

## **CRUNCH Seminars at Brown, Division of Applied Mathematics**

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### **Paper Review: Identification of physical processes via data-driven and data-assimilation methods**

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In this study, an innovative framework is developed that combines data-driven and data-assimilation methods for simultaneously identifying physical processes and inferring model parameters. Spatiotemporal measurement data are first divided into a training data set and a testing data set. Using the training data set, a data-driven method is developed to learn the governing equation of the considered physical problem by identifying the occurred (or dominated) processes and selecting the proper empirical model. Through introducing a prediction error of the learned governing equation for the testing data set, a data-assimilation method is devised to estimate the uncertain model parameters of the selected empirical model. For the contaminant transport problem investigated, the results demonstrate that the proposed method can adequately identify the considered physical processes via concurrently discovering the corresponding governing equations and inferring uncertain parameters of nonlinear models, even in the presence of measurement errors. This work helps to broaden the applicable area of the research of data driven discovery of governing equations of physical problems.