Adaptive methods for nonlinear problems: PDEs and Multiscale Modelling

Charalambos Makridakis
University of Sussex, UK
c.makridakis@sussex.ak.uk

The computation of singular phenomena (shocks, defects, dislocations, interfaces, cracks) arises in many complex systems. For computing such phenomena, it is natural to seek methods that are able to detect them and to devote the necessary computational recourses to their accurate resolution. At the same time, we would like to have mathematical guarantees that our computational methods approximate physically relevant solutions. Our purpose in this talk is to review results and discuss related computational challenges for such nonlinear problems modeled by PDEs. In addition we shall briefly discuss issues related to Micro / Macro adaptive modeling and methods, in particular related to atomistic/continuum coupling in crystalline materials.