Berliner Colloquium für wissenschaftliche Visualisierung

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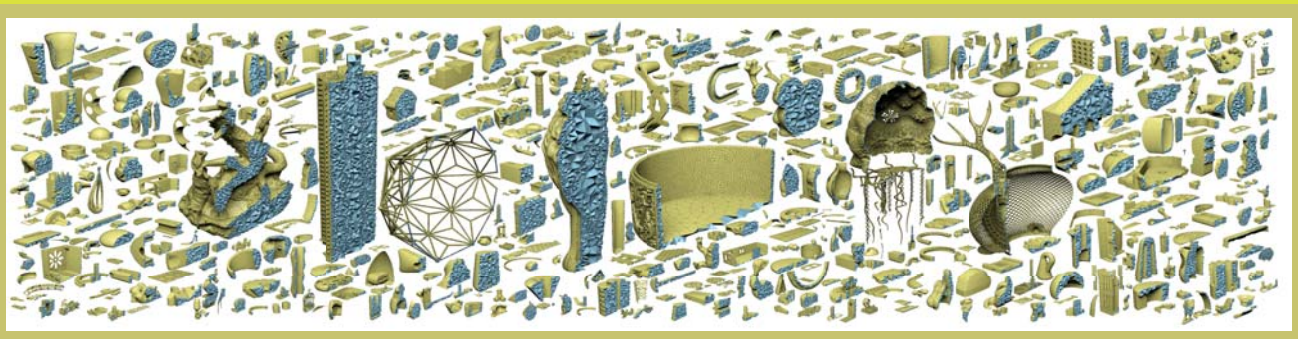
# Black-Box Finite Element Analysis

## Daniele Panozzo, Professor

New York University, USA

Thursday, July 4th, 2019 at 18:00 h
Zuse-Institut Berlin (ZIB), Takustraße 7, 14195 Berlin
Lecture hall (round building, ground floor)



The numerical solution of partial differential equations (PDE) is ubiquitous in engineering and scientific computing. Ideally, a PDE solver should be a "black box": the user provides as input the domain boundary, boundary conditions, and the governing equations, and the code returns an evaluator that can compute the value of the solution at any point of the input domain. This is surprisingly far from being the case for all existing open-source or commercial software, despite the research efforts in this direction and the large academic and industrial interest. To a large extent, this is due to treating meshing and FEM basis construction as two disjoint problems.

I will present an integrated pipeline, considering meshing and element design as a single challenge, that makes the tradeoff between mesh quality and element complexity/cost local, instead of making an a priori decision for the whole pipeline. I will demonstrate that tackling the two problems jointly offers many advantages, and that a fully black-box meshing and analysis solution is already possible for heat transfer and elasticity problems.

Daniele Panozzo is an Assistant Professor of Computer Science at the Courant Institute of Mathematical Sciences in New York. Prior to joining NYU he was a postdoctoral researcher at ETH Zurich (2012-2015). Daniele earned his PhD in Computer Science from the University of Genova (2012). He received the EUROGRAPHICS Award for Best PhD Thesis (2013), the EUROGRAPHICS Young Researcher Award in 2015, and the NSF CAREER Award in 2017.
Daniele is leading the development of libigl (https://github.com/libigl/libigl) and is chairing the Graphics Replicability Stamp (http://www.replicabilitystamp.org). His research interests are in digital fabrication, geometry processing, architectural geometry, and discrete differential geometry.

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