Finite element methods for ill-posed partial differential equations with conditional stability

Erik Burman
UCL, United Kingdom
e.burman@ucl.ac.uk

Ill-posed partial differential equation are omnipresent in computational science, however the numerical analysis of their approximation methods is not so well developed. In this talk we will discuss recent results on stabilized finite element methods for the approximation of ill-posed problems that satisfy a conditional stability estimate. This means that the problem is stable under some additional a priori assumption on the solution. Using the classical linear unique continuation problem with smooth solution as model problem we will show how to design finite element methods whose accuracy reflects the order of the approximation space, the strength of perturbations in data and the stability of the continuous problem. We will then discuss the optimality of the results and how the introduction of further a priori assumptions can be used to improve the accuracy of the method.

Joint work with Lauri Oksanen.