

10th GACM

Colloquium on Computational Mechanics
for Young Scientists from Academia and Industry
September 10 to 13, 2023 in Vienna, Austria



Multi-scale Shape Optimization Problems in Continuum Mechanics

Ramy Nemer¹, Daniel Wolff², Jacques Zwar³

¹ Computing and Fluids Research Group, MINES Paris, PSL - Research University, CEMEF - Centre for Material Forming, CNRS UMR 7635, France, ✉ ramy.nemer@minesparis.psl.eu

² Chair for Computational Analysis of Technical Systems (CATS), RWTH Aachen University, Germany, ✉ wolff@cats.rwth-aachen.de

³ Institute of Lightweight Design and Structural Biomechanics (ILSB), TU Wien, Austria, ✉ jacques.zwar@tuwien.ac.at

Shape optimization problems arise in various applications, be it in the design of microscopic structures in living tissue or in large-scale applications for civil engineering. Driven by an effort to reduce cost for prototyping and production, numerical optimization constitutes an integral part of modern engineering.

These optimization problems have long been an active and fast-evolving field of research due to their versatile fields of application, ranging from continuum mechanics, over heat problems, to fluid mechanics.

From this universality, a variety of different methods has emerged. These include conventional approaches such as gradient-based or gradient-free optimization algorithms that directly optimize a parameterized geometry, but also modern data-driven approaches from the field of Deep Learning, such as Neural Networks or Reinforcement Learning, aiming – like other reduced order models – to lower the computational effort.

With this minisymposium, we would like to address researchers working on all stages of the optimization cycle, namely, geometry representation, analysis, or optimization. We aim to encourage interdisciplinary exchange among the contributors and hope to create fruitful discussions that can inspire future research and new collaborations.

Topics of interest include, but are not limited to:

- shape optimization of real-world applications
- geometry parametrization techniques
- surrogate-based methods
- optimization algorithms
- ...