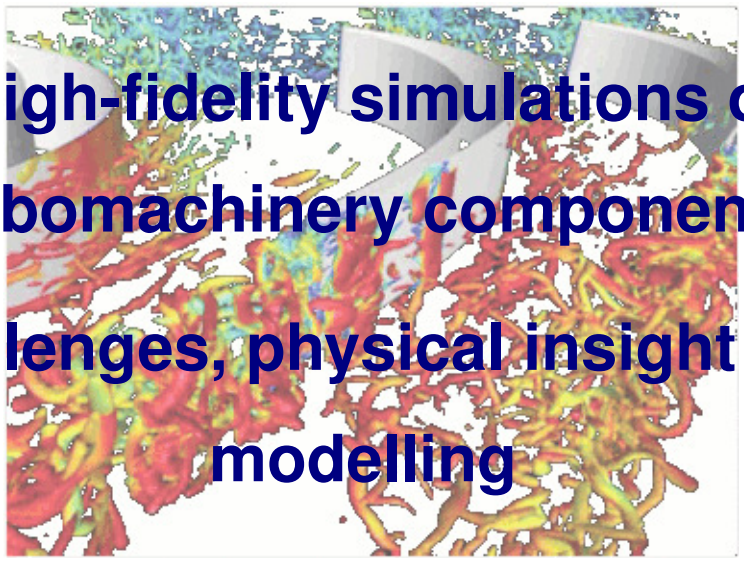

High-fidelity simulations of turbomachinery components: challenges, physical insight and modelling

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CFD predictions are becoming increasingly important in the design of gas turbines because correlation based methods are unable to further improve efficiency and laboratory experiments with the required fidelity are prohibitively expensive.

Although first-principles based simulations are most accurate, the excessive computational cost preclude their use in a design context and therefore modelling is required. However, the inaccuracies introduced by RANS-based CFD approaches limits the impact CFD can have on technology development.

In this presentation, some of the inherent model errors will be described and a novel machine-learning based approach will be introduced that uses high-fidelity data to improve turbulence closures. It will be shown that closure models developed using the gene-expression programming approach outperform traditional models both for the cases they were trained on and for cases not seen before. The challenges associated with running high-fidelity simulations will also be presented and some physical insights gained from those will be shown.

Friday June, 8th 2018 - 3:00 p.m.

School of Engineering

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