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Group Seminar Computational Methods for PDEs

Preconditioning and fast diagonalization of a parabolic PDE-constrained optimization problem using IgA

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Abstract

Waste clearance in the brain is hypothesized to be controlled by the circulation of cerebrospinal fluid (CSF) through a diffusive process, possibly enhanced by additional effects such has advection or chemical reactions. To investigate the exact mechanisms involved, clinical studies injects tracer molecules in the CSF of human patients. The concentration of the tracer is measured at regular intervals by MRI imaging. In this talk we consider a PDE-constrained optimization problem of a parabolic equation where we have limited observation in time (the MRI images). To solve this, we consider robust preconditioning techniques for limited observation problems. Such techniques require higher smoothness and IgA provides a suitable method to achieve this. By exploiting the fact that the observation is distributed in the spatial domain, we can use fast diganalization methods to efficiently realize the space-time preconditioner.