Machine Learning Model of Flow Interactions in Large Schools[1]

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Computations are presented for two, three, four and more foils pitching about their
leading edges and aligned side-by-side. A simple superposition model is developed
from two-body interactions to predict the thrust, efficiency, and lift acting on three
interacting swimmers, by decomposing the three-body interactions into two two-
body interactions. However, the simple model fails to capture nonlinearities that are
present when the swimmers are in close proximity. To accurately predict the three-
body interactions, a machine learning model is developed to capture the residual
nonlinearities not predicted by the superposition model. Finally, this model is used
to predict the performance of schools with more than three bodies, which is verified
with targeted simulations of many-body interactions.

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