and its solution. Next, we will elaborate on one particularly efficient solution approach, based on a polynomial response surface technique. This method leads to a large and coupled algebraic system of equations that can be solved efficiently by means of a multigrid method. Finally, we will demonstrate the approach by means of two numerical examples: a diffusion problem and an elasticity problem.