

# Fluid-dynamic Optimization of HVAC-components with adjoint Navier-Stokes Equations

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## **Abstract**

Due to the complex requirements of the industrial design of HVAC (heat, ventilation and air-conditioning) components, adjoint optimization has gained in importance. Contrary to generic optimization methods, which require at least one evaluation for each design parameter, the computational cost of the adjoint optimization process is independent of the number of degrees of freedom, which allows for an unconstrained number of design parameters.

In the talk, the adjoint sensitivity analysis is derived for shape and topology optimization with respect to the Reynolds-averaged Navier-Stokes-Fourier equations. Examples for the optimization of HVAC components of air crafts are given and numerical results are shown. Furthermore, challenges in the optimization cycle are considered and existing remedies are presented.