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Using Machine Learning to Determine the Velocity Information Content in OH-PLIF Images SHIVAM BARWEY, MALIK HASSANALY, VENKAT RAMAN, University of Michigan, ADAM STEINBERG, Georgia Institute of Technology — This study determines the velocity field information contained purely in OH-PLIF images in the closed domain of a premixed swirl combustor. A fully convolutional neural network (CNN) is used with a dataset containing simultaneous OH-PLIF and PIV measurements in both attached and detached flame regimes. To facilitate the study, the CNN represents a direct projection from OH-PLIF to PIV field. Two types of models are trained: 1) a global CNN which is trained using images from the entire domain, and 2) a set of local CNNs which are trained only on individual sections of the domain. Local models show improvement in creating PIV fields in both attached and detached regimes over the global models in most settings. A comparison between model performance in attached and detached regimes shows that the CNNs are much more accurate across the board in creating velocity fields for attached flames. Further, time history inclusion in the OH fields is also studied, as is the ability of the model to extrapolate to unexplored regions of the domain. Ultimately, this work shows that there is redundant information in the OH-PLIF images, and can open the door for the development of diagnostic tools that decrease the overlapping content between simultaneously measured fields.

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