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The use of machine learning in Computational Fluid Dynamics for an economic approach to flow optimization problems.

Thursday, July 30, 2020 1:00 PM (1 hour)

As in many engineering fields, Computational Fluid Dynamics (CFD) lives upon modelling reality in a feasible way to come to a desired solution. One good example in fluid dynamics is turbulence, which is mathematical modelled in most simulations, but there are many cases where it is necessary to resolve turbulent eddy's to take crucial effects into consideration. If this is coupled with a flow optimization problem, the computation time becomes a limiting factor for companies. An example were machine learning solves a CFD problem like this is in multiphase flow simulation [1]. Where a computationally intensive problem is solved with less processing time.
Build on the research of *Peter A. Leitl* Et al. [2] where the flow in the turbine centre frame (TCF), which is the part between high and low pressure turbine in an aircraft engine, was improved, we will investigate optimization methods for the first stage low pressure turbine in consideration of the changed flow field due to the application of drag reducing micro channel surfaces in the TCF.

[1] Ansari, A., Boosari, S. S. H., & Mohaghegh, S. D. (2020). *Successful Implementation of Artificial Intelligence and Machine Learning in Multiphase Flow Smart Proxy Modeling: Two Case Studies of Gas-Liquid and Gas-Solid CFD Models.* J Pet Environ Biotechnol, 11, 401.
[2] Leitl, P. A., Göttlich, E., Flanschger, A., Peters, A., Feichtinger, C., Marn, A., & Reschenhorfer, B. (2020). *Numerical investigation of optimal riblet size for turbine center frame strut flow and the impact on the performance.* AIAA Scitech 2020 Forum, 307.

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