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Local Learning Strategies for Wake Identification BRENDAN COLVERT, MOHAMAD ALSALMAN, EVA KANSO, Univ of Southern California — Swimming agents, biological and engineered alike, must navigate the underwater environment to survive. Tasks such as autonomous navigation, foraging, mating, and predation require the ability to extract critical cues from the hydrodynamic environment. A substantial body of evidence supports the hypothesis that biological systems leverage local sensing modalities, including flow sensing, to gain knowledge of their global surroundings. The nonlinear nature and high degree of complexity of fluid dynamics makes the development of algorithms for implementing localized sensing in bioinspired engineering systems essentially intractable for many systems of practical interest. In this work, we use techniques from machine learning for training a bioinspired swimmer to learn from its environment. We demonstrate the efficacy of this strategy by learning how to sense global characteristics of the wakes of other swimmers measured only from local sensory information. We conclude by commenting on the advantages and limitations of this data-driven, machine learning approach and its potential impact on broader applications in underwater sensing and navigation.

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