

# A practical introduction to Bayesian inverse problems

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Uncertainty quantification (UQ) is the science of characterization and management of randomness in computational models of real world problems. UQ is paramount to enhance analysis and prediction tasks in multiple inverse problems arising in imaging, material science, spatial statistics, etc. In general, UQ for inverse problems is expressed as a Bayesian inference task where the objective is to estimate a probability distribution instead of a single parameter. This introductory course presents numerical methods for quantification of uncertainties in inverse problems using the Bayesian approach. It can be of interest to students from any discipline in applied mathematics and engineering. The course provides the mathematical background for theory and methods for solving Bayesian inverse problems, which are illustrated via Python examples.



**ShortBio** Felipe Uribe is a postdoctoral researcher at the Technical University of Denmark where he is working in the CUQI project (Computational Uncertainty Quantification for Inverse problems). His research interests are in inverse problems, Bayesian inference, Monte Carlo methods and rare event simulation. He received his PhD from the Technical University of Munich with a dissertation centered on Bayesian inverse problems and reliability analysis under spatially variable parameters. Beyond work, he usually finds himself either playing chess, making bonsai, or enjoying outdoors.

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