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Optimization of a Turbine Blade Trailing Edge using Large Eddy Simulations PATRICK BLONIGAN, CHAITANYA TALNIKAR, Massachusetts Inst of Tech-MIT, JULIEN BODART, University of Toulouse, ISAE, BRIAN PIERCE, Stanford University, SANJEEB BOSE, Cascade Technologies, QIQI WANG, Massachusetts Inst of Tech-MIT — As for many turbomachinery components, heat transfer and pressure loss are the key quantities influencing the design of turbine blades. To compute correct heat transfer and pressure loss data, flow features such as boundary layer transition and flow separation must be captured accurately. While traditional Computation Fluid Dynamics models such as Reynolds Averaged Navier-Stokes (RANS) struggle to capture these features accurately, Large Eddy Simulation (LES) is able to. This talk discusses an optimization study of a turbine blade trailing edge. The design of turbine blades involves two classical competing objectives: minimizing pressure loss and minimizing heat transfer to the blade. This trade-off is especially apparent for the design of the blade's trailing edge. The study was conducted using a novel Bayesian optimization technique developed by the authors. The optimization algorithm is combined with a massively parallel LES solver and the results for a number of trailing edge designs including the optimal geometry will be presented and their implications for turbine blade design will be discussed.

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