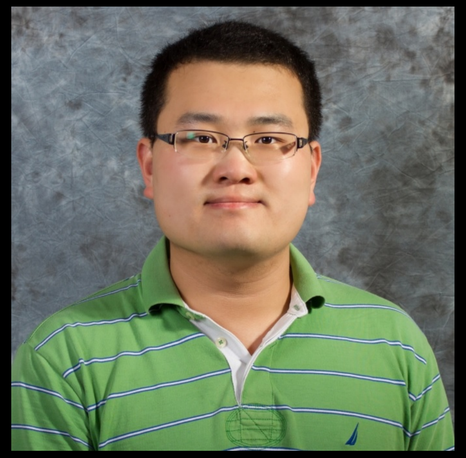
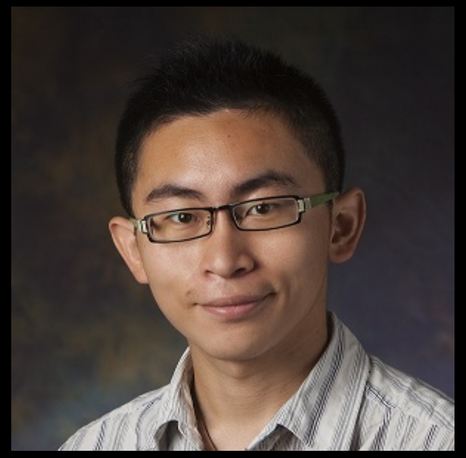
Flow-edge Guided Video Completion



Chen Gao
Virginia Tech

Ayush Saraf
Facebook



Jia-Bin Huang
Virginia Tech

Johannes Kopf
Facebook

VIRGINIA TECH™

facebook

Video Completion

Object removal

Input video

(green indicates the object to be removed)

Object-removed video

Video Completion

Stationary mask inpainting

Input video

(green indicates the occluded region)

Inpainted video

Frame Completion

Input frame

(green indicates the occluded region)

Inpainted frame

Frame Completion

Input video

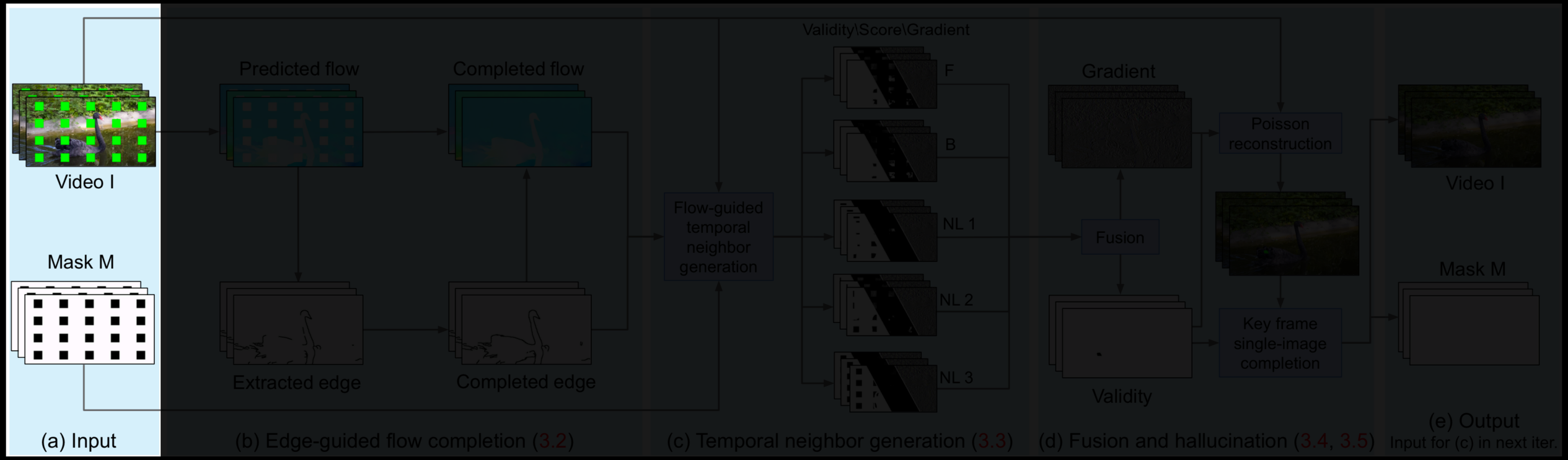
(green indicates the object to be removed)

Object-removed video

(inpaint frame by frame)

Method

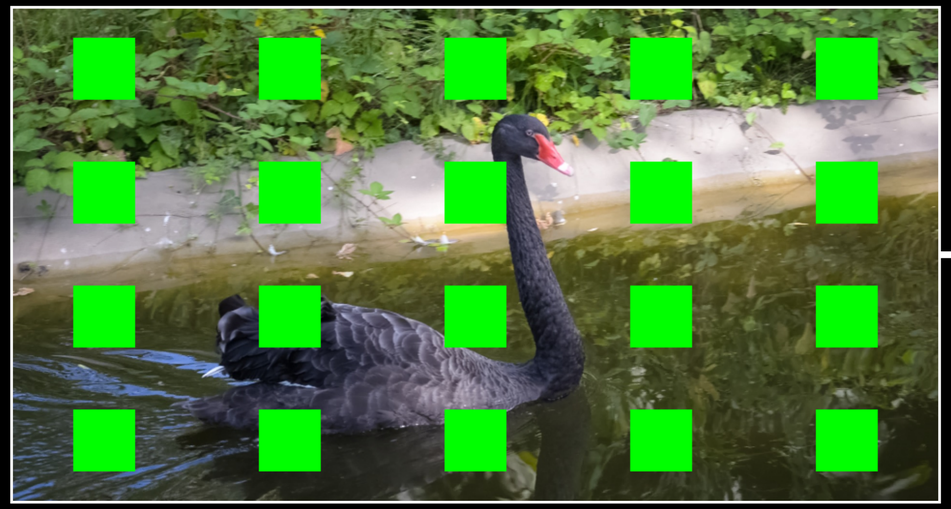
Overview



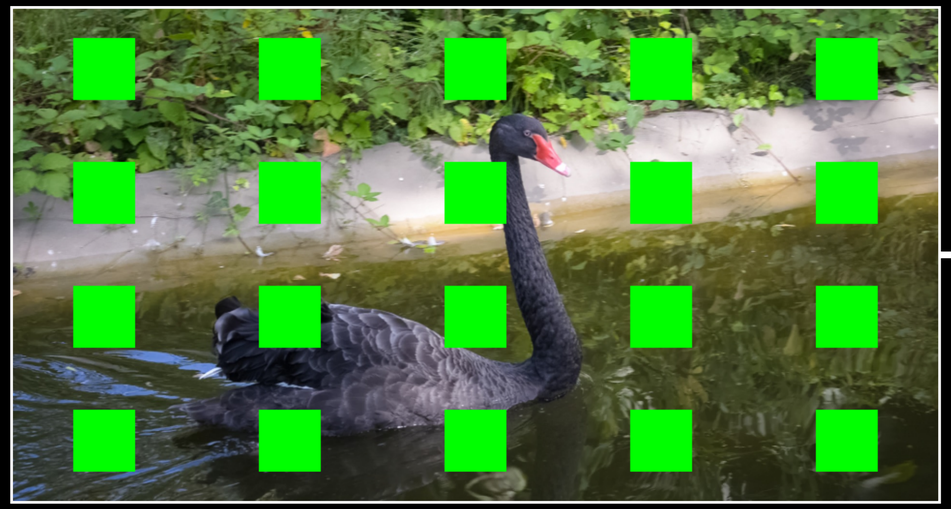
Flow completion

Color completion

Flow Completion



Frame I_i



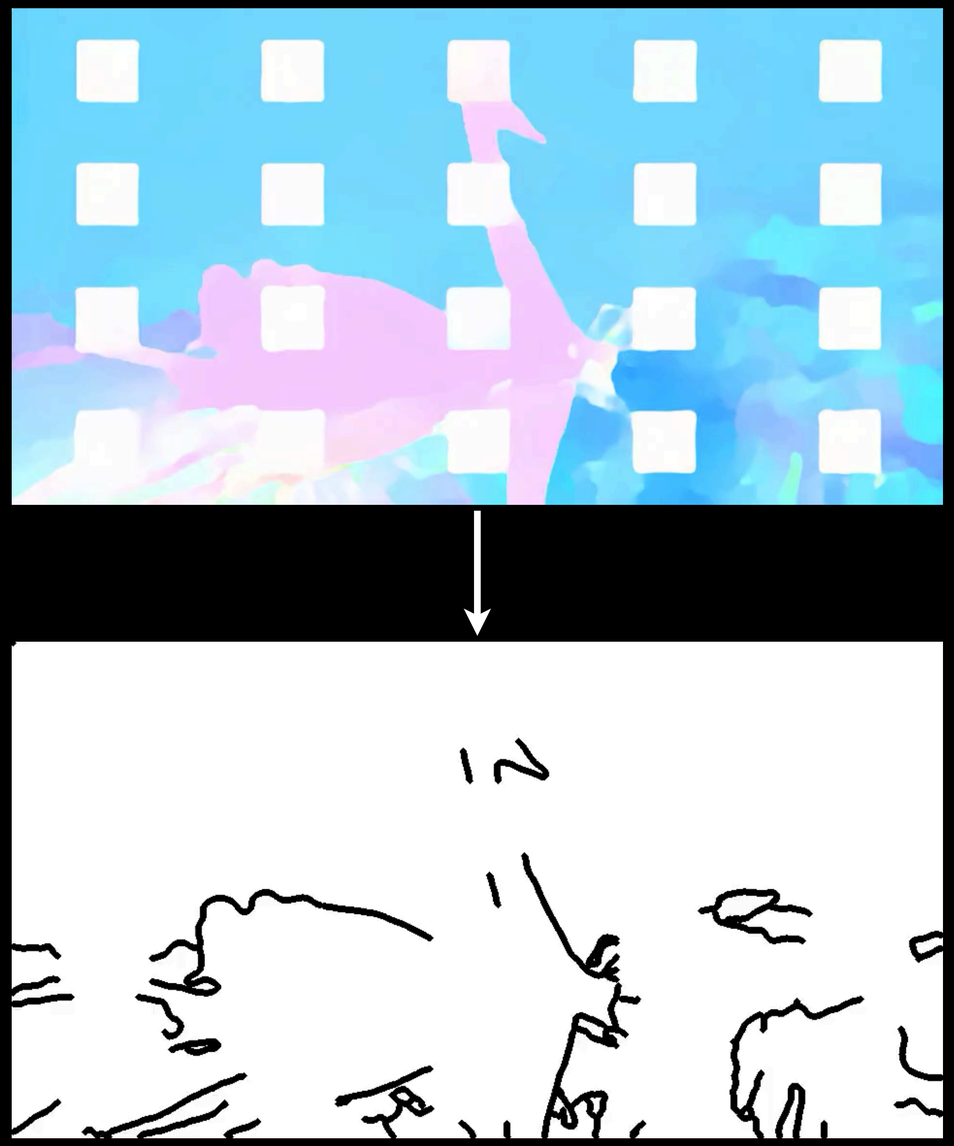
Frame I_j

FlowNet2

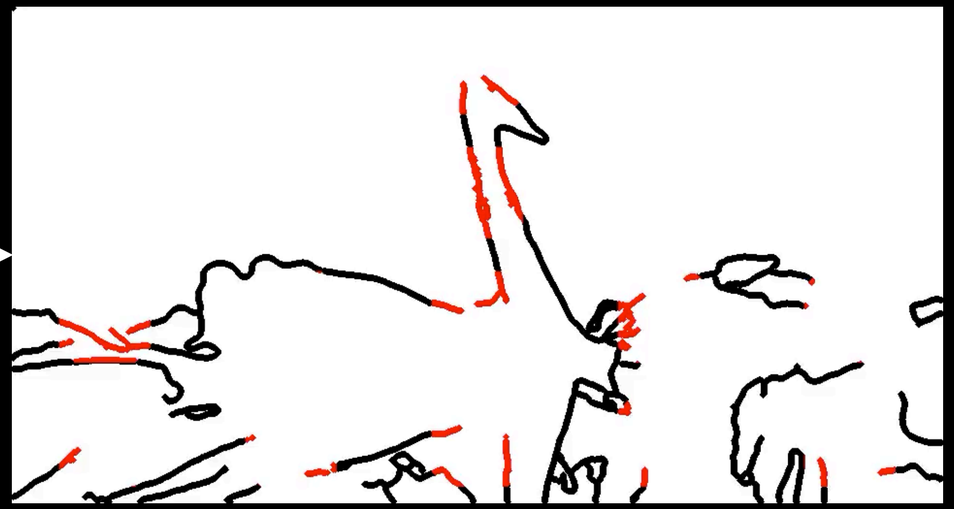
Flow $F_{i->j}$

Flow field
color encoding

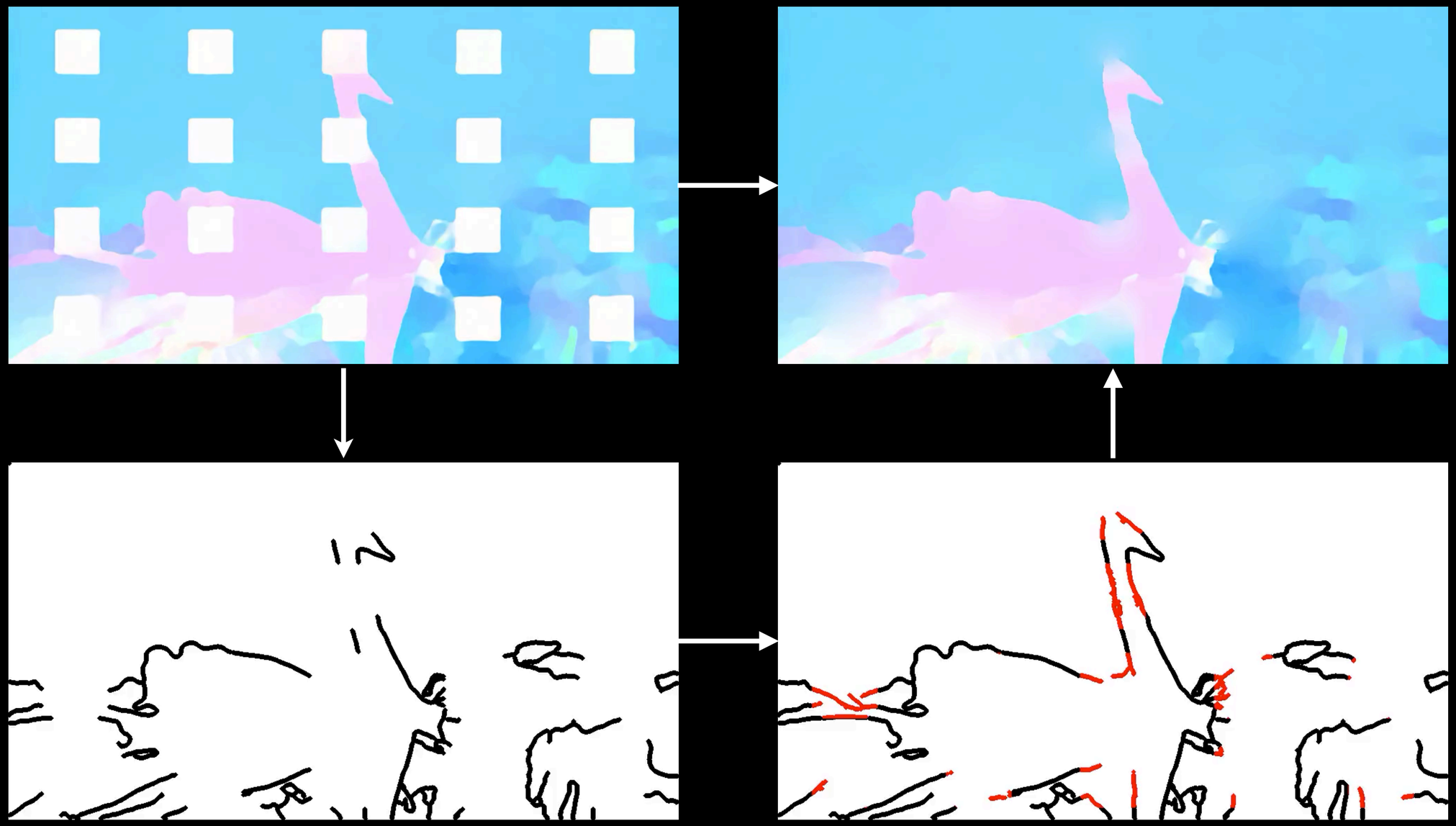
Flow Completion



Flow Completion



Flow Completion



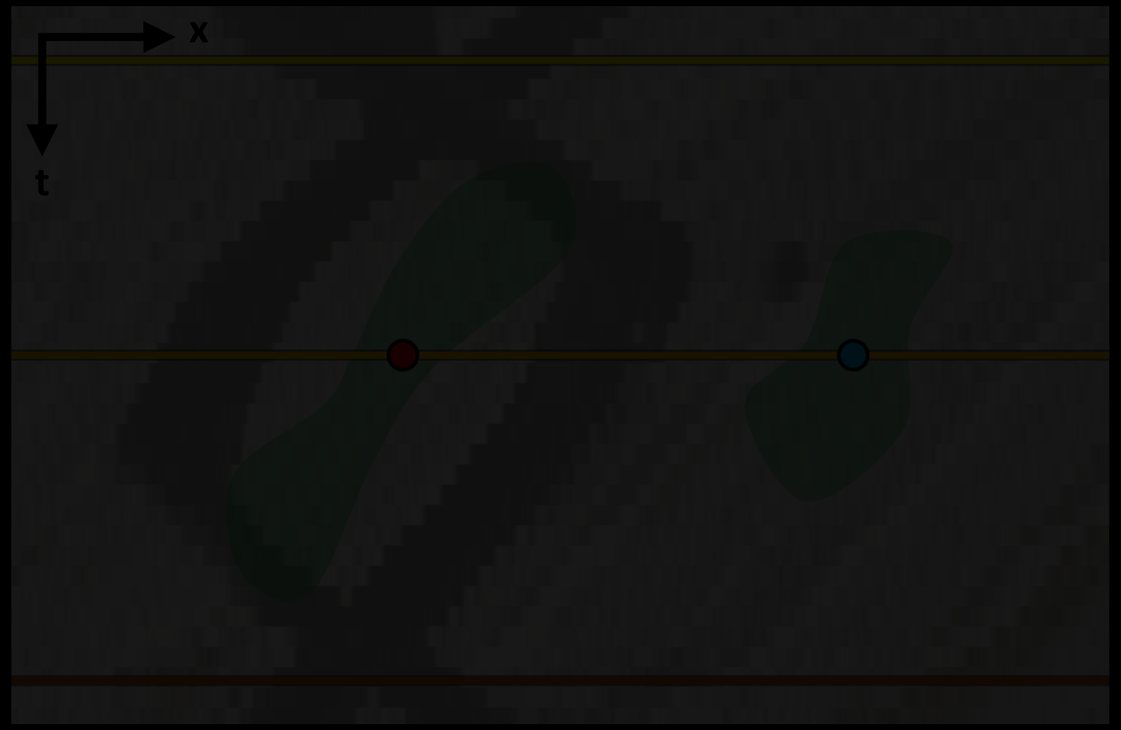
Color Completion

Find known temporal neighbor for each missing pixel

Early frame

Current frame

Later frame



Space-time

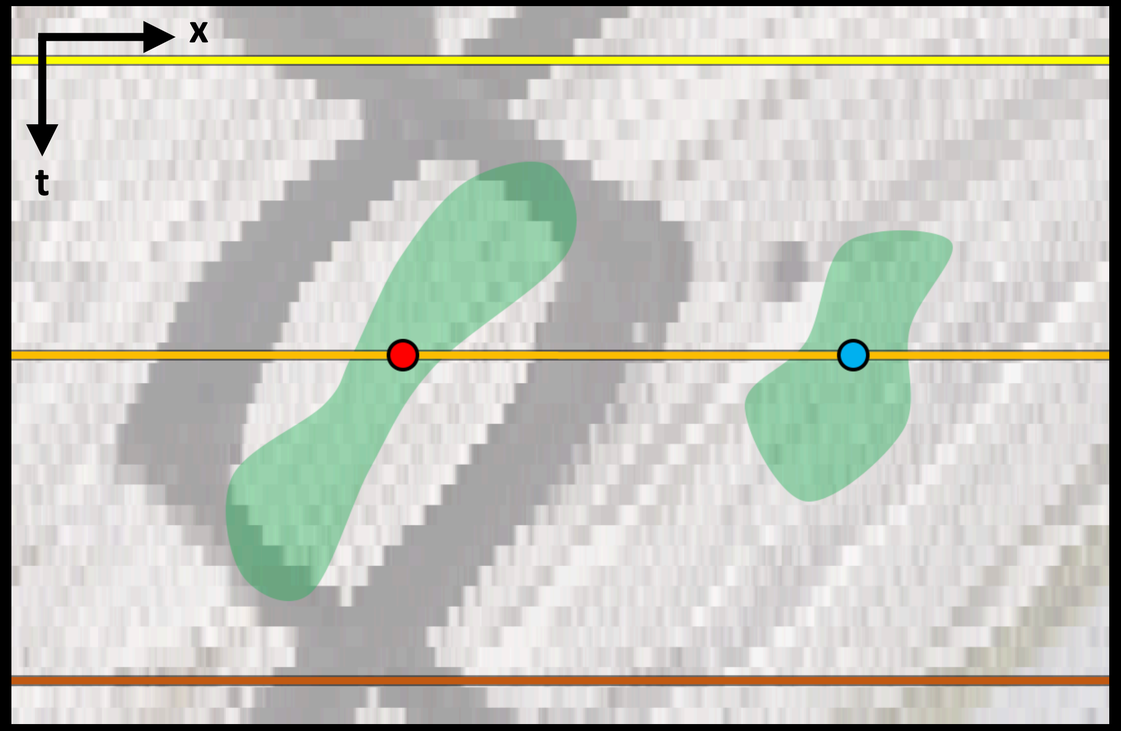
Color Completion

Find known temporal neighbor for each missing pixel

Early frame

Current frame

Later frame



Space-time

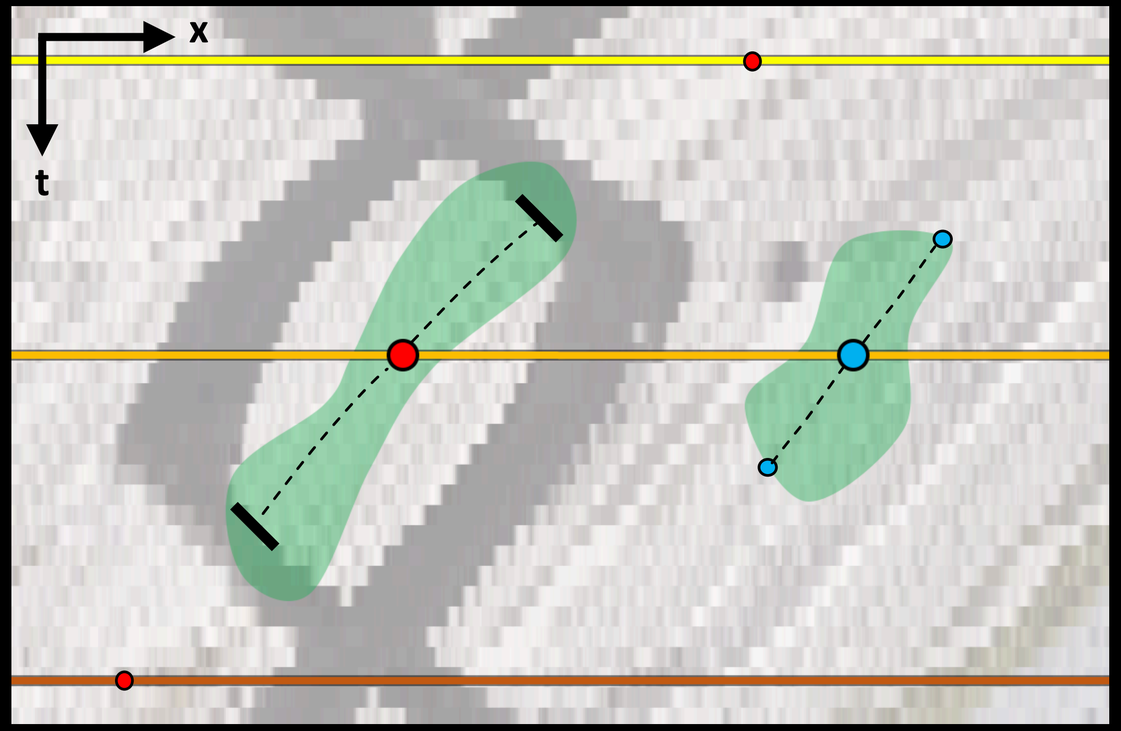
Color Completion

Find known temporal neighbor for each missing pixel

Early frame

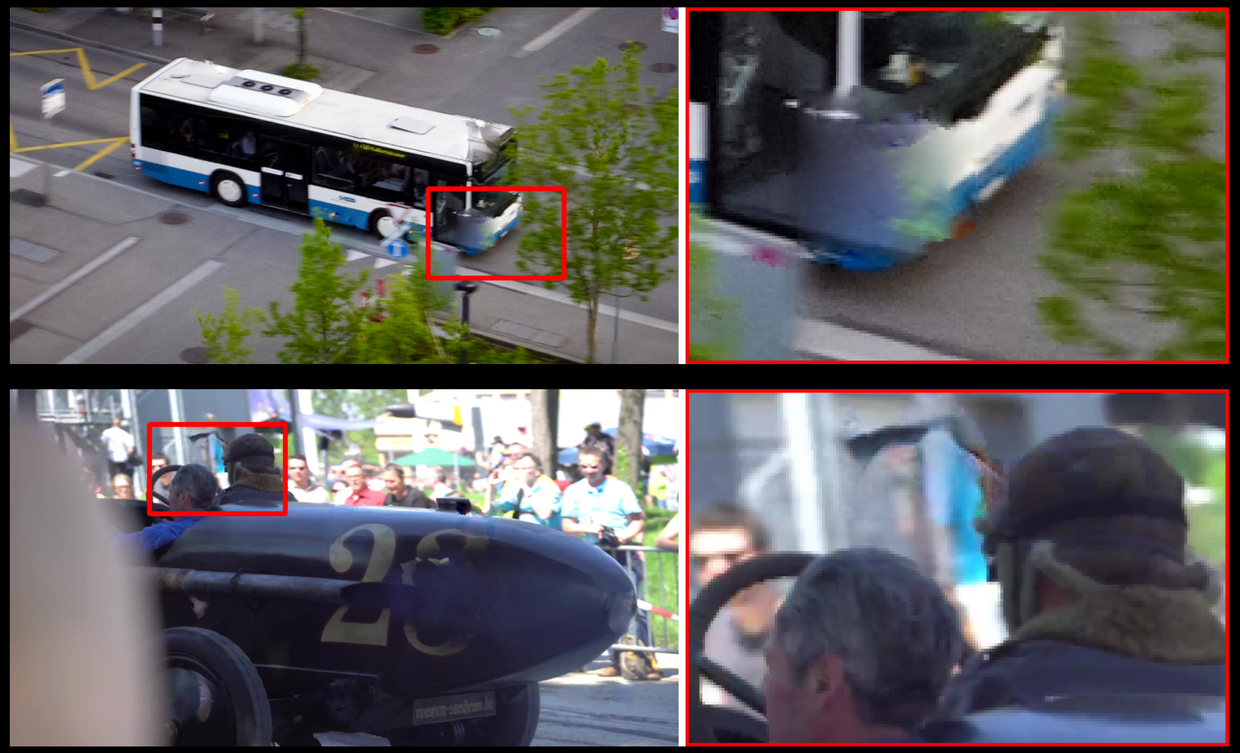
Current frame

Later frame

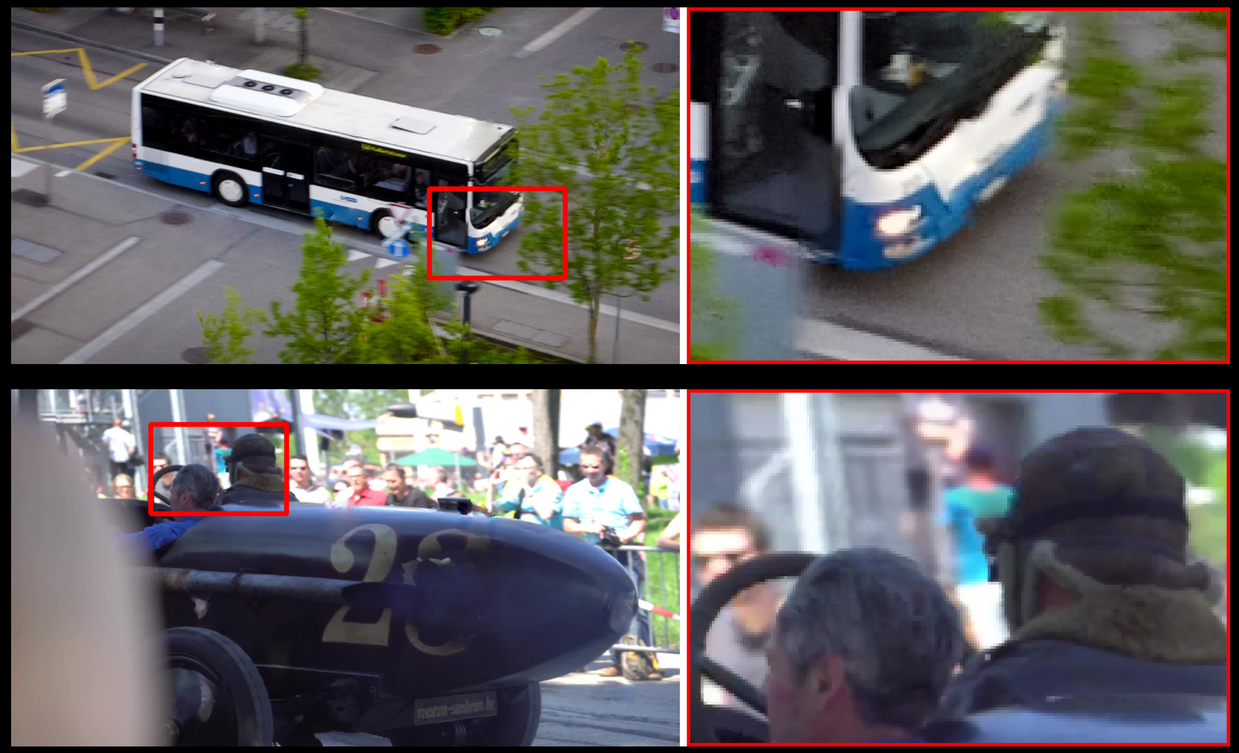


Space-time

Non-local Flow Neighbors

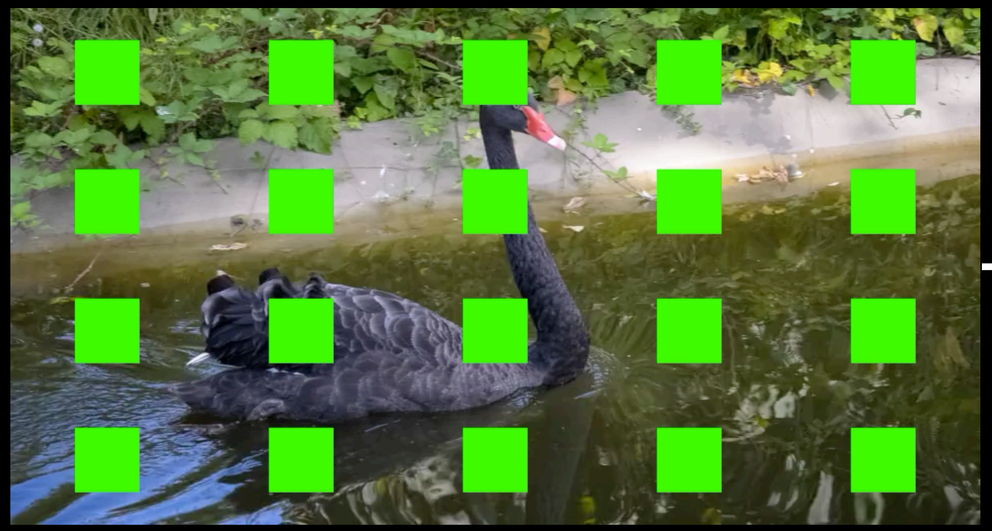


Without non-local neighbors



With non-local neighbors

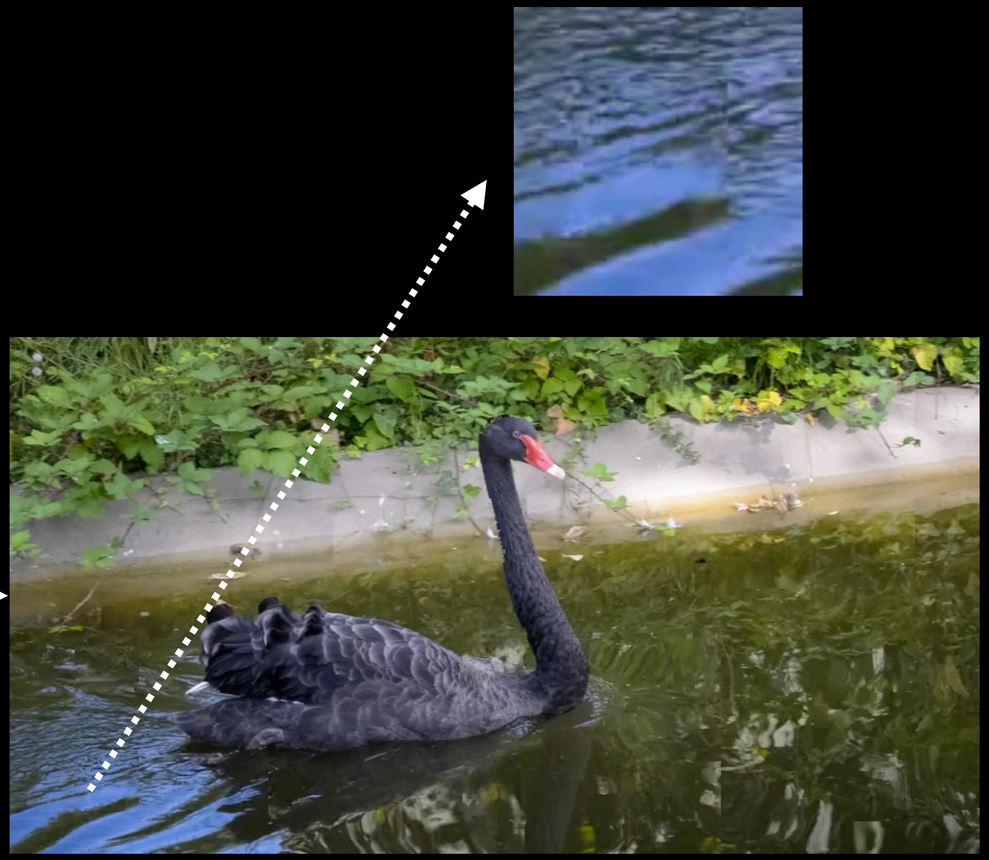
Color Completion



Input video

(green indicates missing region)

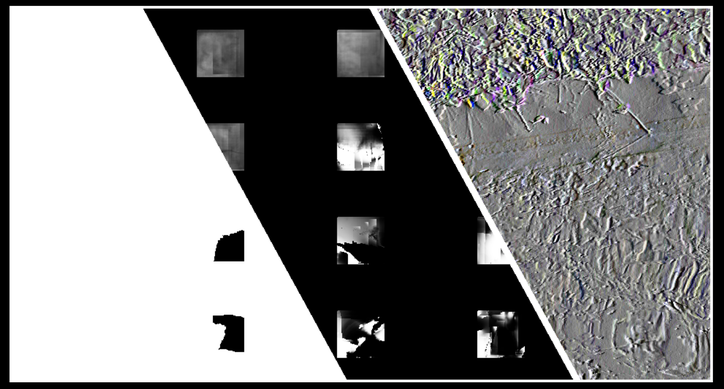
Color domain



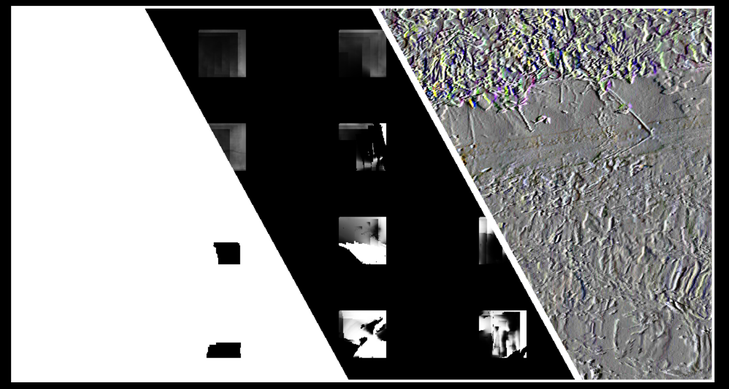
Completed video

Color Completion

Obtain local and non-local temporal neighbors as candidates

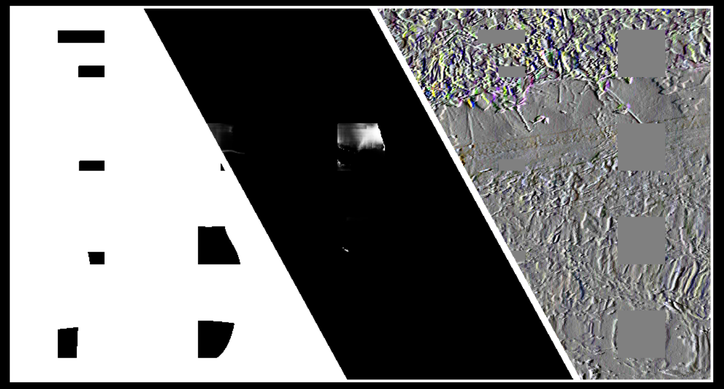


Forward flow neighbor

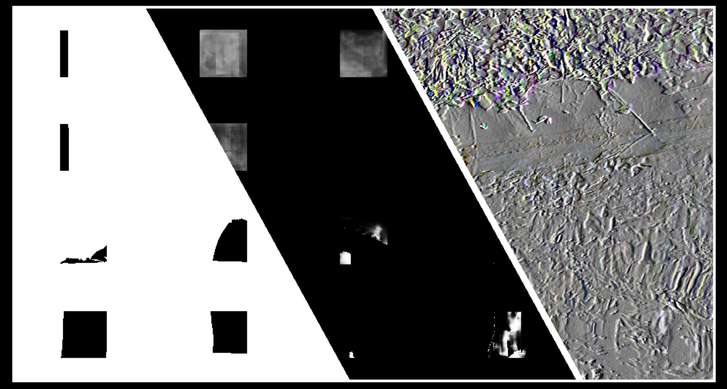


Backward flow neighbor

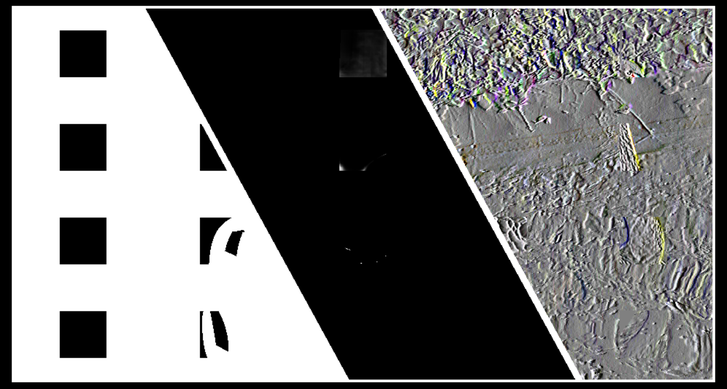
Validity \ Score \ Gradient



Non-local flow neighbor 1



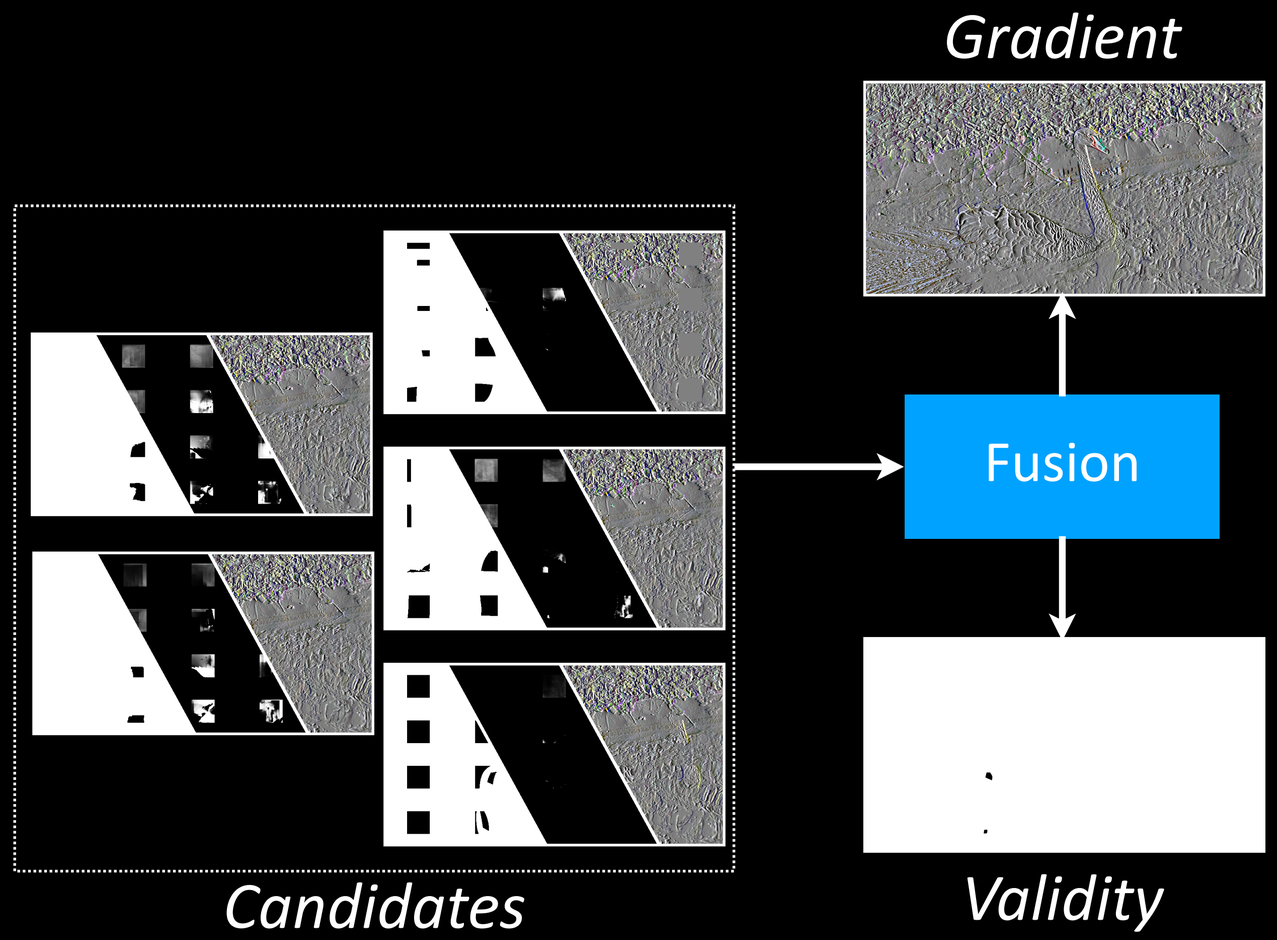
Non-local flow neighbor 2



Non-local flow neighbor 3

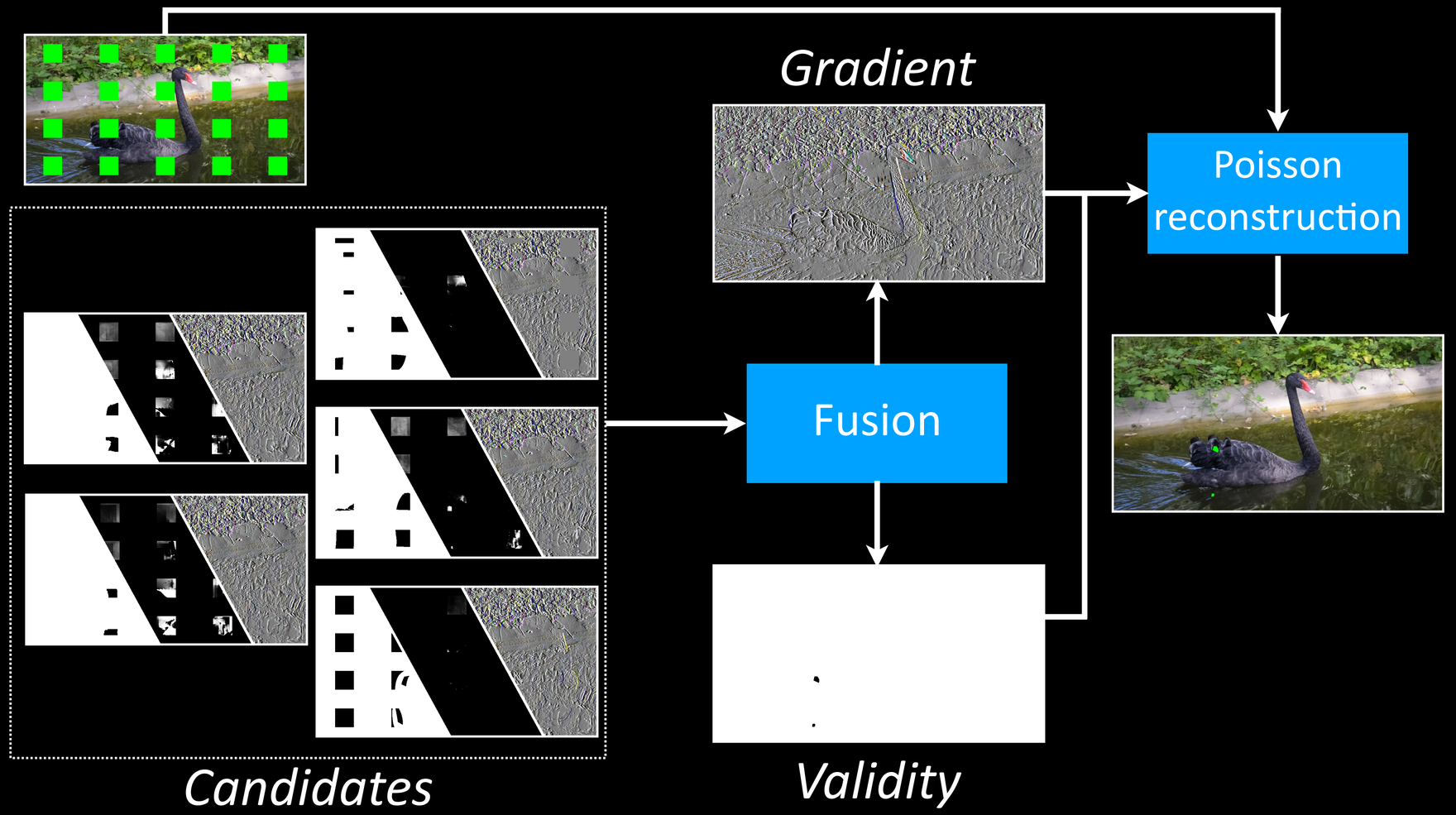
Color Completion

Fuse candidates in the gradient domain using confidence-weighted average



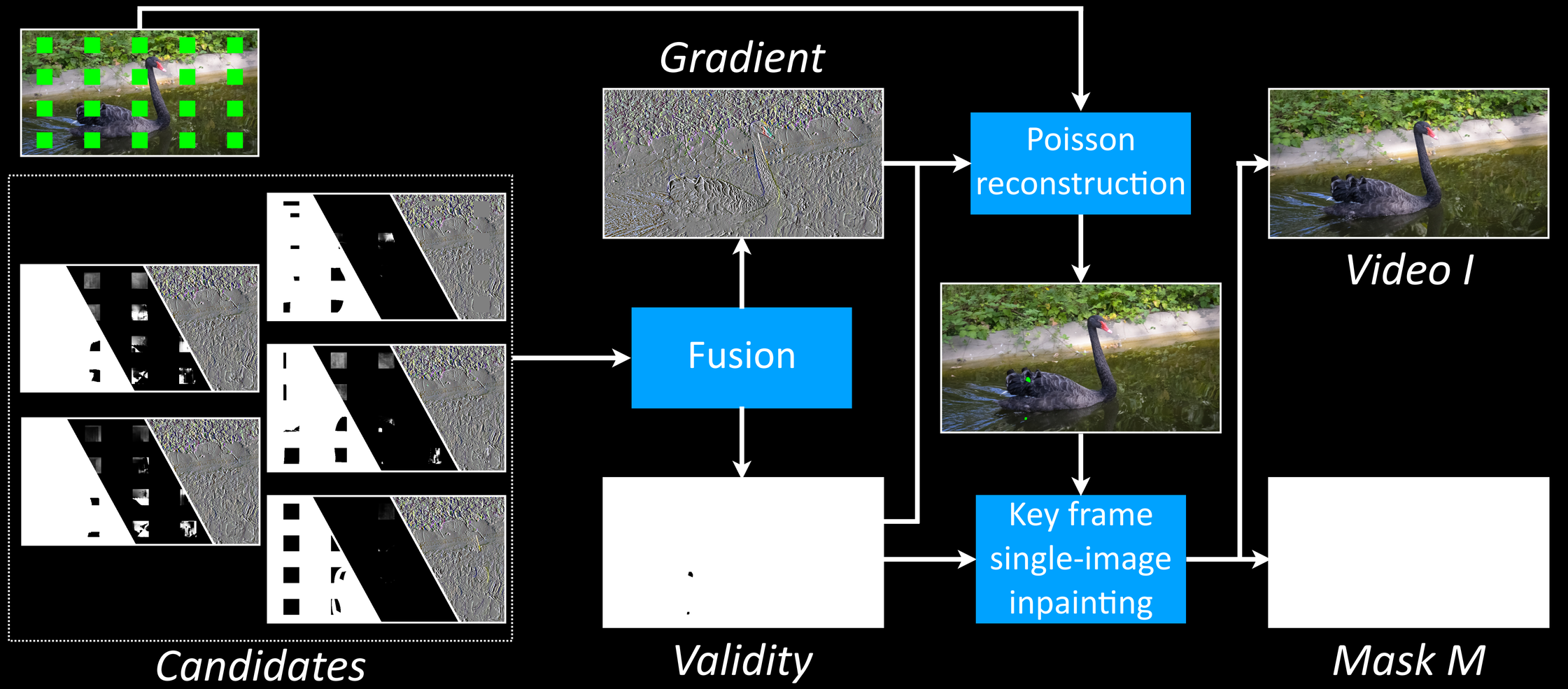
Color Completion

Reconstruct images by Poisson reconstruction



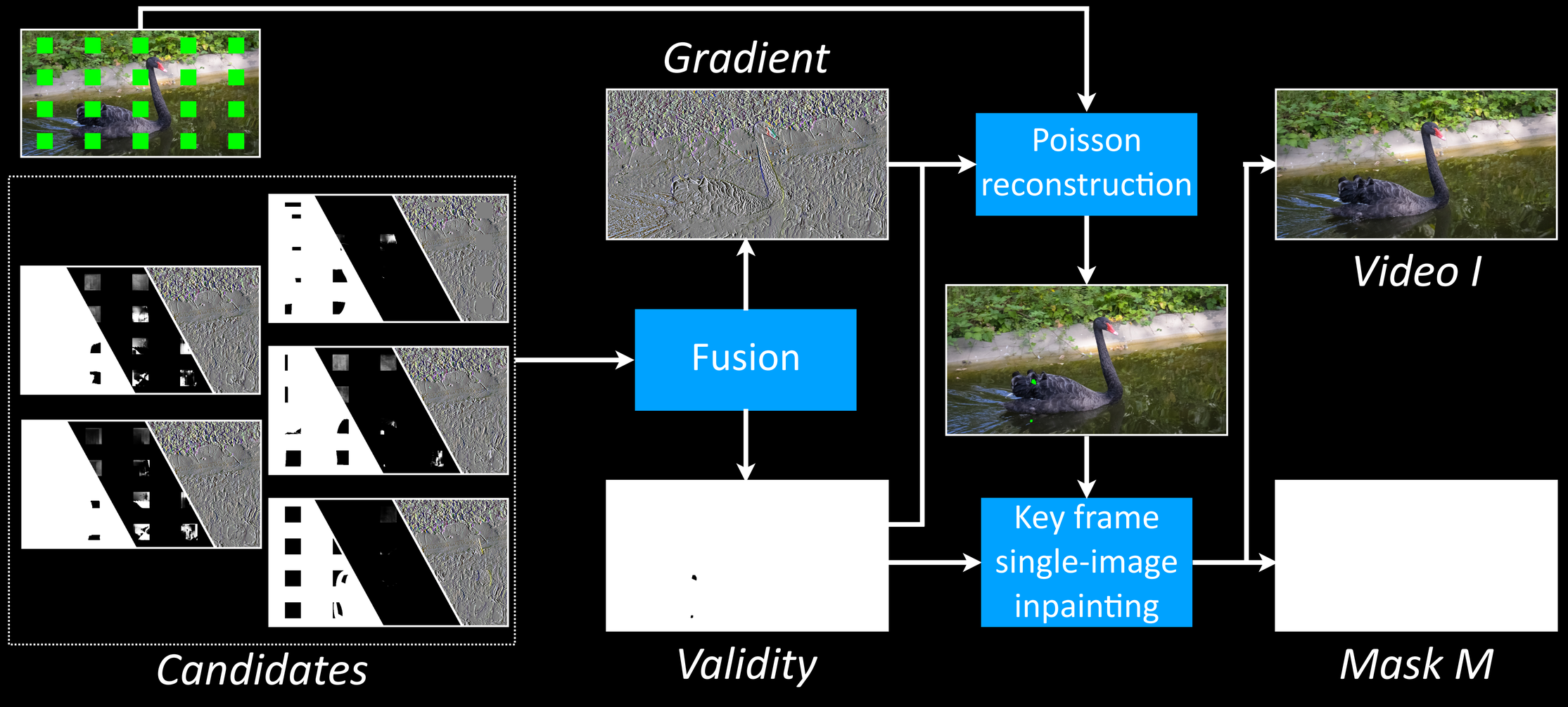
Color Completion

Pick a frame with most missing pixels and fill with spatial inpainting

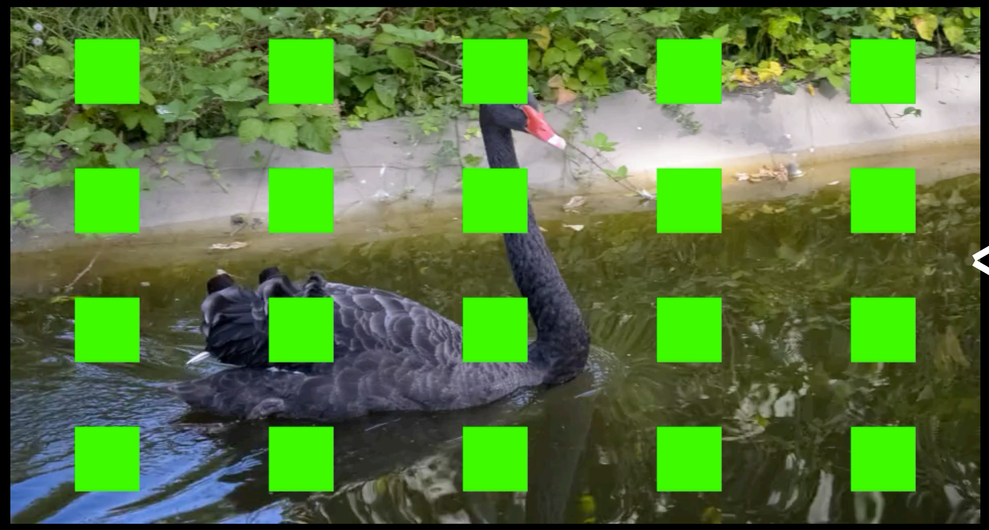


Color Completion

Pass the results into the next iteration until there is no missing pixel



Video Completion

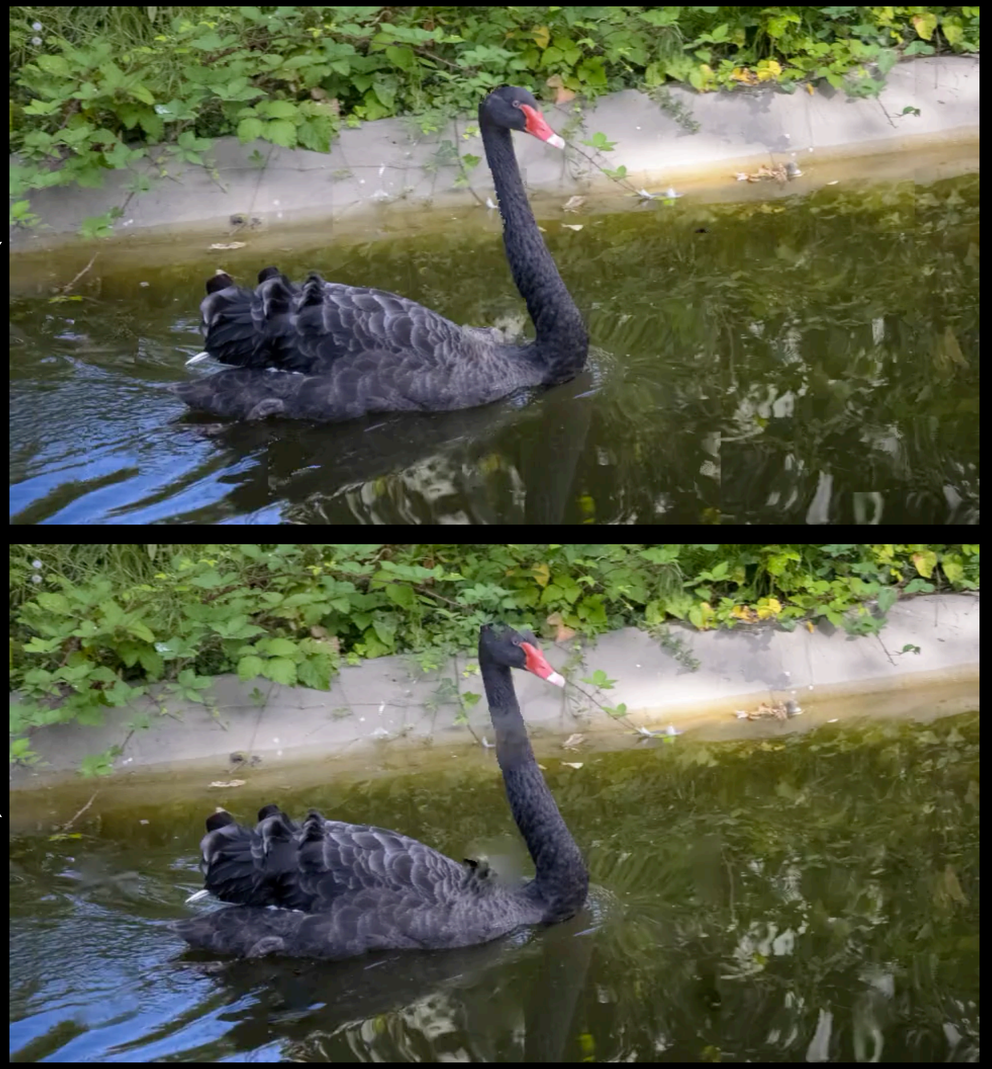


Input video

(green indicates missing region)

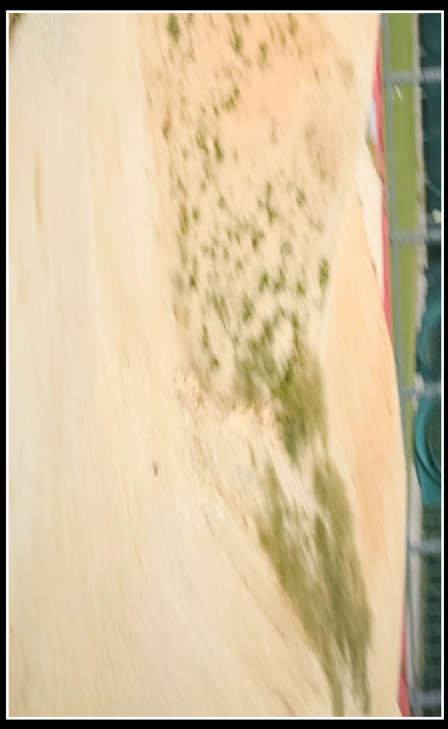
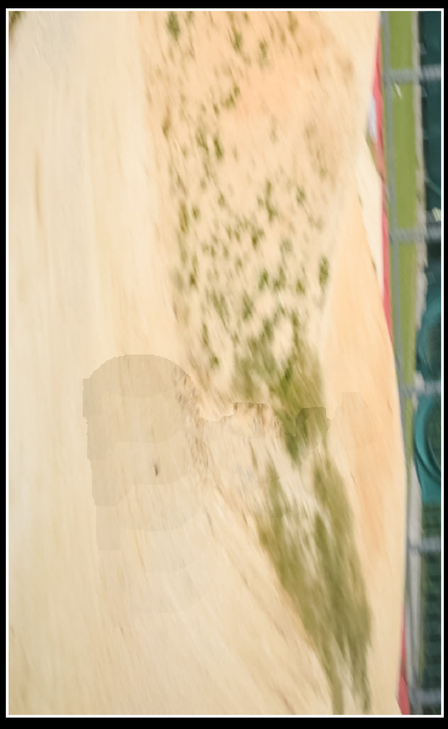
Color domain

Gradient domain

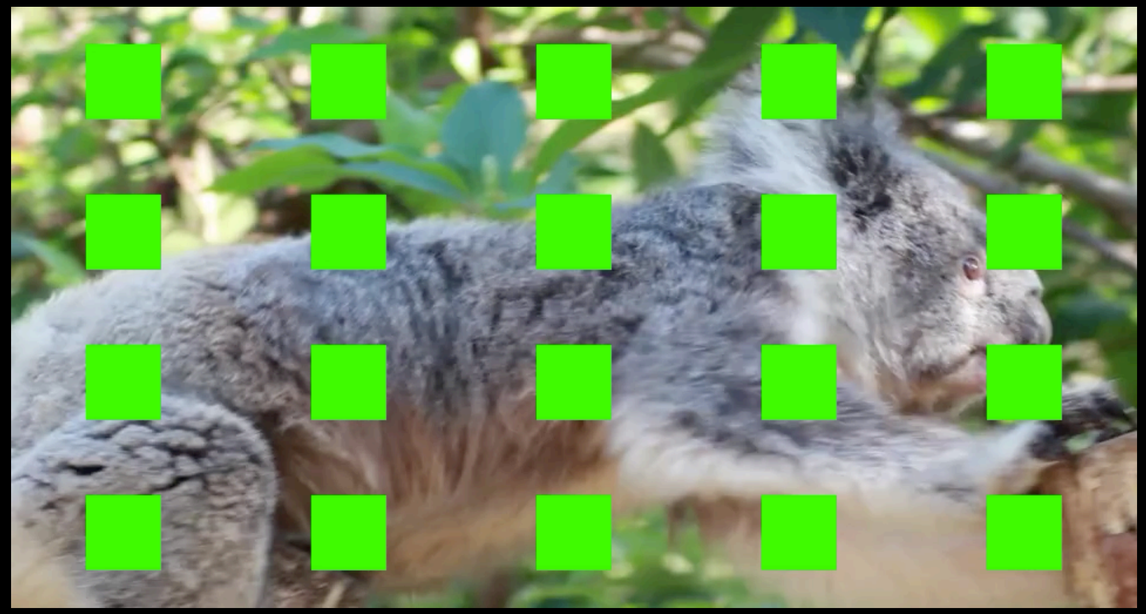


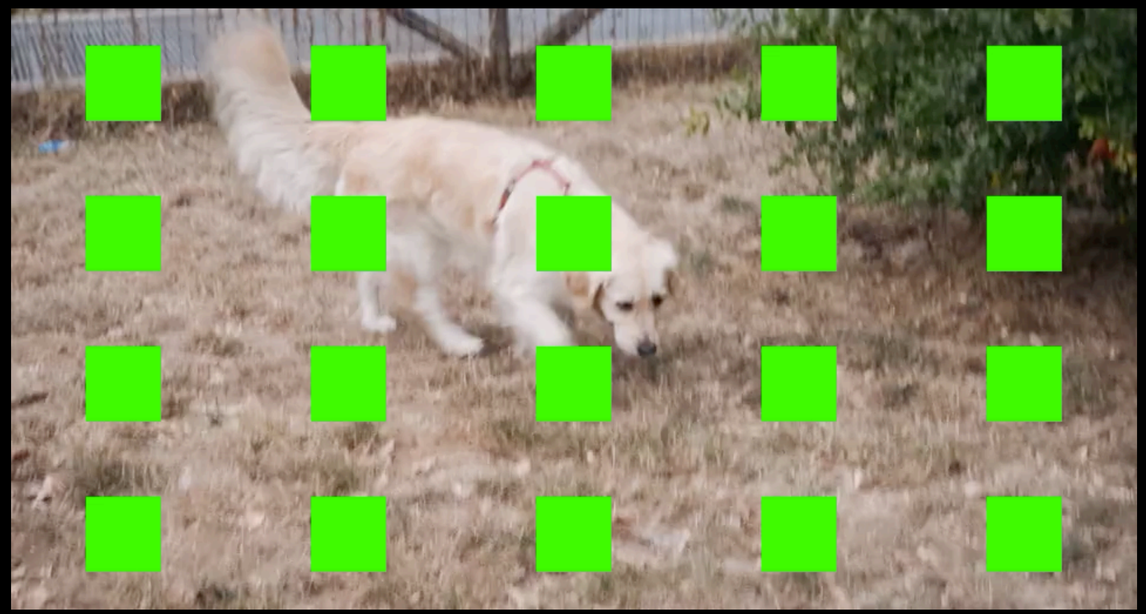
Completed video

Gradient *Color*

Results





Input video

(green indicates missing region)

Completed video

Input video

(green indicates missing region)

Completed video

Input video

(green indicates the object to be removed)

Completed video

Input video

(green indicates the object to be removed)

Completed video

Quantitative evaluation

	720 × 384 resolution					
	Stationary masks			Object masks		
	PSNR ↑	SSIM ↑	LPIPS ↓	PSNR ↑	SSIM ↑	LPIPS ↓
Kim *et al.*	25.19	0.8229	0.301	28.07	0.8673	0.283
Newson *et al.*	27.50	0.9070	0.067	32.65	0.9648	0.023
Xu *et al.*	27.69	0.9264	0.077	39.67	0.9894	0.008
Lee *et al.*	28.47	0.9170	0.111	35.76	0.9819	0.021
Huang *et al.*	28.72	0.9256	0.070	34.64	0.9725	0.018
Oh *et al.*	30.28	0.9279	0.082	33.78	0.9630	0.058
Ours	**31.38**	**0.9592**	**0.042**	**42.72**	**0.9917**	**0.007**

Flow-edge Guided Video Completion

Piecewise-smooth flow completion

Non-local flow neighbors

Seamless blending

Project page: http://chengao.vision/FGVC