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## Current structures and reconnection events analysis in hybrid-kinetic turbulence simulations using unsupervised machine learning

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Kinetic turbulence in magnetized space plasmas has been extensively studied via in situ observations, numerical simulations and theoretical models. In this context, a key point concerns the formation of coherent current structures and their disruption through magnetic reconnection. As of today, reconnection can only be accurately identified by human analysis. We are setting-up a machine learning unsupervised technique aimed at automatically detecting the presence of current sheet (CS) magnetic structures where reconnection is occurring. We make use of anomaly detection and clustering techniques. We are applying these techniques to 2D kinetic HVM (Hybrid Vlasov Maxwell) plasma turbulence simulations, where ions evolve by solving the Vlasov equation and the electrons are treated as a fluid. Electron inertia is included. The final goal is to build up an algorithm able to select data subsets starting from big data sets where potentially interesting physical processes are at play. After that, we intend to extend the technique to space data and to 3D simulation data.

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