

# Uncertainty Quantification for Conservation Laws

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Inputs for systems of conservation laws, such as the initial data, boundary conditions, coefficients in sources and fluxes etc, need to be measured. In practice, measurements are uncertain. This uncertainty propagates into the resulting solution of the PDE. Uncertainty Quantification (UQ) covers the modeling, analysis and computation of this uncertainty in the solution. UQ for hyperbolic systems of conservation laws has received great attention in the last decade. The aim of this course of lectures is to introduce the audience to some fundamental issues and techniques in this area. We aim to cover the following topics:

1. Random entropy solutions for scalar conservation laws with uncertain initial data and fluxes.
2. Entropy measure-valued solutions and Statistical solutions for multi-dimensional systems of conservation laws.
3. Efficient numerical methods for UQ such as multi-level Monte Carlo, Quasi-Monte Carlo and more recent machine learning algorithms.

The lectures will also illustrate as to how even the underlying deterministic problem might be better understood in the stochastic setting.