



**POLITECNICO**  
MILANO 1863



## MOX Seminar Series

**Omar Lakkis**

Free University of Bolzano-Bozen, Faculty of Computer Science and University of Sussex, GB

# A posteriori error analysis and adaptive schemes for the wave equation

25 May 2017, 2:00 pm

Aula Consiglio, VII piano - Dipartimento di Matematica, Politecnico di Milano - Edificio 14.

### Abstract:

*A posteriori error estimates provide a rigorous foundation for the derivation of efficient adaptive algorithms for the approximation of solutions of partial differential equations (PDEs). While the literature is rich with results for the approximation of elliptic and parabolic PDEs, it is much less developed for the hyperbolic equations such as the acoustic or elastic wave equations. In this talk, I will review some of the "standard" a posteriori results for the scalar linear wave equation, including those of [1] and [2], and present recent improvements and further developments to lower order Sobolev norms based on Baker's Trick [3] for backward Euler schemes. Subsequent focus will be given to practically relevant methods such as Verlet, Cosine, or Newmark methods, a popular example of which is the Leap-frog method [4].*

*Notes: This is based on joint work with E.H. Georgoulis, C. Makridakis and J.M. Virtanen.*

### References:

- [1] W. Bangerth and R. Rannacher, *J. Comput. Acoust.* 9(2):575–591, 2001.
- [2] C. Bernardi and E. Süli, *Math. Models Methods Appl. Sci.* 15(2):199--225, 2005.
- [3] E. H. Georgoulis, O. Lakkis, and C. Makridakis. *IMA J. Numer. Anal.*, 33(4):1245–1264, 2013, <http://arxiv.org/abs/1003.3641>
- [4] E. H. Georgoulis, O. Lakkis, C. Makridakis, and J. M. Virtanen. *SIAM J. Numer. Anal.*, 54(1), 2016, <http://arxiv.org/abs/1411.7572>



Omar Lakkis:

*I have a PhD in Applied Mathematics and Scientific Computing from the University of Maryland (2002). Then, I have worked as a postdoc at the Università di Milano (2002), the University of Crete and FORTH Heraklion Crete (2003-2004). I have joined the University of Sussex, as a permanent lecturer in (2004-2010), and senior lecturer (2010-2016), currently visiting senior lecturer. In 2016, I have moved my main affiliation to the Free University of Bolzano, where I work at the Faculty of Computer Science. I have visited IPAM at UCLA, California (2002), Hausdorff Institute for Mathematics, Bonn (2008), Basque Center for Applied Mathematics, Bilbao (2011), and ACMAC, Heraklion (2012).*

<http://mox.polimi.it>

Contact: 02 2399 4611, [segreteria-mox@polimi.it](mailto:segreteria-mox@polimi.it)