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**Learning to classify wakes from local sensory information** MOHAMAD ALSALMAN, BRENDAN COLVERT, EVA KANSO, Univ of Southern California, KANSO TEAM — Aquatic organisms exhibit remarkable abilities to sense local flow signals contained in their fluid environment and to surmise the origins of these flows. For example, fish can discern the information contained in various flow structures and utilize this information for obstacle avoidance and prey tracking. Flow structures created by flapping and swimming bodies are well characterized in the fluid dynamics literature; however, such characterization relies on classical methods that use an external observer to reconstruct global flow fields. The reconstructed flows, or wakes, are then classified according to the unsteady vortex patterns. Here, we propose a new approach for wake identification: we classify the wakes resulting from a flapping airfoil by applying machine learning algorithms to local flow information. In particular, we simulate the wakes of an oscillating airfoil in an incoming flow, extract the downstream vorticity information, and train a classifier to learn the different flow structures and classify new ones. This data-driven approach provides a promising framework for underwater navigation and detection in application to autonomous bio-inspired vehicles.

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