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Extensive cavitation tunnel acoustic characterization of controllable pitch propellers for the development of a machine learning tool

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For the propeller acoustic characterization, experimental tests in model scale are the currently established methods, however they are affected by uncertainties mostly due to scale effects. For this reason, it is difficult to consistently reproduce in model scale some of full scale functioning conditions.

To overcome this it is interesting to define empirical formulations to shape the most significant cavitating phenomena in terms of URN spectrum. A suitable approach for the determination of such formulations may consist in the experimental characterization of model propellers collecting a large amount of data such to accurately describe propeller functioning conditions and related noise emissions. Collected data should be then analysed to extrapolate desired formulations exploiting advanced data analysis technics. Within these, machine learning methods represent one of the most promising solutions.

In the present work the acoustical characterization of two propellers, performed at the University of Genoa cavitation tunnel, is presented. The collected sample includes cavitation buckets, noise spectra, pressure pulses and photos picked up at various pitches, different incoming flow and in many functioning points, even in off design conditions.

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