

R. Viala, S. Le Conte, S. Vaiedelich, S. Cogan and Y. Ben-Haim, 2022, Playability of a 1734 Guarneri cello: Info-gap robustness analysis of uncertainty, *Model Validation and Uncertainty Quantification*, vol. 3, pp.67–72, Part of the Conference Proceedings of the Society for Experimental Mechanics Series.

Abstract Mechanical stresses due to strings are imposed on an instrument when it is played. Such stress can lead to long-term strains or damages. In the cultural heritage domain, this can prevent an instrument from being played if the risk of damage is too high. Most of the properties of such instrument are uncertain, such as mechanical parameters, relative humidity or already existing cracks. Model-based approaches dealing with deep uncertainties can be a very efficient approach for decision support. In this paper, an example is given with an antique cello, which exhibits damages, especially boreholes or galleries created by wood-eating insects. A model is created for static analysis to compute the stress field that will be used as a basis for the info-gap robustness analysis of the uncertainties and their impact on the sustainability of the instrument, considering defects, probabilistic distributions of elastic constants and Knightian uncertainties of yield stresses of wood.

Keywords Cultural heritage, Chordophones, Info-gap robustness analysis, Uncertainties, Wood mechanics, Decision support tool.