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CSC/WCPM joint seminar

Monday, 26 May, 1 p.m., MAS2.05/2.06 Seminar room

Modular Bayesian uncertainty assessment for structural health monitoring

André Jesus, School of Engineering, University of Warwick

Abstract: This presentation is focused on Structural Health Monitoring technology, which aims to develop smart structural systems, capable of assessing and predicting infrastructure serviceability issues. Due to the complexity of this challenge uncertainties often do occur and severely affect results. These range from aleatoric material properties and noise perturbations, to parameter uncertainty and inadequacy of a model to predict the structural behaviour. An enhanced modular Bayesian approach, using multiple response Gaussian processes and the Metropolis Hastings algorithm, has been developed to comprehensively quantify uncertainties during model calibration. Results of its application to reduced and full-scale structures and associated benefits are also highlighted.

Quantum transport simulations for understanding the thermoelectric effect in nanocomposites

Samuel Foster, School of Engineering, University of Warwick

Abstract: Thermoelectric materials have the useful ability to convert heat differences into electric currents, and could play a significant role in reducing carbon emissions. However, current applications remain limited due to poor efficiency and high material and manufacturing costs. One class of promising materials for the new generation of thermoelectrics are nanocomposites. Nanocomposites can achieve significant reductions in the thermal conductivity, an essential aspect in increasing thermoelectric efficiency. In such materials, however, the electrical conductivity and power factor are also reduced, lowering the efficiency back down again. Proper theory and simulation is needed in order to optimize the thermoelectric efficiency in such materials. In this work, we employ the quantum transport Non-Equilibrium Green's function (NEGF) method to calculate the electronic and thermoelectric coefficients of two dimensional materials embedded with nanoinclusions. This formalism includes electron-phonon interactions, captures details of geometry, quantisation, tunnelling, and the ballistic to diffusive nature of transport in a unified way, which makes it a convenient and accurate method for understanding thermoelectric transport in nanomaterials, beyond semiclassical approximations. We are able to show how these nanocomposites can be optimised to limit degradation in the thermoelectric power factor, and in some cases even provide mild improvements.

A buffet lunch is available from 12:45 pm.

More info: http://warwick.ac.uk/wcpm/seminars