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Learning Flow Regimes from Snapshot Data MAZIAR HEMATI, Univ of Minnesota - Twin Cities — Fluid flow regimes are often categorized based on the qualitative patterns observed by visual inspection of the flow field. For example, bluff body wakes are traditionally classified based on the number and groupings of vortices shed per cycle (e.g., 2S, 2P, P+S), as seen in snapshots of the vorticity field. Subsequently, the existence and nature of these identified flow regimes can be explained through dynamical analyses of the fluid mechanics. Unfortunately, due to the need for manual inspection, the approach described above can be impractical for studies that seek to learn flow regimes from large volumes of numerical and/or experimental snapshot data. Here, we appeal to established techniques from machine learning and data-driven dynamical systems analysis to automate the task of learning flow regimes from snapshot data. Moreover, by appealing to the dynamical structure of the fluid flow, this approach also offers the potential to reveal flow regimes that may be overlooked by visual inspection alone. Here, we will introduce the methodology and demonstrate its capabilities and limitations in the context of several model flows.

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