14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19–24, 2019, Paris, France

DATA SCIENCES AND UNCERTAINTY QUANTIFICATION IN COMPUTATIONAL MECHANICS AND ENGINEERING SCIENCES TRACK NUMBER 800

C. DESCELIERS*, R. GHANEM†, M.P. MIGNOLET‡, F. PLED* AND C. SOIZE*

* Université Paris-Est, Laboratoire Modélisation et Simulation Multi Echelle,
MSME UMR 8208 CNRS
5 bd Descartes, 77454 Marne-la-Vallée, France
{christophe.desceliers,florent.pled,christian.soize}@univ-paris-est.fr and http://www.msme.u-pem.fr

† University of Southern California
210 KAP Hall, Los Angeles, CA 90089, United States of America
ghanem@usc.edu and https://www.sc.edu

‡ Arizona State University
P.O. Box 876106, Tempe, AZ 85287, United States of America
marc.mignolet@asu.edu and https://www.asu.edu

Key words: Data Sciences, Computational Mechanics, Uncertainty Quantification, Stochastic Modeling, Probabilistic Learning

ABSTRACT

Many problems in engineering sciences can be tackled and understood through the analysis of data obtained either by experimental tests or by numerical simulations. Uncertainty quantification and optimization under uncertainties in computational mechanics and engineering sciences can take advantage of all the recent fundamental advances in data sciences and stochastic modeling such as, non-exclusively, representation of stochastic vectorial spaces, polynomial chaos representations, Gaussian processes for regression, random matrix theory, non-Gaussian stochastic field theory, computational statistics tools such as maximum likelihood and Bayesian approaches, etc.

This mini-symposium focuses on the recent developments in scientific machine learning, involving computational statistics and probability theory that bring contributions to new emerging methodologies with applications in computational mechanics. The applications may concern, among others:

- Solid computational mechanics;
- Computational fluid dynamics;
- Fluid-structure interactions and coupled problems;
- Stochastic multiscale modeling of random heterogeneous materials;
- Stochastic inverse problems in high dimension;
- Wave or crack propagation in random heterogeneous media;
- Uncertain multiphysics linear and nonlinear computational mechanics;
- Nonconvex multidimensional stochastic optimization.