

## **Yuto Miyatake (talk 11): A posteriori and statistical estimation of discretization errors in the numerical solution of evolution equations**

*Thursday, June 12, 2025 10:30 AM (45 minutes)*

In inverse problems and data assimilation, various sources of uncertainty arise. Among them, discretization errors in evolution equations can be significant and should sometimes be treated as a major source of uncertainty to be quantified.

In this talk, we present a posteriori and statistical approaches to estimating such errors. The key idea is to model the discretization error as a random variable and to impose prior information on its distribution. We then estimate statistical quantities such as the variance using numerical solutions and noisy observations of the state variables.

In particular, we introduce discretization error quantification methods based on isotonic regression, a statistical technique for fitting a non-decreasing real-valued function to (typically one-dimensional) data.

We demonstrate efficient algorithms whose computational cost is typically negligible compared to that of solving the overall inverse problem.