

## **Solving PDEs with Multigrid Methods**

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Abstract: In recent years, substantial effort has been focused on developing methods capable of solving the large linear systems that arise from the discretization of partial differential equations, especially on unstructured grids. This research has been driven by domain scientists' demands of higher accuracy, both in mathematical modeling (more accurately representing the physical problem) and in computational solution (better approximating the continuum solution). Geometric and algebraic multigrid methods have been demonstrated to provide optimal performance for many of these problems, but suffer from certain fragilities that limit their applicability. In this talk, we outline the classical geometric and algebraic multigrid methods and demonstrate their effectiveness. We also introduce a new extension to the algebraic multigrid method and demonstrate its ability to efficiently solve systems that the classical algorithms cannot.