Supplementary Material

This document provides descriptions of the supplementary videos associated with this manuscript. Using several representative experimental datasets, these videos are intended to illustrate the performance of the "RAFTcorr" code package and its GUI to resolve full-field displacement, velocity, and strain fields.

1. Video S1: GUI Demonstration and Workflow

This video demonstrates the RAFTcorr graphical user interface (GUI), including data loading, region-of-interest (ROI) selection, displacement and strain visualization, and real-time probe analysis. The workflow highlights the end-to-end "input-to-result" process without manual parameter tuning.

2. Video S2: Full-Field Displacement in Uniaxial Tensile Test

This video presents representative full-field displacement maps obtained from an aluminum specimen under uniaxial tension [1]. The results illustrate the dense, pixel-wise tracking capability of RAFTcorr throughout the deformation process.

3. Video S3: Von Mises Strain Evolution (Uniaxial Tension)

This video shows the corresponding von Mises strain field for the deformation presented in Video S2, highlighting the evolution of strain localization during loading.

4. Video S4: Velocity Field Tracking in Laser-Induced Cavitation

This video demonstrates RAFTcorr applied to tracking the transient velocity field near a laser-induced inertial cavitation event in a 10 wt% gelatin hydrogel [2]. The results illustrate the capability of the framework to capture rapid, high-gradient deformation.

5. Video S5: Velocity Streamlines in Cavitation Flow

This video visualizes the corresponding velocity streamlines derived from the displacement field in Video S4, providing insight into the local flow structure induced by cavitation.

6. Video S6: Mode I Fracture Tracking in Foam Material

This video presents displacement tracking during a Mode I fracture test on a foam specimen [3]. The results highlight RAFTcorr's ability to capture complex deformation patterns in fracture processes.

7. Video S7: Von Mises Strain in Fracture Test

This video shows the corresponding von Mises strain field for the deformation in Video S6, illustrating strain concentration and localization near the crack region.

References

[1] Leu, J., Tong, Z., Doty, A., Tsimpoukis, S., Deng, B., & Yang, J. (2026). Machine Learning-Aided Spatial Adaptation for Improved Digital Image Correlation Analysis of Complex Geometries. *Strain*, *62*(1), e70022.

[2] Yang, J., McGhee, A., Tong, Z., Radtke, G., Rodriguez Jr, M., & Franck, C. (2025). Inertial interface cavitation creates complex, flow-like structures within a soft solid. *bioRxiv*, 2025-02.

[3] Yang, J., Tao, J. L., & Franck, C. (2021). Smart digital image correlation patterns via 3D printing. *Experimental Mechanics*, *61*(7), 1181-1191.