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Data-driven analysis of vortex dynamics around a sinusoidally pitching airfoil[1] KARTHIK MENON, RAJAT MITTAL, Johns Hopkins University — Data-driven methods to analyze fluid flows have been recently gaining popularity in many subdomains of fluid dynamics. This has been primarily driven by our improved ability to generate large, high-quality data sets, and efforts to extract patterns from large amounts of data in an efficient manner. This talk will describe our work to understand the dynamics of aeroelastic flutter from one such data set consisting of over 500 simulations of a sinusoidally pitching airfoil under different conditions. In particular, the focus will be on the analysis of the vortex dynamics close to the surface of the airfoil as well as in the wake, which is instrumental in driving flutter. We describe a novel dynamic mode decomposition (DMD) formulation that allows us to decompose the flow in the vicinity of the moving airfoil and also discuss data-driven clustering methods to identify distinct vortex patterns in this complex flow.

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