

## EXPERIMENTAL AND SYNTHETIC DATA ASSIMILATION FOR DATA-BASED SIMULATION AND DESIGN

1700-Data Science and Machine Learning

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### ABSTRACT

Since decades, the maturity of computational science and engineering has allowed us to simulate complex phenomena with attention to detail. Besides, continually emerging measurement systems and methodologies have also led to a massive leap in experimental mechanics. Those, as mentioned above together, shall result in the boost of the collected data, either numerical or experimental.

The traditional way to investigate the properties of materials consists of solving inverse problems to identify the parameters of constitutive laws. However, for constantly emerging new advanced materials and processes such as additive printing, the availability of the laws to be identified is questionable, and time constraints require new approaches. Moreover, the sheer quantity of collected data, both experimental and synthetic (simulated), requires the development of dimensionality reduction algorithms. In this context, the whole new field emerges, when the simulation is directly based on the data, enriching the inverse problem by data assimilation. For experimental data, the measurement error has to be taken into account as well as modeling error for numerical data, requiring the development of specific stochastic approaches.

Thus, for a deeper understanding of physical phenomena through the somewhat redundant data, this mini-symposium endeavors to gather experts from both disciplines of experimental mechanics and computational science, and to promote the integration of experimental results and numerical algorithms. Particular areas of interest for this MS include, but not limited to:

- (1) Data-driven simulation
- (2) Manifold learning and neural networks for digital image correlation
- (3) Inverse problems with massive data
- (4) Design and analysis of computer (in silico) and actual (in vitro/in vivo) experiments
- (5) Assimilation of synthetic and non-synthetic data
- (6) Bayesian identification