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Two Applications Using Low-Fidelity Models: Digital Twins and Uncertainty Propagation

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ABSTRACT In this talk, we explore two applications of low-fidelity models: digital twinning and uncertainty propagation. Both applications rely on reduced-order linear models of wind turbines but are used in distinct ways. The digital twin model integrates linear models of the wind turbine with measurements from the TetraSpar prototype, installed off the coast of Norway, to enable virtual sensing. We aim to determine whether we can accurately estimate loads and fatigue on a floating wind turbine using a limited set of measurements. The uncertainty propagation application investigates methods to incorporate the stochastic nature of inputs, such as wind and waves. The current approach relies on a brute-force method, simulating thousands of load cases. Can we instead account for this stochasticity directly?

BIO Emmanuel Branlard is an associate professor of Mechanical Engineering at the University of Massachusetts (UMass) Amherst, focusing on multiphysics (aero-hydro-servo-elastic) modelling of wind turbines, using mid-to-low fidelity models, and open-source tools such as OpenFAST. Before that, Emmanuel worked at the National Renewable Energy Laboratory, Orsted, and the Technical University of Denmark.