ATTSF: Attention! Stay Focus!

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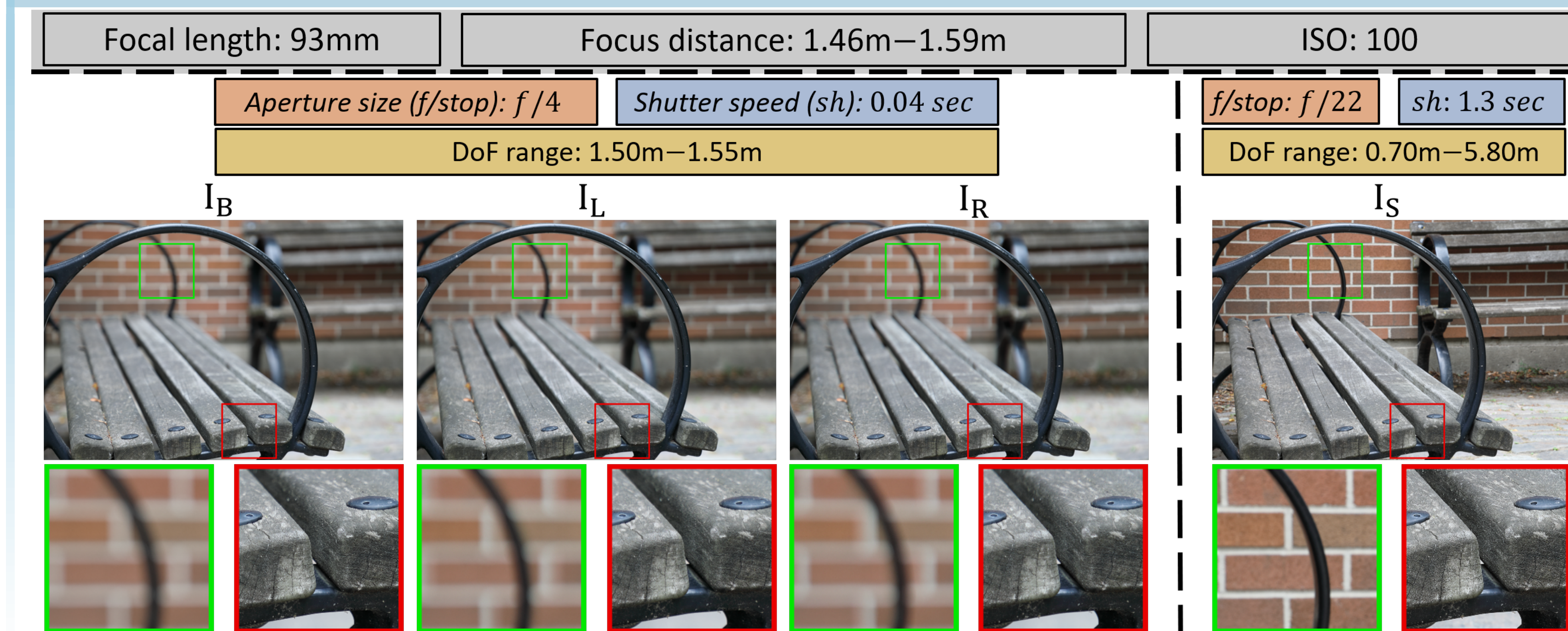
CVPR
VIRTUAL JUNE 19-25

Problem Definition and Contribution

Goal: Reproducing the sharp image from dual-pixel blurred input images caused by the defocus dual camera.

Motivations:

- Out focus input images have useful information but needed to be attentionally contribute to the final output.
- The most recent model use U-Net which treats pixels equally in both pixel-wise and channel-wise.
- The two blurry input images need to be consider both locally and globally to ensure the global smoothness of the final image.
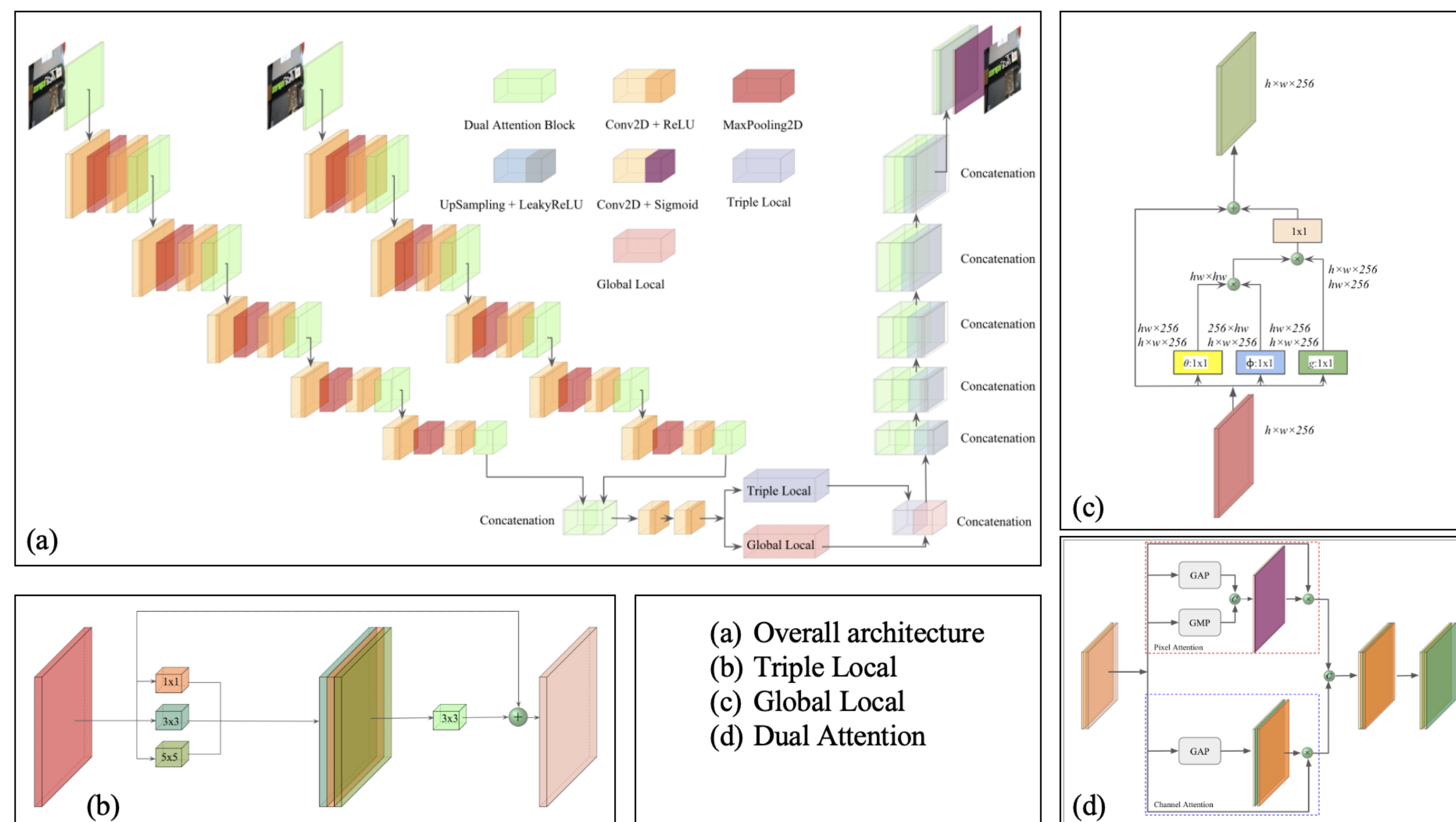
Problem Formulation

| Focal length: 93mm | Focus distance: 1.46m−1.59m | ISO: 100 |

| Aperture size (f/stop): f/4 | Shutter speed (sh): 0.04 sec | | f/stop: f/22 | sh: 1.3 sec |
| DoF range: 1.50m−1.55m | | | DoF range: 0.70m−5.80m |

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Method

Main Idea: We design an attention deep learning network which leverages the original encoder and decoder architecture by adding the dual-attention modules before every encoder blocks to attentionally extract the feature in each blur input image.
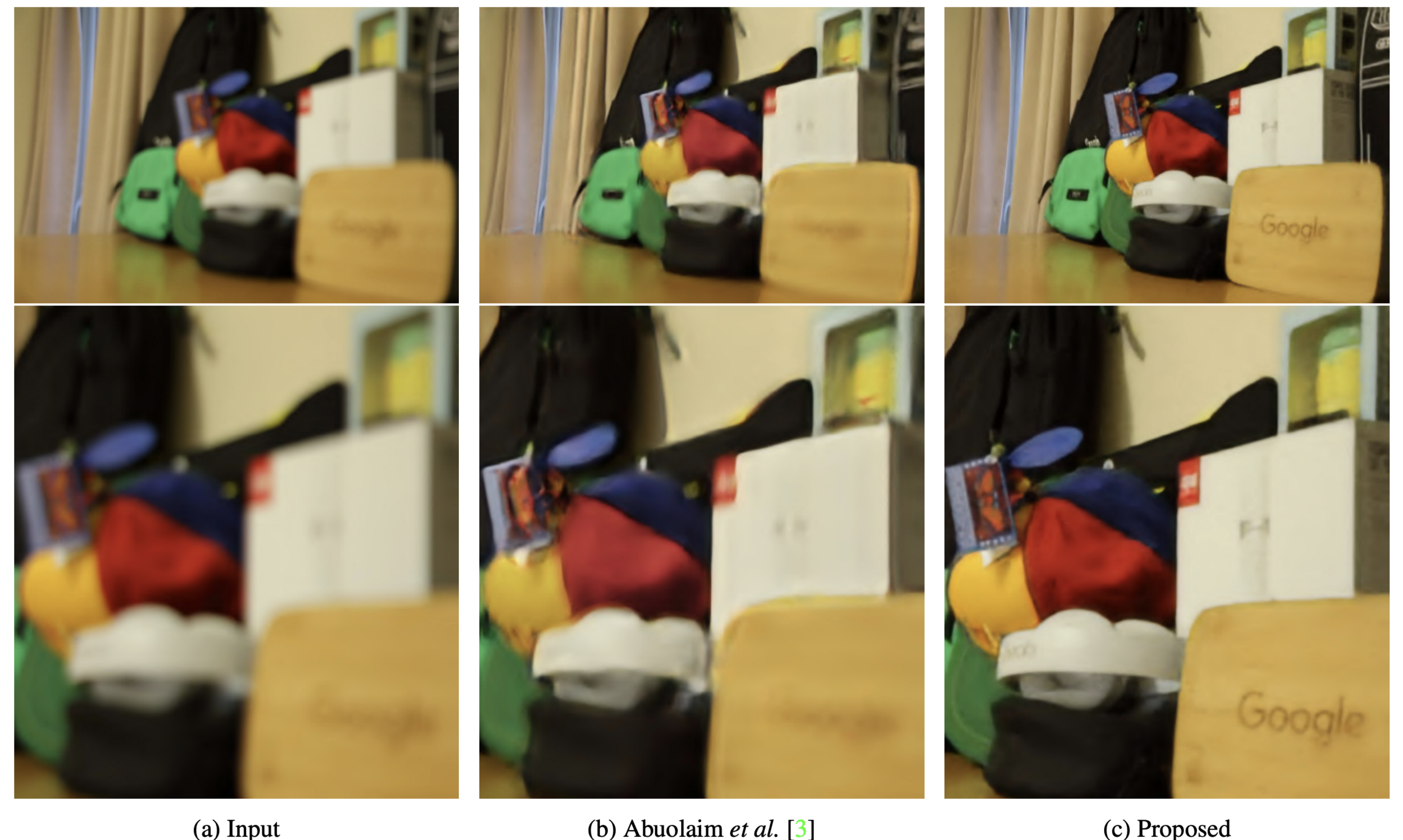
Network Architecture:

Dual Attention Block, Conv2D + ReLU, MaxPooling2D
UpSampling + LeakyReLU, Conv2D + Sigmoid, Triple Local
Global Local
Concatenation

(a) Overall architecture
(b) Triple Local
(c) Global Local
(d) Dual Attention

Loss Function

$$Loss = \alpha \times SSIMLoss + \beta \times MAELoss \qquad (1)$$

Experiments & Results

With Groundtruth:

(a) Input (b) Ground Truth (c) Abuolaim et al. [3] (d) Proposed

(a) Input (b) Ground Truth (c) Abuolaim et al. [3] (d) Proposed

Without Groundtruth:

(a) Input (b) Abuolaim et al. [3] (c) Proposed

References:

[1] NTIRE Defocus Deblurring Challege

[2] ATTSF [Vo et al. CVPRW21]

[3] Defocus Deblurring Using Dual-Pixel Data [Abuolaim et al. ICCV20]