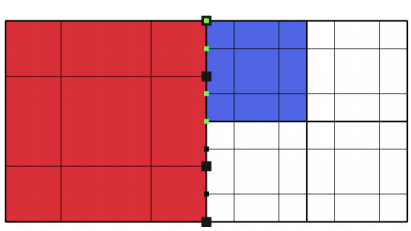
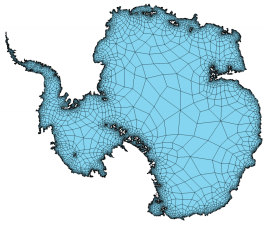
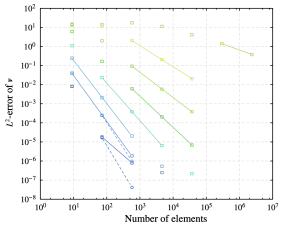
Fall 2019: Advanced Topics in Numerical Analysis: Finite Element Methods

Cross-listed as MATH-GA.2011-002 and CSCI-GA 2945.002

Lectures: Wednesday 5:10–7:00pm, WWH 1302, first class on Sep 4

Instructor: Georg Stadler,
WWH #1111
E-mail: stadler@cims.nyu.edu

Description: This course covers theoretical and practical aspects of finite element methods for the numerical solution of partial differential equations. The first part of the course will focus on theoretical foundations of the method (calculus of variations, Poincare inequality, Cea's lemma, Nitsche trick, convergence estimates). The second part targets practical aspects of the method, illustrates how it can be implemented and used for solving partial differential equations in two and three dimensions. Examples will include the Poisson equation, linear elasticity and, time permitting, the Stokes equations.

Prerequisites: Prerequisites are a graduate PDE course, Numerical Methods II (or equivalent) and some programming experience. In case of doubt, please come by or send an email to the instructor.

Required work: Several theoretical and practical home work assignments and a final project.

Literature:

- Elman, Silvester and Wathen, *Finite Elements and Fast Iterative Solvers*, Oxford University Press, 2014.
- Brenner and Scott, *The Mathematical Theory of Finite Element Methods*, Springer, 1996. Available from https://www.springer.com/gp/book/9780387759333.
- Süli, *Lecture Notes on Finite Element Methods for Partial Differential Equations*, 2019, Available from https://people.maths.ox.ac.uk/suli/fem.pdf.