

Deep Neural Networks for Image Stitching

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Motivation

- Experiment with both conventional and deep learning image stitching approaches;
- Construct effective image stitching pipeline.
- Improve robustness of state-of-the-art method under challenging conditions.



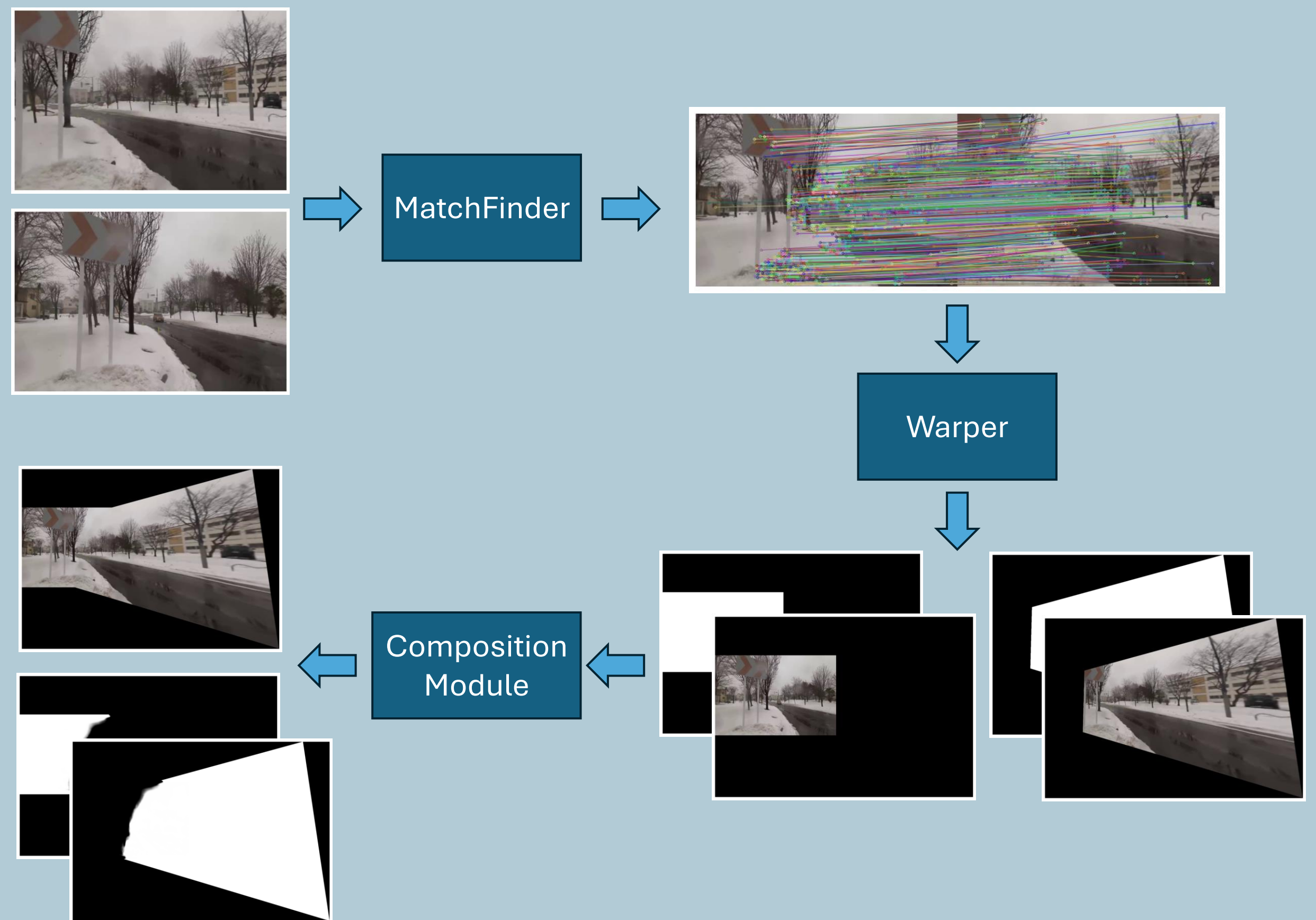
COLMAP Dataset

- Custom dataset with challenging elements such as rain, snow, low-light conditions, and lens obstructions;
- Generated from video sequences using COLMAP 3D reconstruction;
- 1254 images forming 32,297 pairs with depth maps, intrinsic and extrinsic matrices



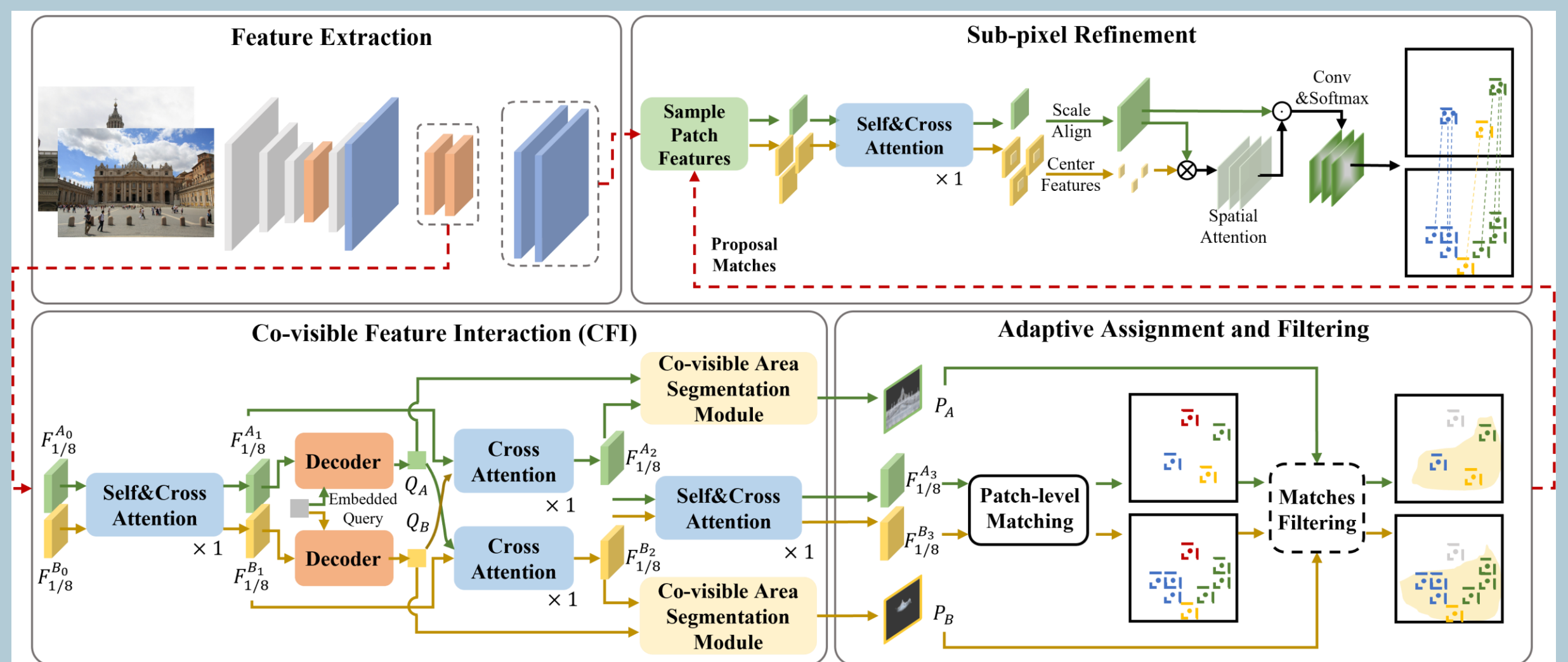
Proposed Solution

Configurable image stitching pipeline with options for feature matching and final image composition strategies



AdaMatcher

Fine-tuned on proposed dataset to enhance robustness under adverse conditions



Results of the Experiments

Metric	SIFT	LoFTR	Baseline	Fine-tuned
Pose error at 5°	0.0036	0.0108	0.0127	0.0132
Pose error at 10°	0.0403	0.0491	0.0611	0.0585
Pose error at 20°	0.1902	0.1657	0.2169	0.2028
Epipolar distance precision	0.1753	0.1374	0.1467	0.1603
Homography precision AUC@3px	0.647	0.4866	0.5543	0.6443
Homography precision AUC@5px	0.6773	0.5765	0.6407	0.7321
Homography precision AUC@10px	0.7183	0.6686	0.7277	0.8119
Valid feature matches	20.22	181.26	163.3	147.82
Elapsed time	125.1 ms	44.68 ms	72.45 ms	64.42 ms

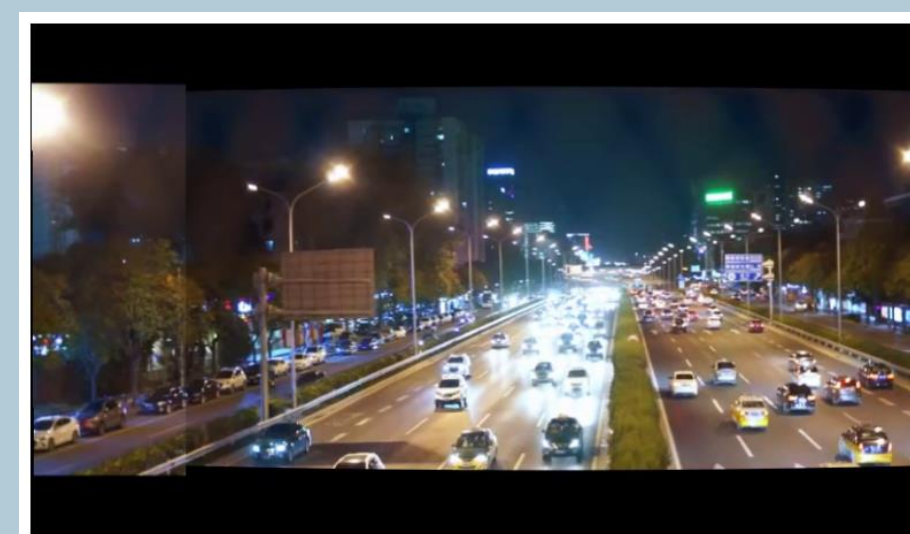
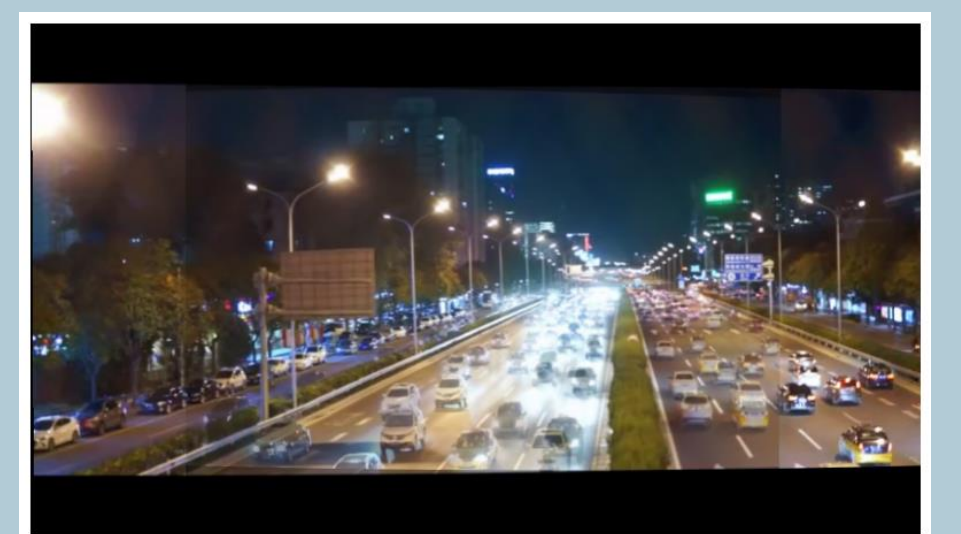
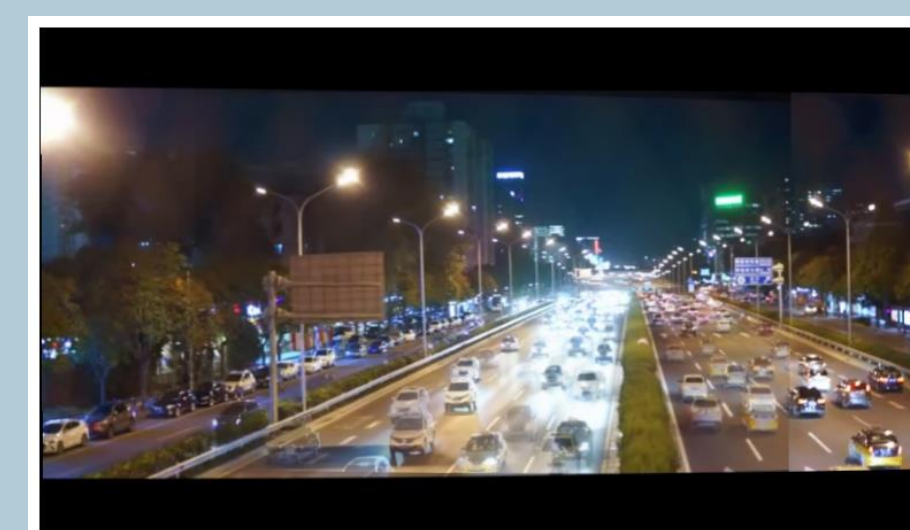


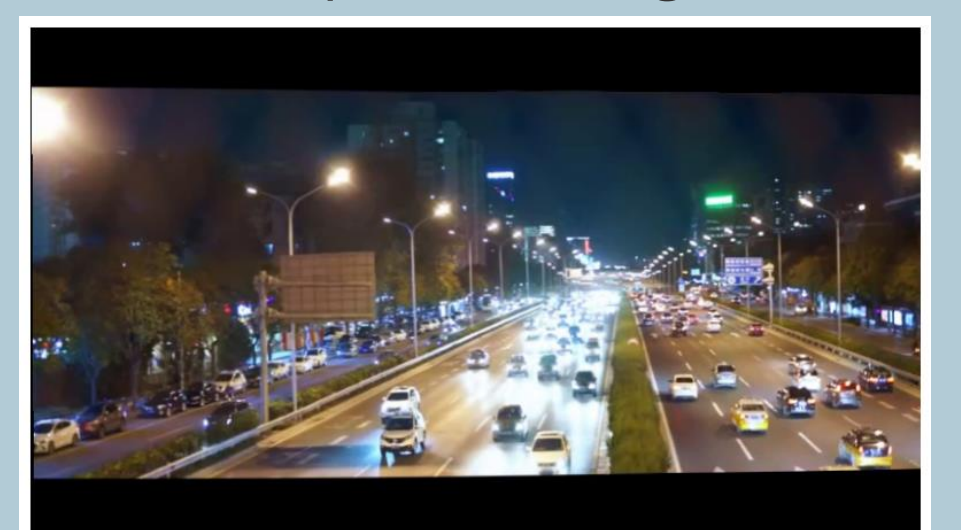
Image Overlay



Alpha Blending



Weighted Alpha Blending



UDIS++ Composition Module