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Deep optical flow for experimental fluid dynamics: sensitivity to network training DAIKI KURIHARA, HIROTAKA SAKAUE, GIANLUCA BLOIS, DANIELE SCHIAVAZZI, University of Notre Dame — New advances in non-invasive medical imaging are emerging which hold promise to revolutionize patient screening and early disease detection. Optical flow through deep convolutional neural networks have shown significant promise. We utilize the LiteFlowNet[1], which is state-of-the-art architecture. LiteFlowNet with pre-trained weights shows a volatile performance on particle flows when compared to standard techniques in PIV. We first investigate how this depends on the specific examples seen during training and on the training modality (staged or end-to-end). We then train using a new dataset generated based on a Rankine vortex flow configuration, solutions to Stokes first and second problems, and CFD dataset from the literature[2]. Finally, we discuss the integration of prediction uncertainty in the LiteFlowNet architecture.
[1] Hui T-W., Tang X., Change Loy C., Liteflownet: A lightweight convolutional neural network for optical flow estimation, Proceedings of the IEEE conference on computer vision and pattern recognition, pp.8981-8989, June 18-22 2018, Salt Lake City, UT.
[2] Cai S., Zhou S., Xu C., Gao Q., Dense motion estimation of particle images via a convolutional neural network, Experiments in Fluids, 60(4), pp. 73, 2019.

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