# Data-driven correction of models for deformable solids

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**Abstract.** Unveiling physical laws from data is seen as the ultimate sign of human intelligence. While there is a growing interest in this sense around the machine learning community, some recent works have attempted to simply substitute physical laws by data. We believe that getting rid of centuries of scientific knowledge is simply nonsense. There are models whose validity and usefulness is out of any doubt, so try to substitute them by data seems to be a waste of knowledge. While it is true that fitting well-known physical laws to experimental data is sometimes a painful process, a good theory continues to be practical and provide useful insights to interpret the phenomena taking place.

That is why we present here a method to construct, based on data, automatic corrections to existing models. Emphasis is put in the correct thermodynamic character of these corrections, so as to avoid violations of first principles such as the laws of thermodynamics. These corrections are sought under the umbrella of the GENERIC framework [M. Grmela and H. Ch. Öttinger, Dynamics and thermodynamics of complex fluids. I. Development of a general formalism. Phys. Rev. E 56, 6620, 1997], a generalization of Hamiltonian mechanics to non-equilibrium thermodynamics. This framework ensures the satisfaction of the first and second laws of thermodynamics, while providing a very appealing context for the proposed automated correction of existing laws. In this work we focus on solid mechanics, particularly large strain (visco-) hyperelasticity.