Efficient Feature Extraction for High-resolution Video Frame Interpolation

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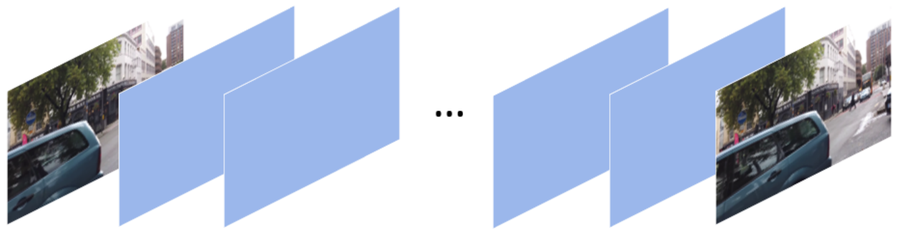
Code & Testset

Motivation

Goal: Computationally efficient method for high-resolution **video frame interpolation**

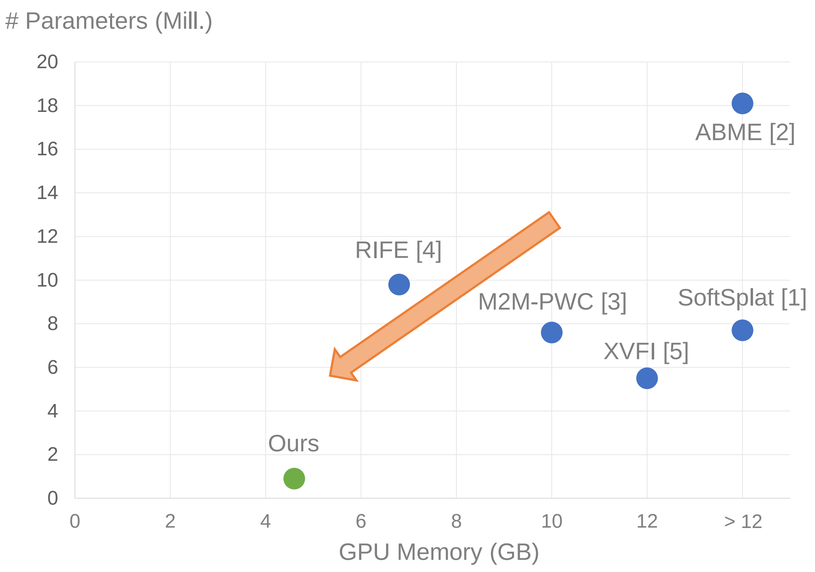


State-of-the-art Models

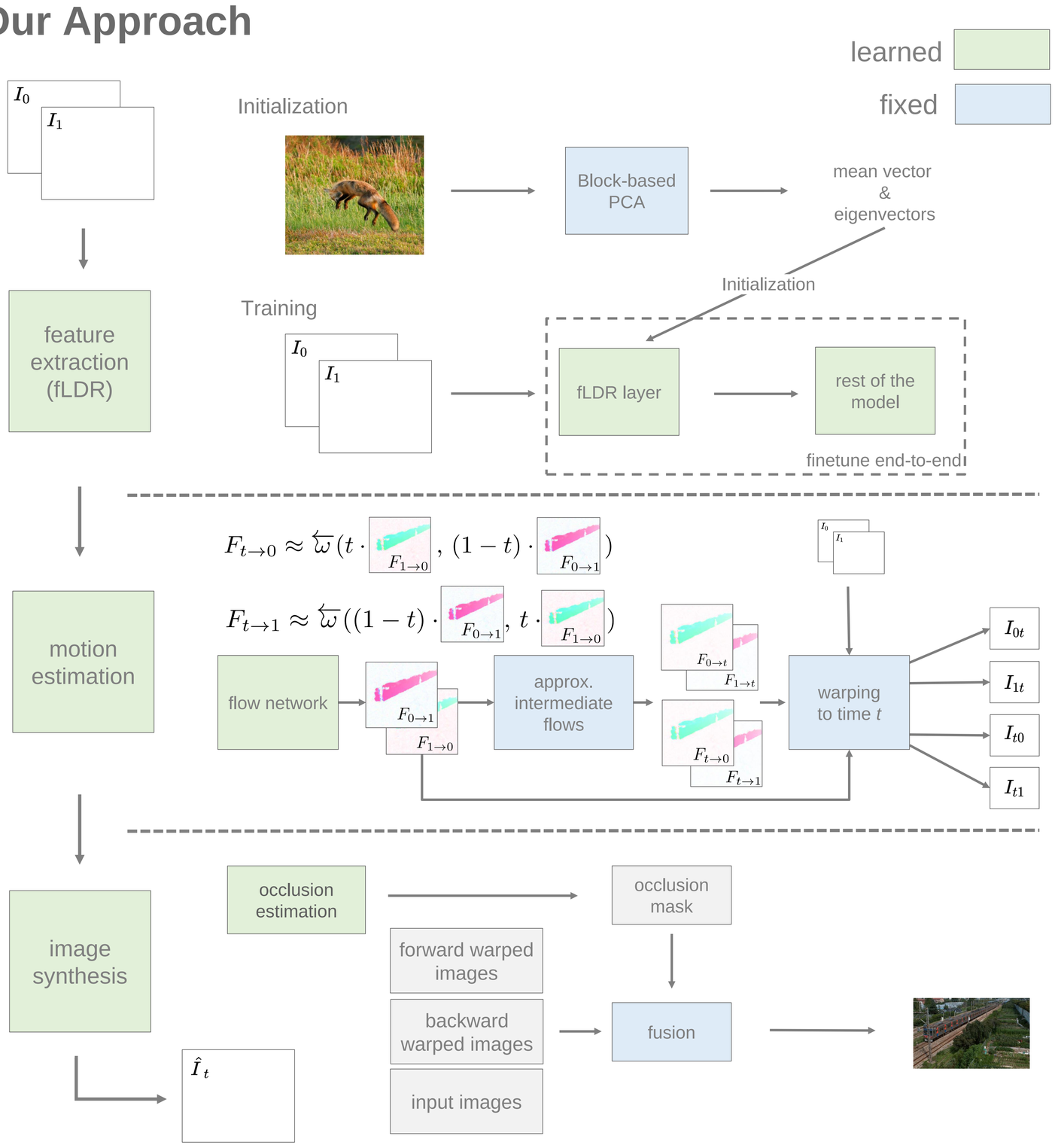
- High memory demands for 4K
- High model complexity

Our Approach

- Efficient feature extraction
- Lightweight overall framework



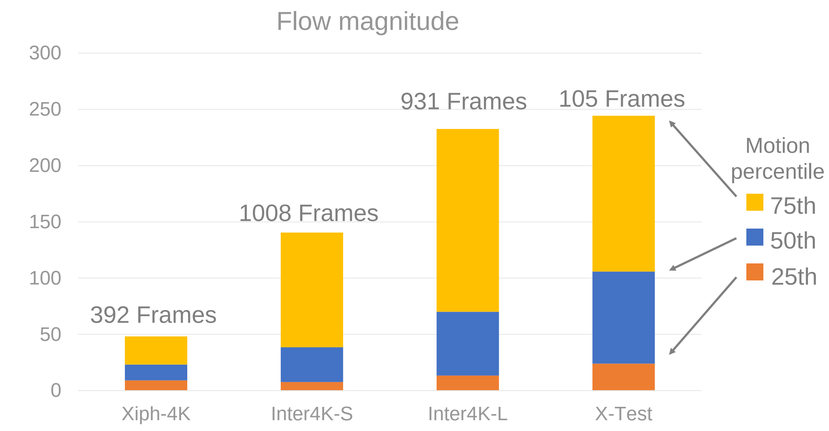
Our Approach



Inter4K Testset

New 4K testset for video frame interpolation

- >100 Scenes
- Sampled from Inter4K video dataset [6]
- More diverse motion

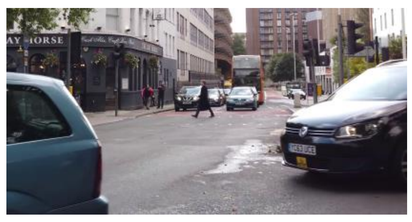


Qualitative Results

RIFE (ECCV 2022) [4]

M2M-PWC [3]

Ground truth



Ours

Quantitative Results

	Pretrained flow	# Param. (Mill.)	Memory (for 4K)	Training dataset	Xiph-4K (PSNR)	X-Test (PSNR)	Inter4K-S (PSNR)	Inter4K-L (PSNR)	Inference (in s/f)
M2M-PWC [1]	✓	7.6	10 GB	Vimeo90K	**34.88**	**30.81**	29.22	24.87	**0.21**
RIFE$_m$ [2]	✗	9.8	6.8 GB	Vimeo90K	34.80	26.80	28.37	24.40	0.40
XVFI [3]	✗	5.5	>12 GB	X-Train	34.04	30.34	28.82	24.62	–
Ours	✗	**0.9**	**4.6** GB	X-Train	34.16	30.45	**29.29**	**25.16**	0.51

Ablation

	# Param. (in Mill.)	Memory (for 4K)	X-Test	Inter4K-S
Ours (full)	0.9	4.6GB	30.45	29.29
w/o finetuning projection vectors	0.9	4.6GB	29.46	28.34
w/o backward flow ($F_{t\to0}$ & $F_{t\to1}$)	0.9	4.6GB	30.13	28.81
with synthesis	2.6	9.5GB	30.59	29.12

References & Disclosure of Funding

[1] Niklaus and Liu., Softmax splatting for video frame interpolation. In CVPR, 2020.
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[3] Hu et al., Many-to-many splatting for efficient video frame interpolation. In CVPR, 2022.
[4] Huang et al., Real-time intermediate flow estimation for video frame interpolation. In ECCV, 2022.
[5] Sim et al., XVFI: eXtreme video frame interpolation. In ICCV, 2021.
[6] Stergiou and Poppe., Adapool: Exponential adaptive pooling for information-retaining downsampling. arXiv:2111.00772 [cs.CV], 2021.

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3AI THE THIRD WAVE OF AI

erc European Research Council Established by the European Commission

Conclusion

- We propose the fLDR module, an efficient way to extract low-dimensional features for motion estimation.
- Our framework is overall lightweight in terms of memory and trainable parameters.
- We curate a new challenging 4K testset for frame interpolation.
- We achieve state-of-the-art accuracy on X-Test, Inter4K-S and Inter4K-L among approaches without pretrained flow.