

# Data-driven Reduced Order Modeling for Accelerating Naval Design and Optimization

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Reduced Order Modeling (ROM) offers an efficient approach to mitigating the high computational cost associated with simulation-based design and optimization. Proper Orthogonal Decomposition (POD) is a widely used reduction technique that enables the fast and efficient solution of parametric PDEs by leveraging a limited set of precomputed numerical solutions. However, when applied to nonlinear physics and complex geometries, additional numerical treatments may be required to maintain the desired accuracy. In this study, we present several applications where a reduction-based framework has been employed to decrease the computational burden of hull and propeller optimization. We discuss the deformation techniques used and their integration within a numerical pipeline. Additionally, we focus on non-intrusive POD and machine learning frameworks. Finally, we explore the optimization strategy, demonstrating the use of a genetic algorithm to navigate the non-convex solution manifold of the reduced model.