Preconditioners for monolitic multi-physics problems -- with applications toward the biomechanics of the brain

In this talk we will discuss preconditioning algorithms for monolithic schemes of coupled problems involving the coupling of porous and viscous flow as well as fluid-structure interaction and dimension reduction problems. We explore how fractional Laplacian solvers may be utilized to obtain parameter robust schemes. The schemes are discussed in the context of biomechanical modelling of the waste clearance processes in the brain that is believed to fail in various forms of dementia such as Alzheimer's and Parkinson's diseases.