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AdaFNIO: A Physics-Informed Adaptive Fourier Neural Interpolation Operator for Synthetic Frame Generation

Physics-informed AI generating sharper, higher fidelity video frames for science, robotics, and media.

Researchers at Purdue University have developed AdaFNIO, a physics-informed operator to generate synthetic frames to improve the quality and framerate of videos. Unlike alternative approaches, Purdue's method does not have to train on scaled or rotated training data because it uses physics principles to identify features in the frame. This results in synthetic frames with greater robustness and accuracy across a range of video types. AdaFNIO also has the potential to be used in audio applications, including in upscaling, noise reduction, and resampling. This technology can be used for frame interpolation for computer vision, scientific/medical video enhancement, and more. Relevant industries include: medical, AI and robotics, research and more.

Technology Validation: This technology has been benchmarked against other state-of-the-art models based on Structural Similarity (SSIM) and Peak Signal-to-Noise Ratio (PSNR) of the synthetic frames. On the 493 Vimeo90k dataset, AdaFNIO achieved the best PSNR (36.50). On the DAVIS 494 dataset, AdaFNIO achieved the best SSIM (0.888). AdaFNIO outperformed every other model on the DISFA+ 495 dataset.

Advantages:

-More accurate frame generation

-Higher visual fidelity

-Better signal-noise ratio and structural similarity compared to competing models

Applications:

-Video interpolation

Technology ID
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Category
Artificial Intelligence & Machine Learning/AI-Integrated Imaging Systems & Industrial Vision and Inspection

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-Scientific video enhancement

-Computer vision

-Time series analysis

-Audio processing

-Robotics and control systems

TRL: 3

Intellectual Property:

Provisional-Patent, 2023-07-03, United States

Utility Patent, 2024-06-28, United States

Keywords: video frame interpolation,synthetic frame generation,physics informed AI,high fidelity video enhancement,scientific video processing,AI upscaling,signal to noise optimization,computer vision interpolation,audio signal resampling,medical video analysis