

## INVITATION TO THE LECTURE

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# SURROGATE-ACCELERATED MARKOV CHAIN MONTE CARLO METHODS FOR BAYESIAN INVERSE PROBLEMS

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This talk focuses on efficient sampling using Markov chain Monte Carlo (MCMC) methods for Bayesian inversion. The sampling process is based on the Delayed Acceptance Metropolis-Hastings algorithm and accelerated through adaptively constructed surrogate models, while maintaining the asymptotic exactness of the Markov chain. The surrogate models are built using non-intrusive methods; specifically, neural network surrogate models will be discussed. The motivation for the use of the Bayesian approach stems from the need to solve geotechnical inverse problems with uncertainties, such as identifying material parameters based on data from a tunnel sealing experiment or determining fracture apertures.

However, the methods are also applicable beyond geosciences. In considered problems, the forward model typically involves solving partial differential equations using numerical methods. Using surrogate-accelerated MCMC methods, the number of required forward model evaluations can be significantly reduced. The resulting MCMC framework is available in the form of a Python package, **SurrDAMH** ([github.com/dom0015/surrDAMH](https://github.com/dom0015/surrDAMH)).