Supplementary Material

Mop Moiré Patterns using MopNet

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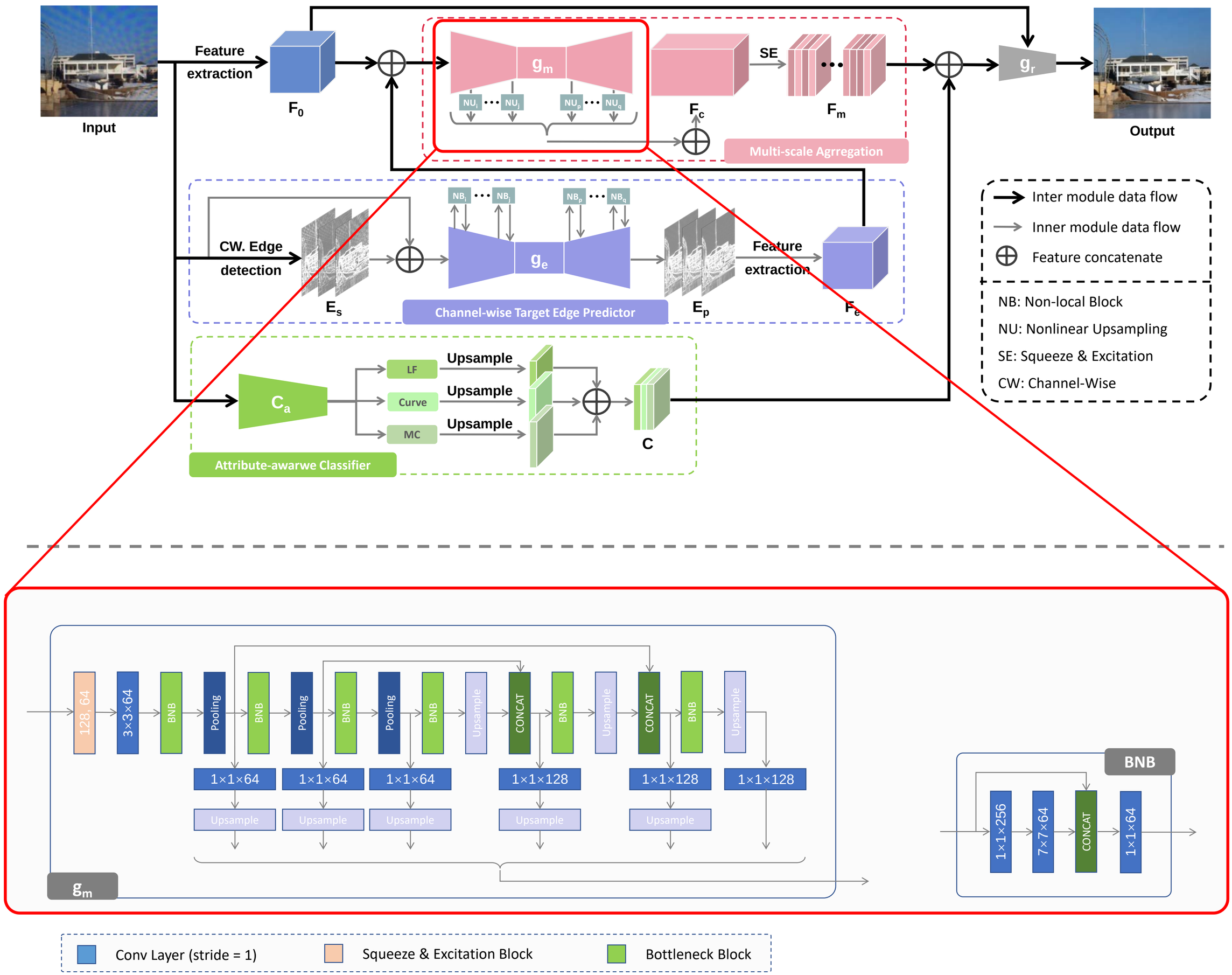
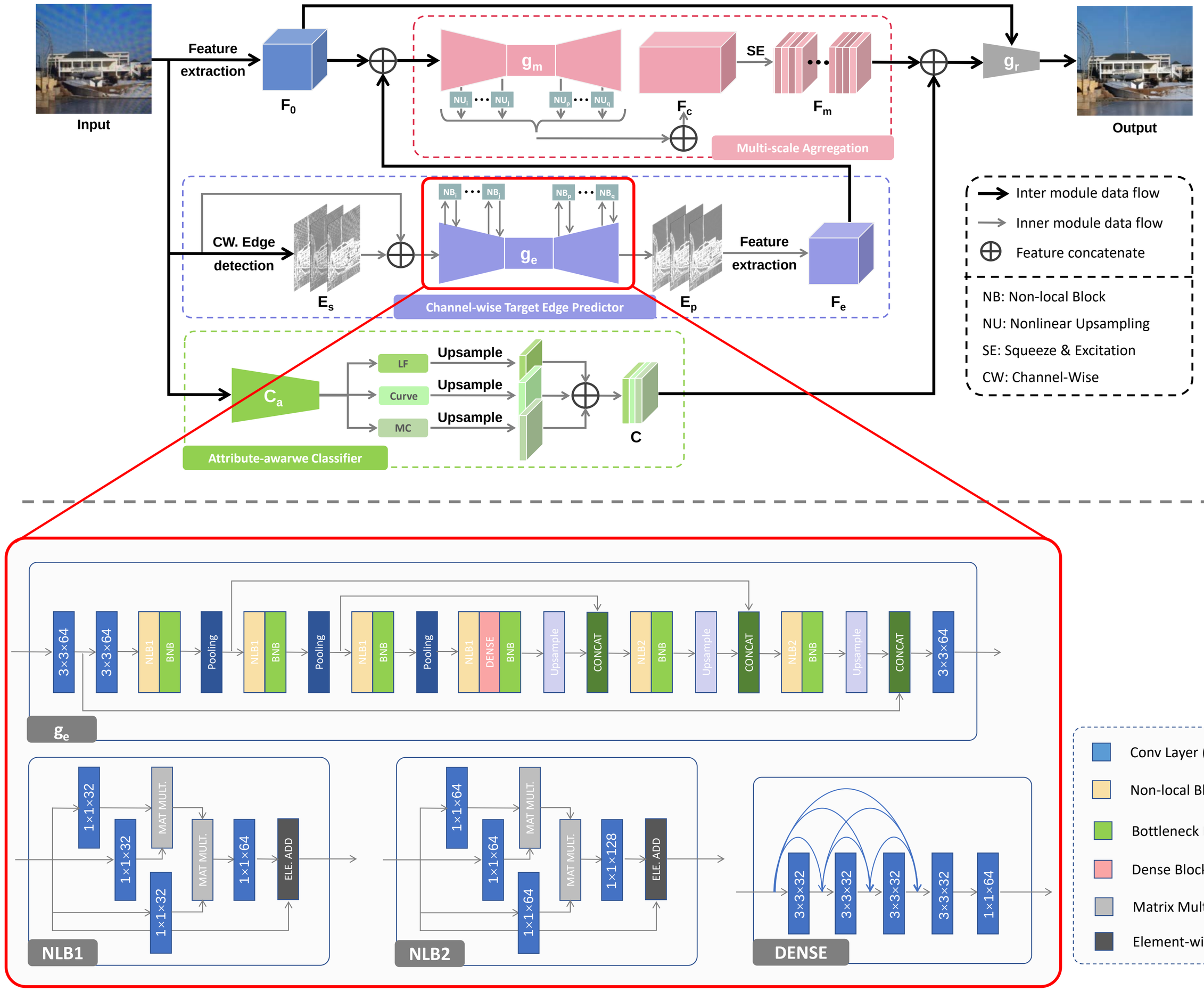
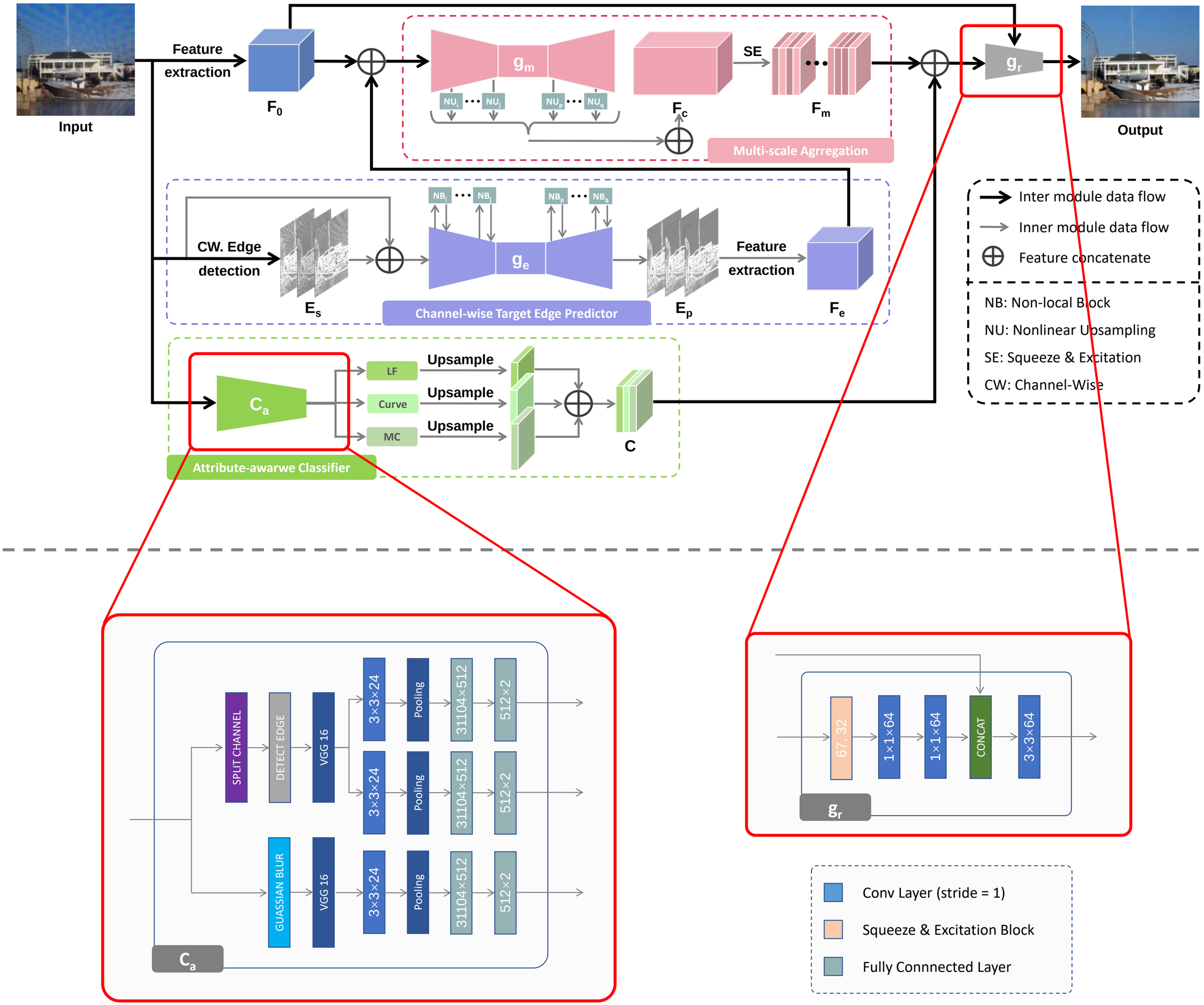
Network Structure



Network Structure



Network Structure



Attributes Annotation

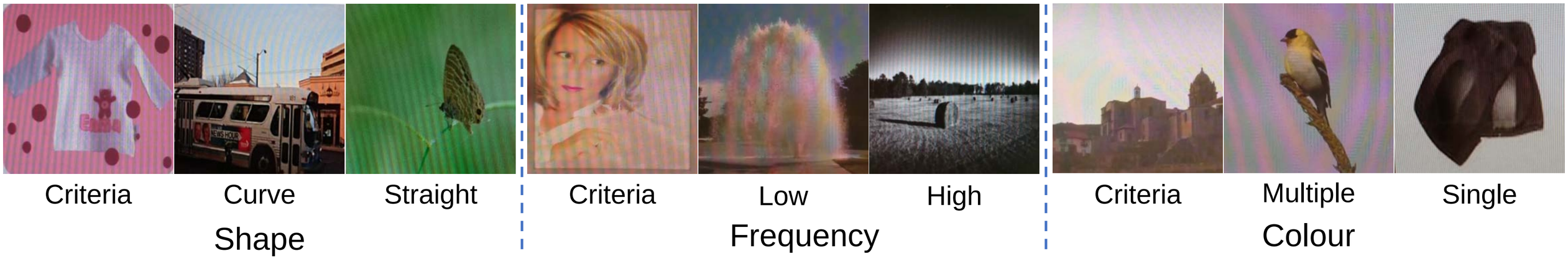


Figure S1: Criteria and Examples for Attributes Annotation

- We hire professional data annotators, and show them the typical sample images of moiré pattern with one type of dominant attribute to explain the attribute classification task. For example, in the leftmost group of Figure S1, the image in the middle and the image on the right exhibit the representative case where the moiré pattern in image belongs to curve class and straight stripe class concerning pattern shape, respectively.

- Then the sample criteria images, which are displayed in the left in each group of Figure S1, are given to annotators for reference. Specifically, take the frequency criteria image in the second group for instance, we ask the annotators to label the moiré pattern in the image as a high frequency one if its dominant frequency appears higher than the criteria image, and vice versa.

- The annotators are divided into three groups to deal with the three attributes respectively. Given an image, two annotators are asked to classify each single attribute independently in the first pass, and when their annotations are inconsistent, the third annotator is required to re-annotate the attribute.

Attributes Annotation

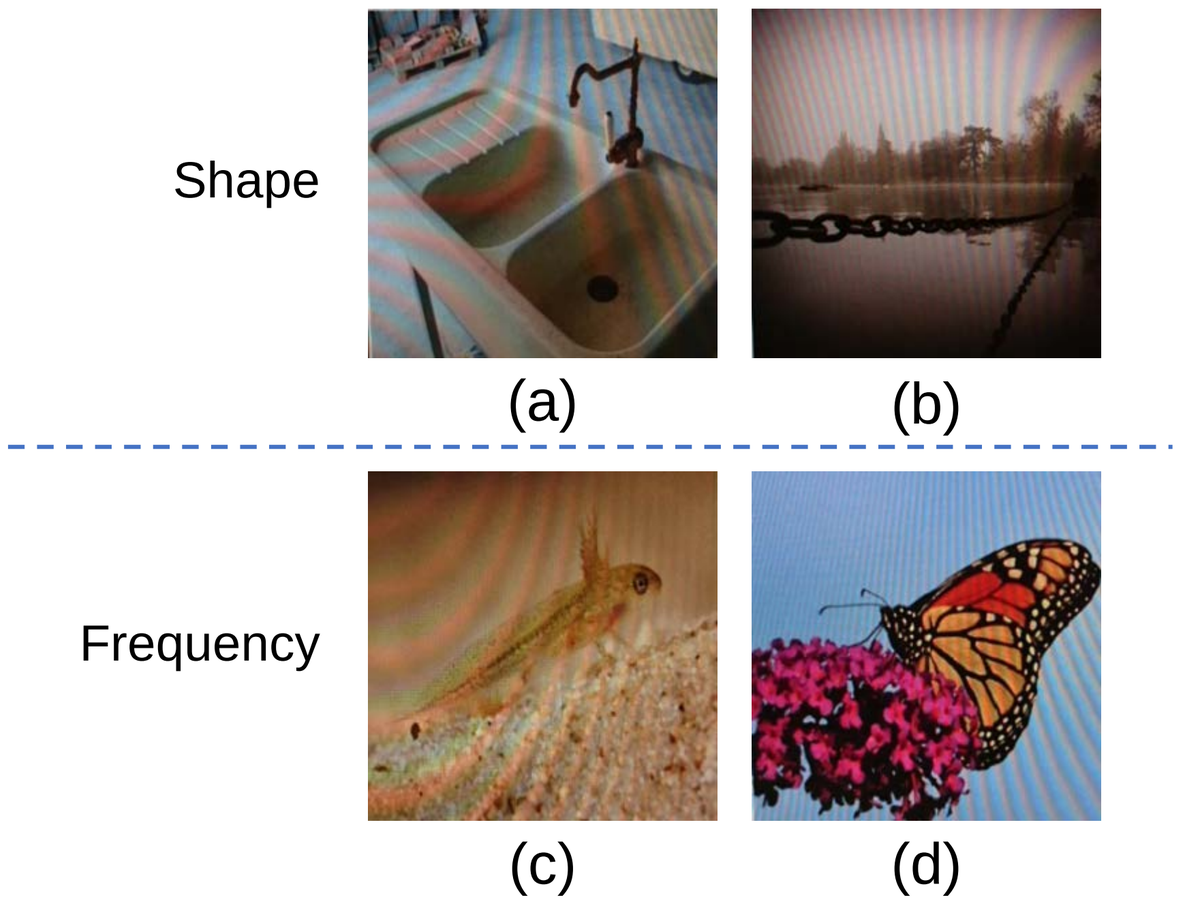


Figure S2: Examples for Mixed Attributes

- As for the complex patterns with mixed or ambiguous appearance attributes, we choose to annotate the pattern with the most dominant attribute labels for describing the pattern appearance and facilitating the removal on the whole.

- For instance, Figure S2(a) shows a mixed scene where there exist both curves and straight moiré stripes in a single image, and we label this image as curve moiré pattern because the straight stripes only occupy a rather small part on the right, while the curve pattern dominates in this image. Similarly, (b) is annotated as straight shaped class, and in terms of frequency, (c) is labeled as a low frequency moiré pattern, while (d) is a high frequency one.

Perceptual Study Setting

- We invite 50 participants to rate the quality of 50 randomly selected results of MopNet according to their visual perception, compared with other three moiré-specific methods including descreen plugin[1] for Photoshop, Yang et al[2]., and DMCNN[3].

- The procedure of the perceptual study is as follows:

1. We explain the phenomenon of moiré pattern and display sample moiré contaminated images to participants to help them to understand each pattern attribute.
2. Participants are asked to rate 50 groups of images in terms of visual quality. In each group, the leftmost image is the input image randomly selected from the testing set, and the other images are moiré pattern removal results by MopNet and the other three methods, shown in random order. No time constraints are placed for rating.
3. The number of images is calculated by summing the choices of all participants, with a total number of $50 \times 50 = 2500$ for each method.
4. The average perceptual preference score $\emptyset$ is computed from the rankings , as

$$\emptyset_m = \frac{1}{M} \sum_i \sum_j \left(N - rank_{i,j,m} + 1 \right),$$

where m stands for a certain method, M for the number of participants, N for the number of methods evaluated, and i, j for the index of participant and the group of results.

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[1] http://www.descreen.net/eng/soft/descreen/descreen.htm

[2] J. Yang, X. Zhang, C. Cai, and K. Li. Demoiréing for screen-shot images with multi-channel layer decomposition. In IEEE Visual Communications and Image Processing, pages 1–4.

[3] Y. Sun, Y. Yu, and W. Wang. Moiré photo restoration using multiresolution convolutional neural networks. IEEE Transactions on Image Processing, 27(8):4160–4172, 2018.

Perceptual Study Results

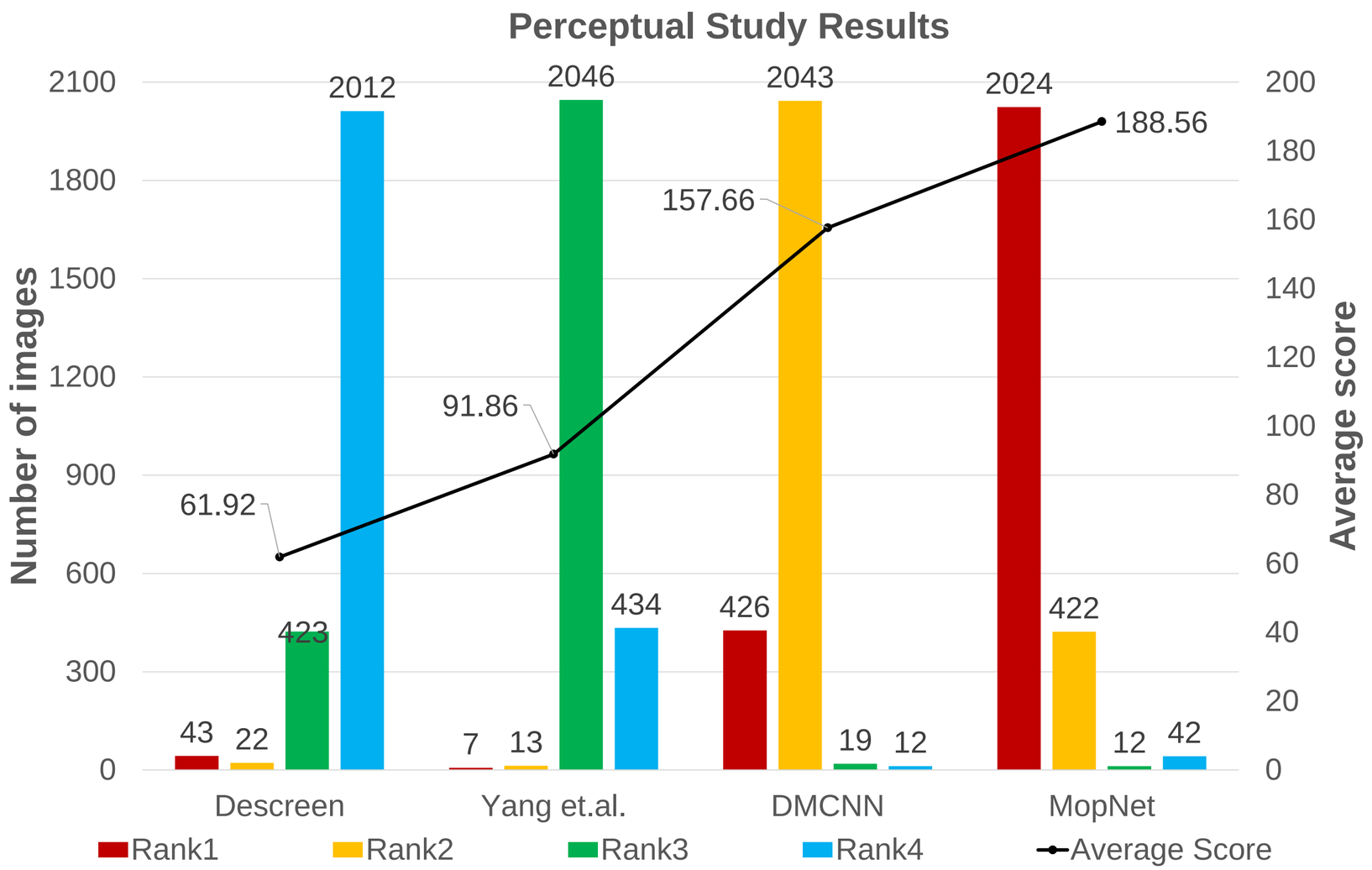


Figure S3: Perceptual Study Results for Comparison

- As Figure S3 illustrates, the average perceptual preference score of MopNet is evidently higher than the other methods by a great margin, and MopNet has achieved the most rank-1 choices with very few rank-3 or rank-4 results.

- The perceptual study results demonstrate that MopNet performs the best in terms of enhancing the visual quality of moiré contaminated images, and human observers show clear preference order in moiré pattern removal results by different methods as: MopNet, DMCNN, Yang *et.al*, and Descreen.

Perceptual Study Results

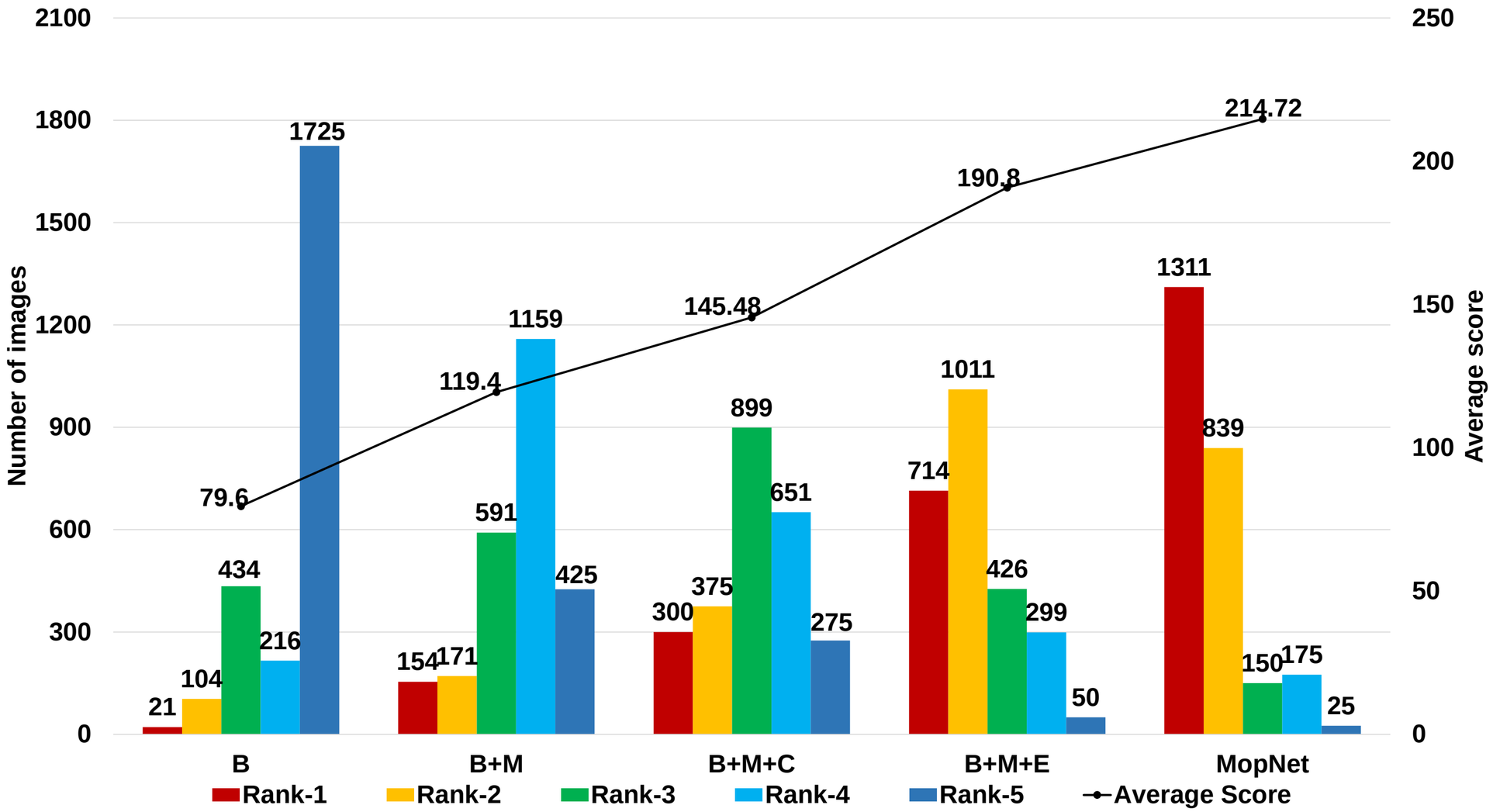


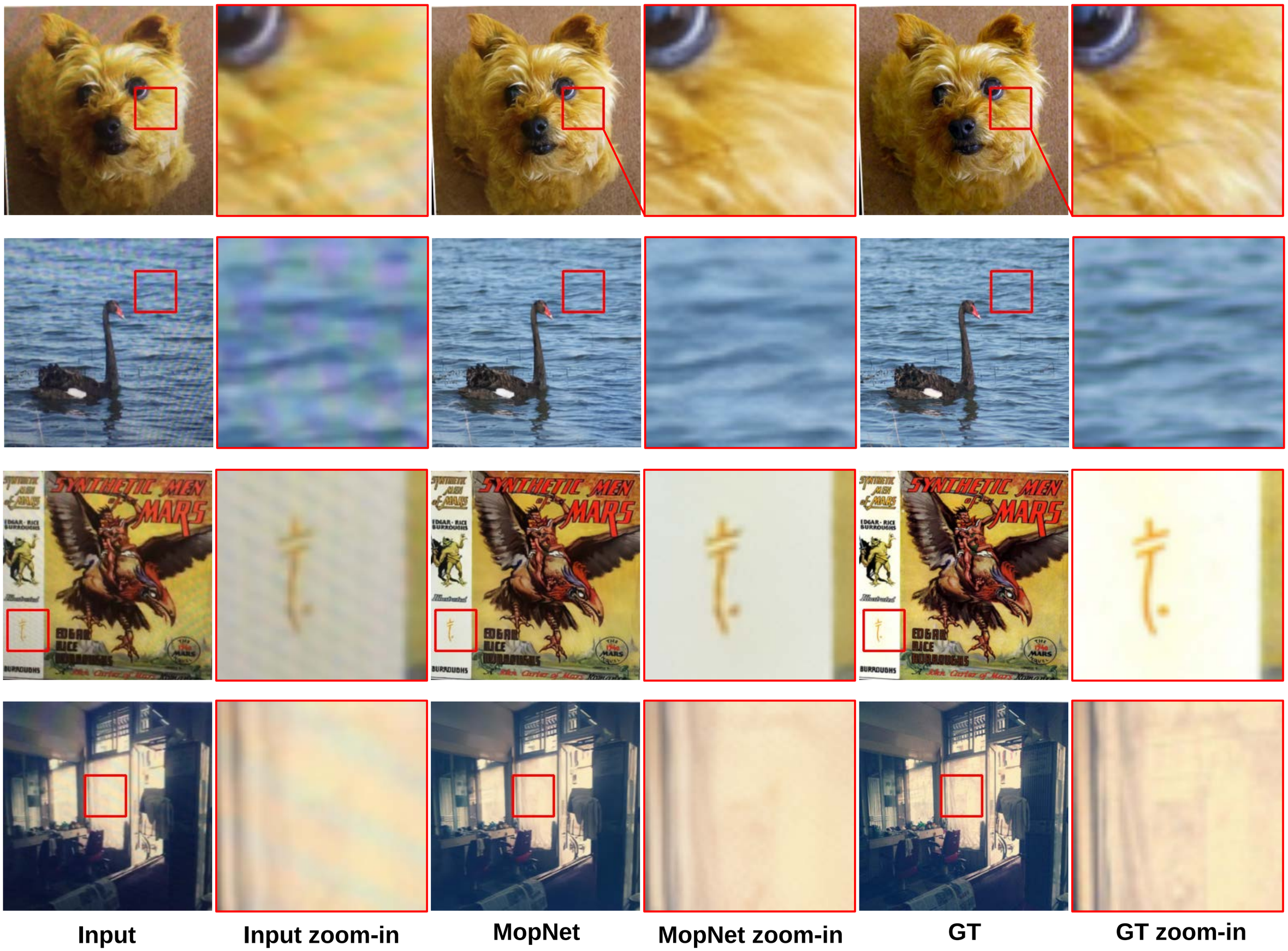
Figure S4: Perceptual Study Results for Ablation

- As shown in Figure S4, we compare the complete MopNet against variations of full objective through perceptual study. The average perceptual preference score of MopNet is higher than those of any ablations. Besides, the MopNet has the most rank-1 images compared to other variations.

- It is consistent with quantitative evaluation results in our main paper that proposed modules benefit the removal of moire patterns. In some cases, any of edge map or classification suffices to remove the moire patterns. It may be because both modules infer the shape information from patterns, facilitating better removal.

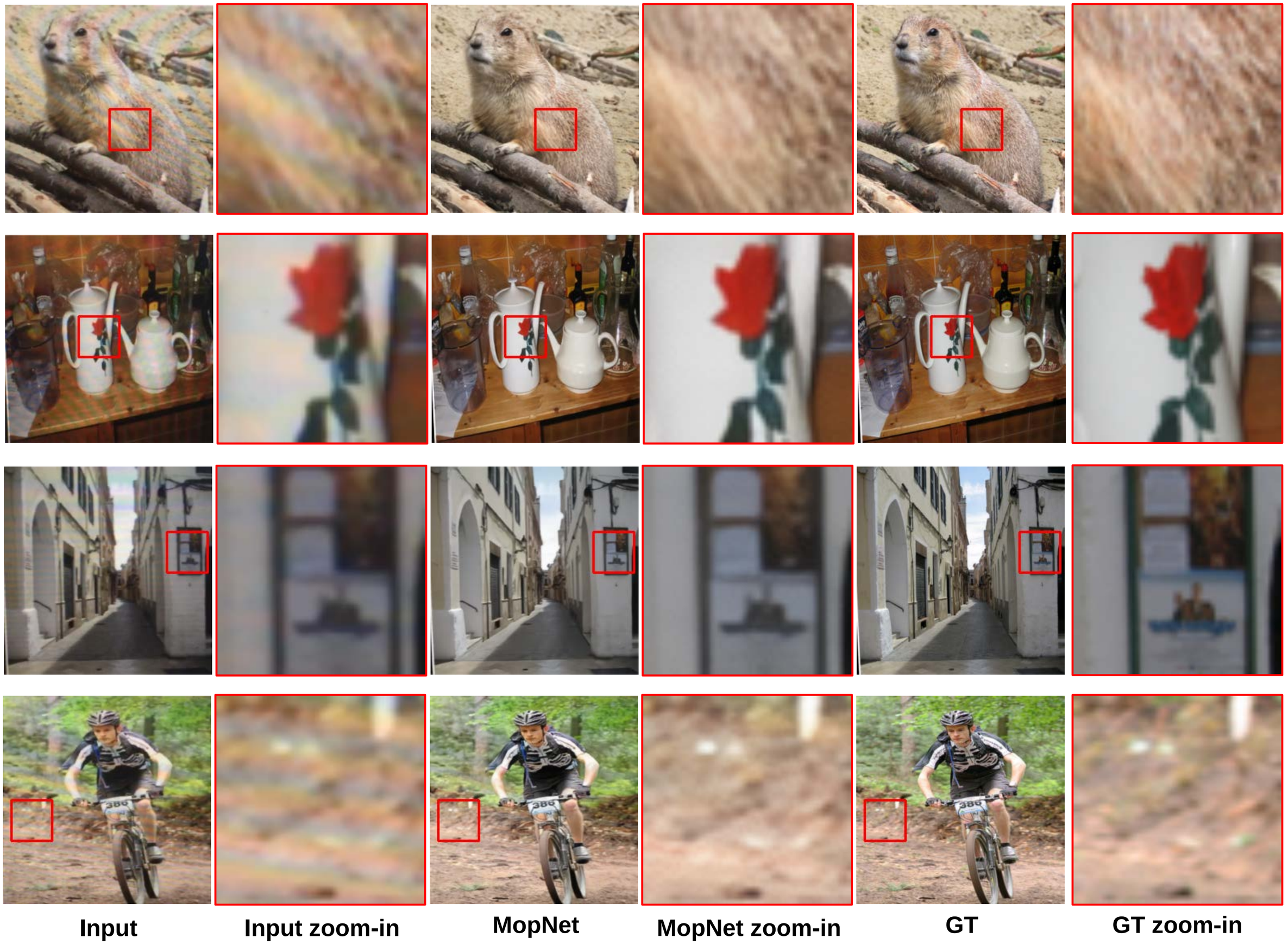
Zoom-in Results

- We show some zoom-in results generated by MopNet.



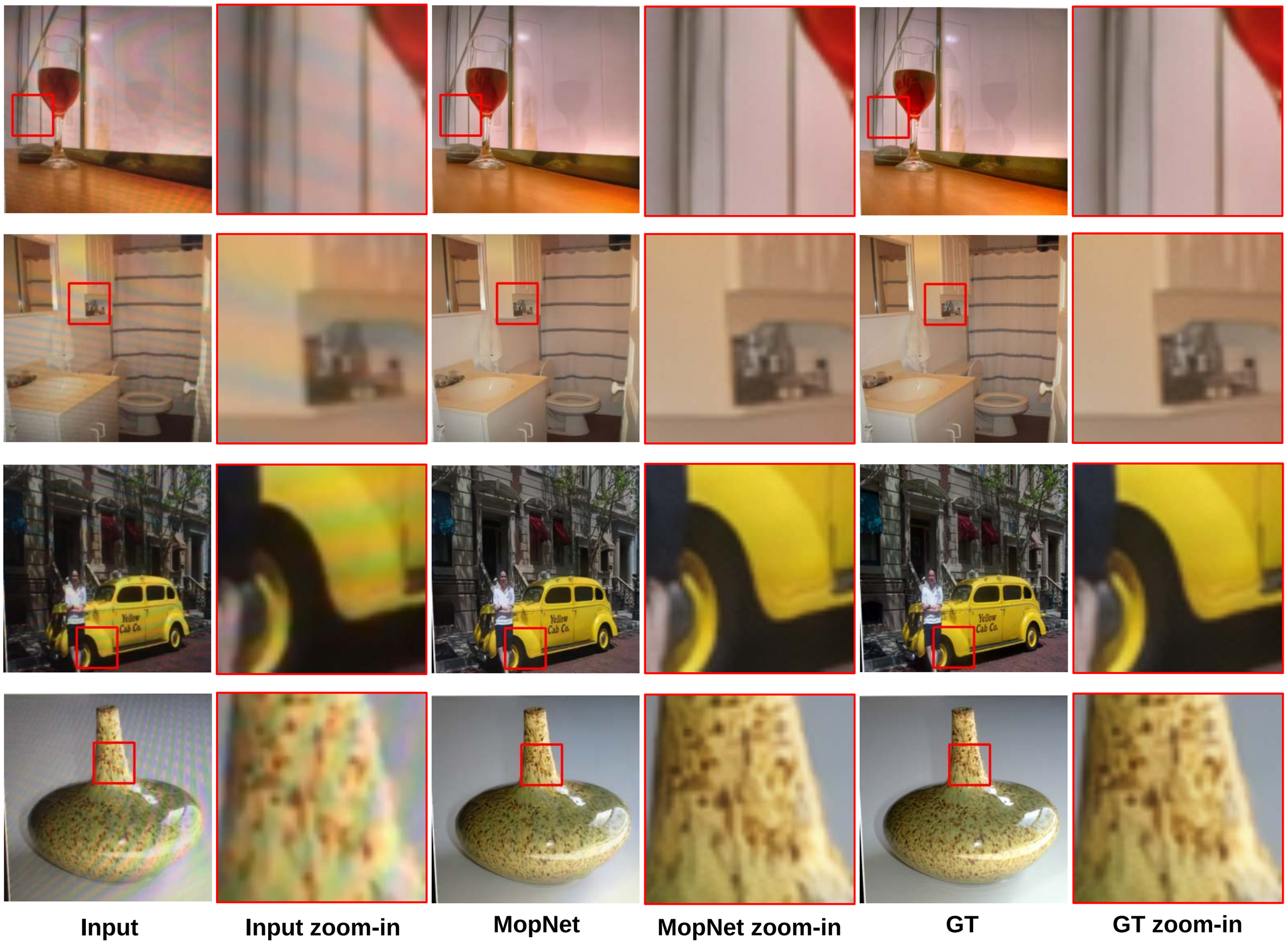
Zoom-in Results

- We show some zoom-in results generated by MopNet.



Zoom-in Results

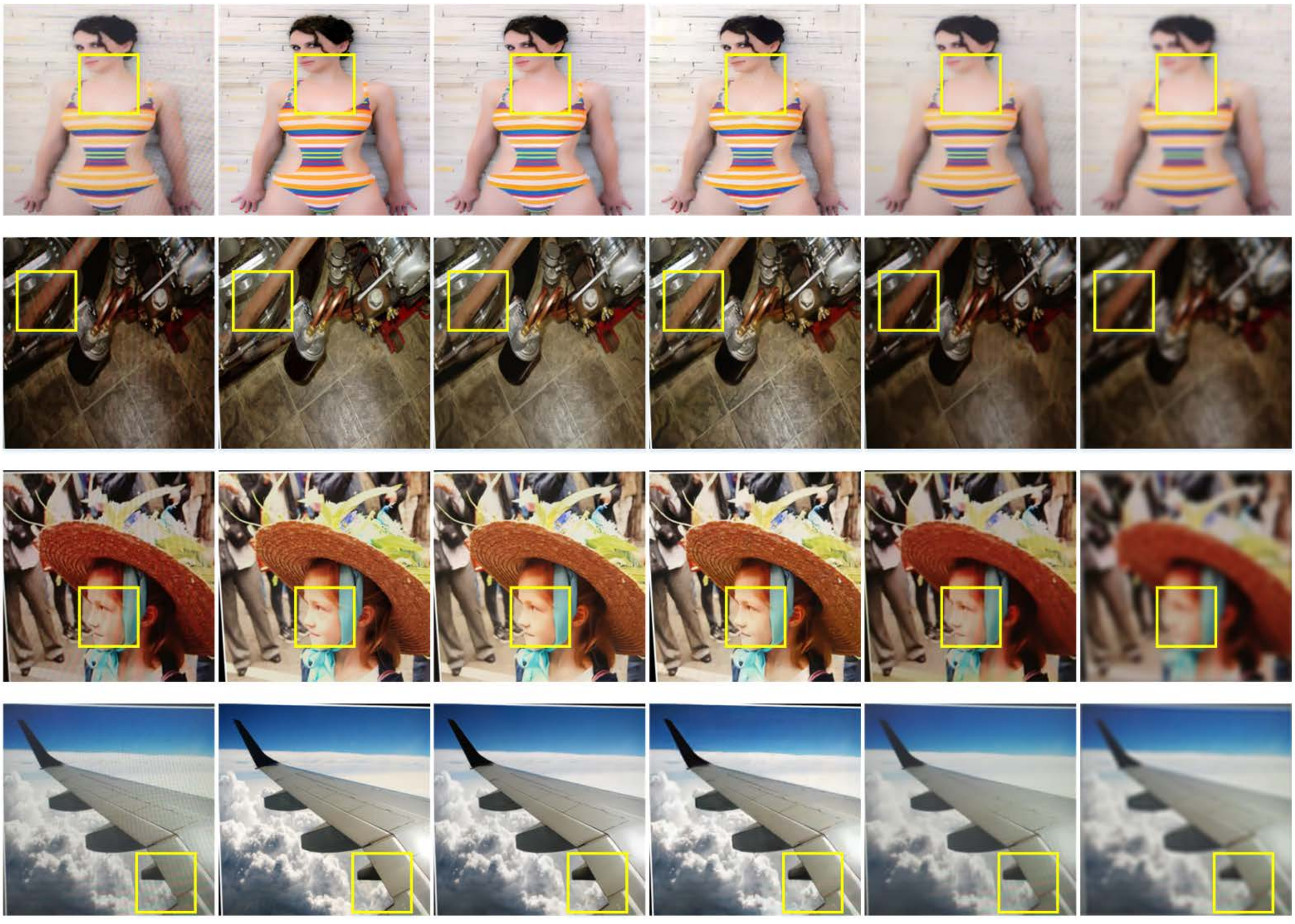
- We show some zoom-in results generated by MopNet.



Input | Input zoom-in | MopNet | MopNet zoom-in | GT | GT zoom-in

More Comparison Results

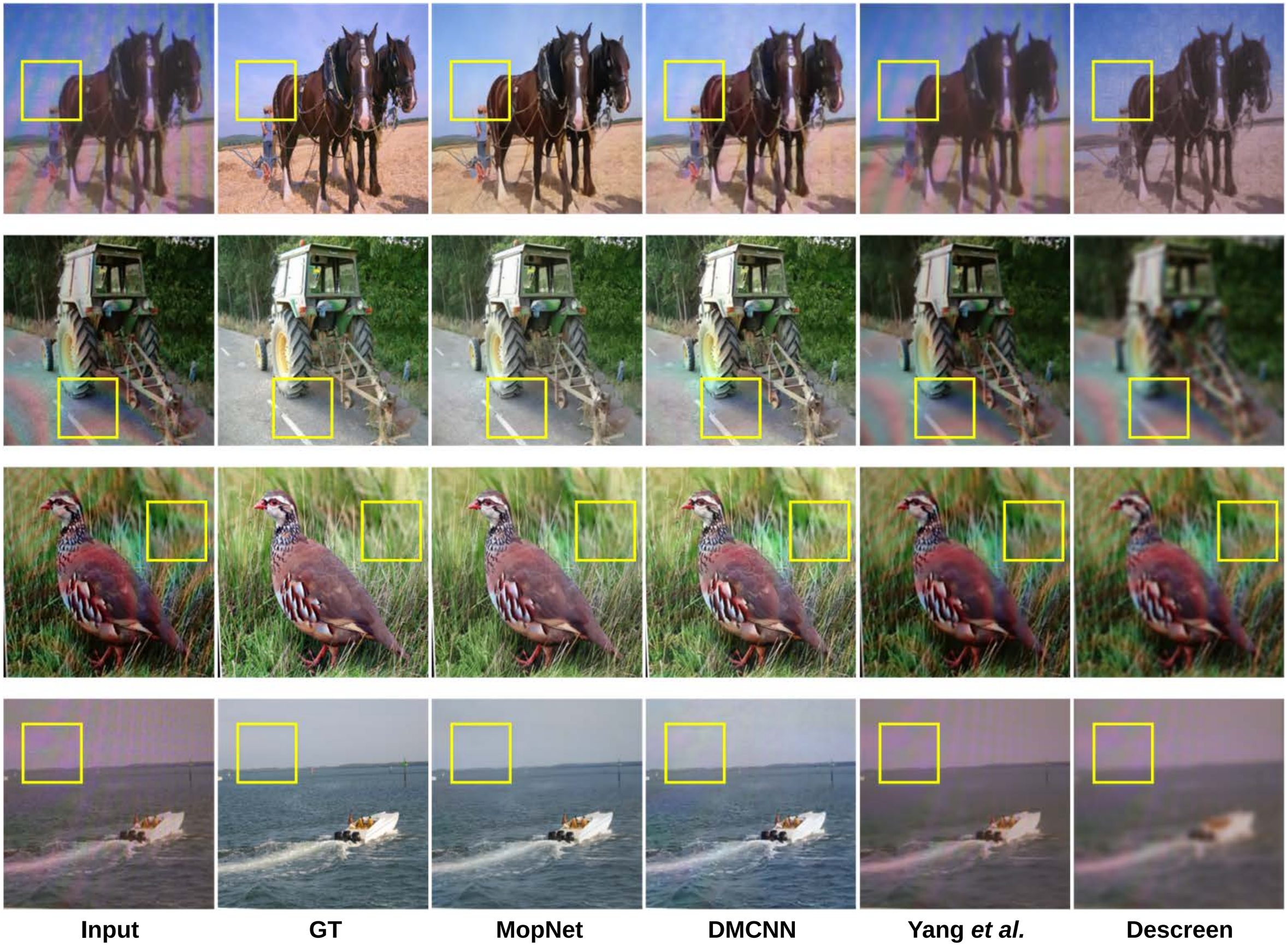
- **High Frequency:**



Input **GT** **MopNet** **DMCNN** **Yang *et al.*** **Descreen**

More Comparison Results

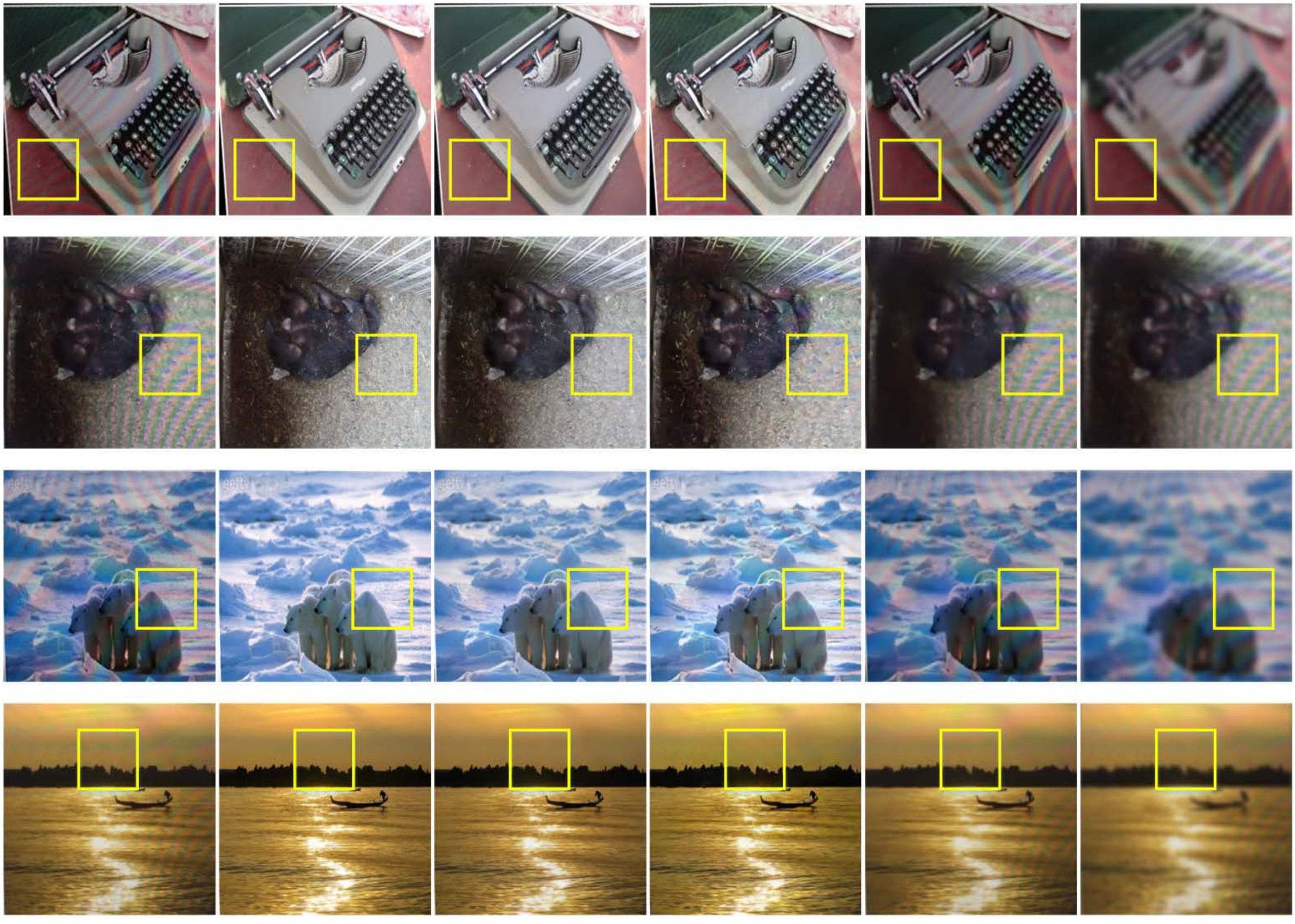
- **Low Frequency:**



Input | GT | MopNet | DMCNN | Yang *et al.* | Descreen

More Comparison Results

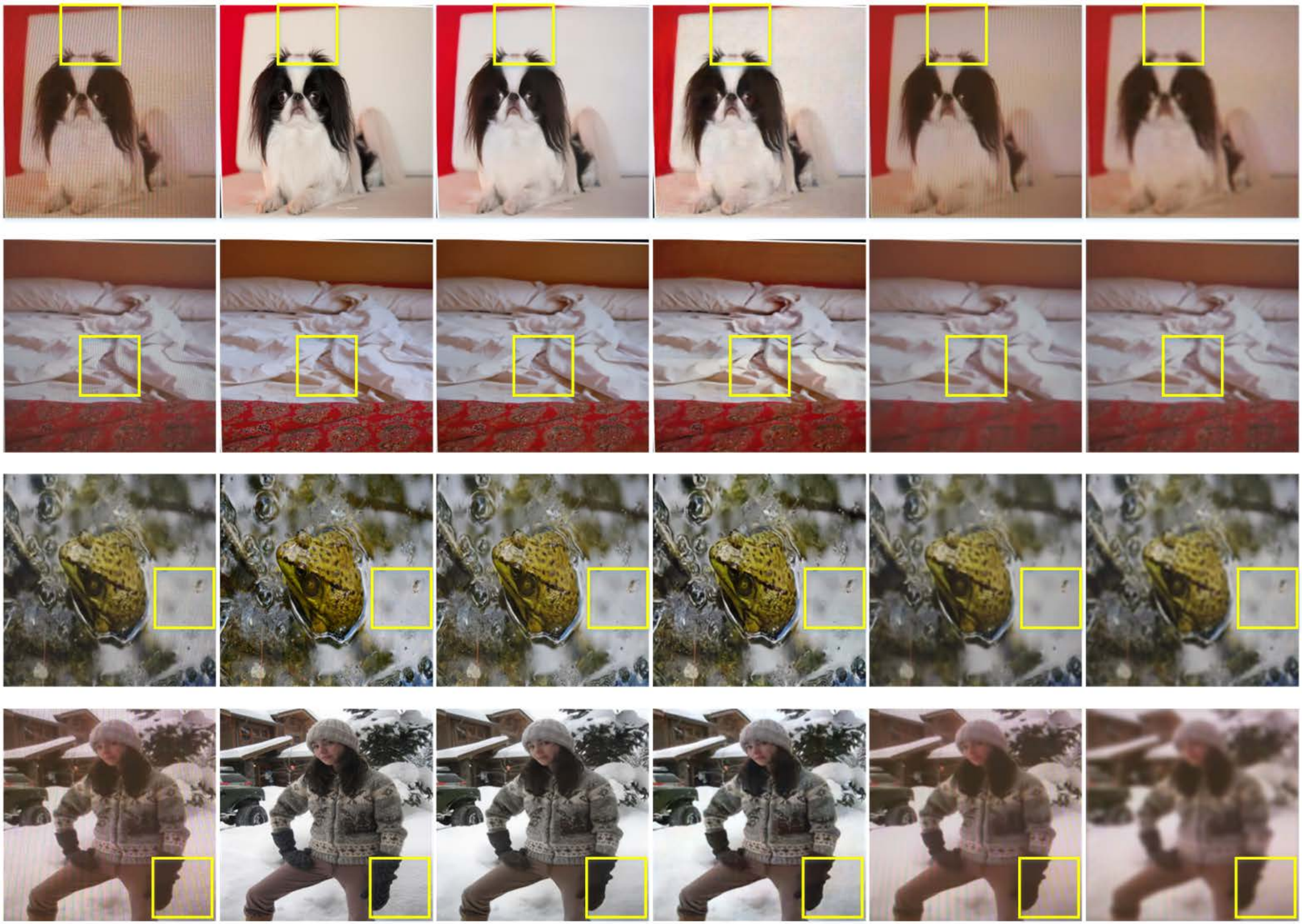
- **Curve:**



Input **GT** **MopNet** **DMCNN** **Yang *et al.*** **Descreen**

More Comparison Results

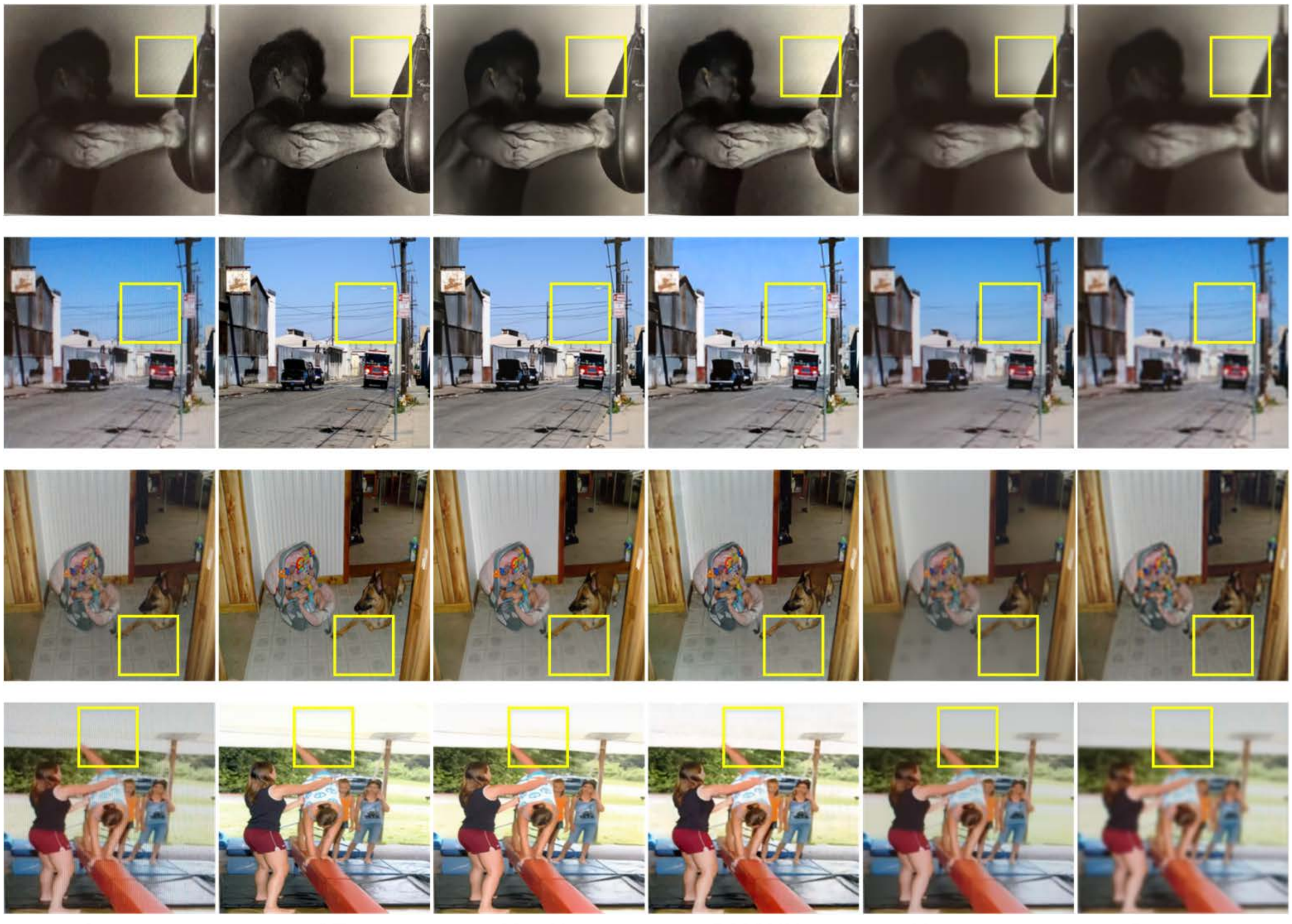
- **Straight:**



Input **GT** **MopNet** **DMCNN** **Yang *et al.*** **Descreen**

More Comparison Results

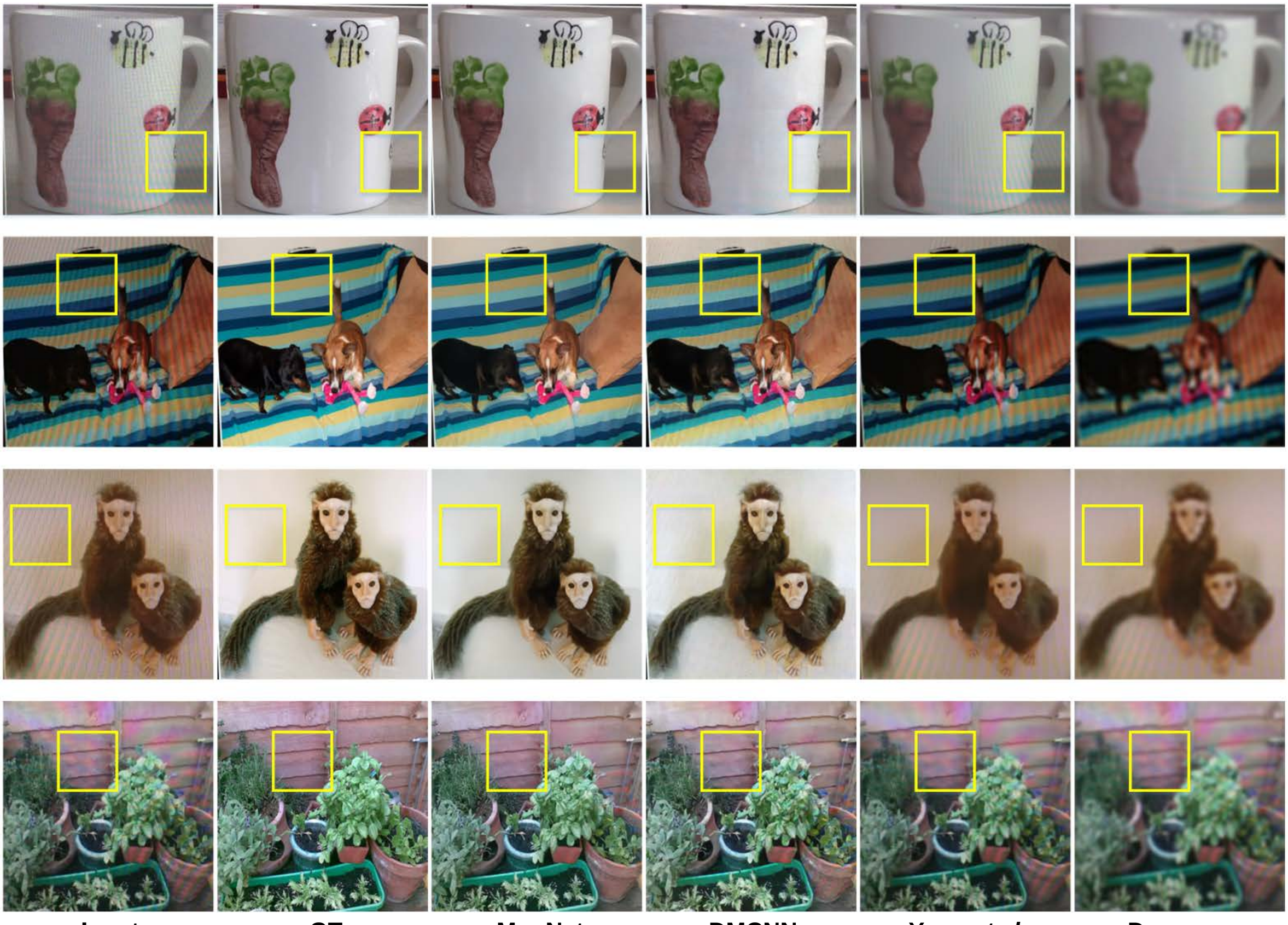
- **Single Colour:**



Input | GT | MopNet | DMCNN | Yang *et al.* | Descreen

More Comparison Results

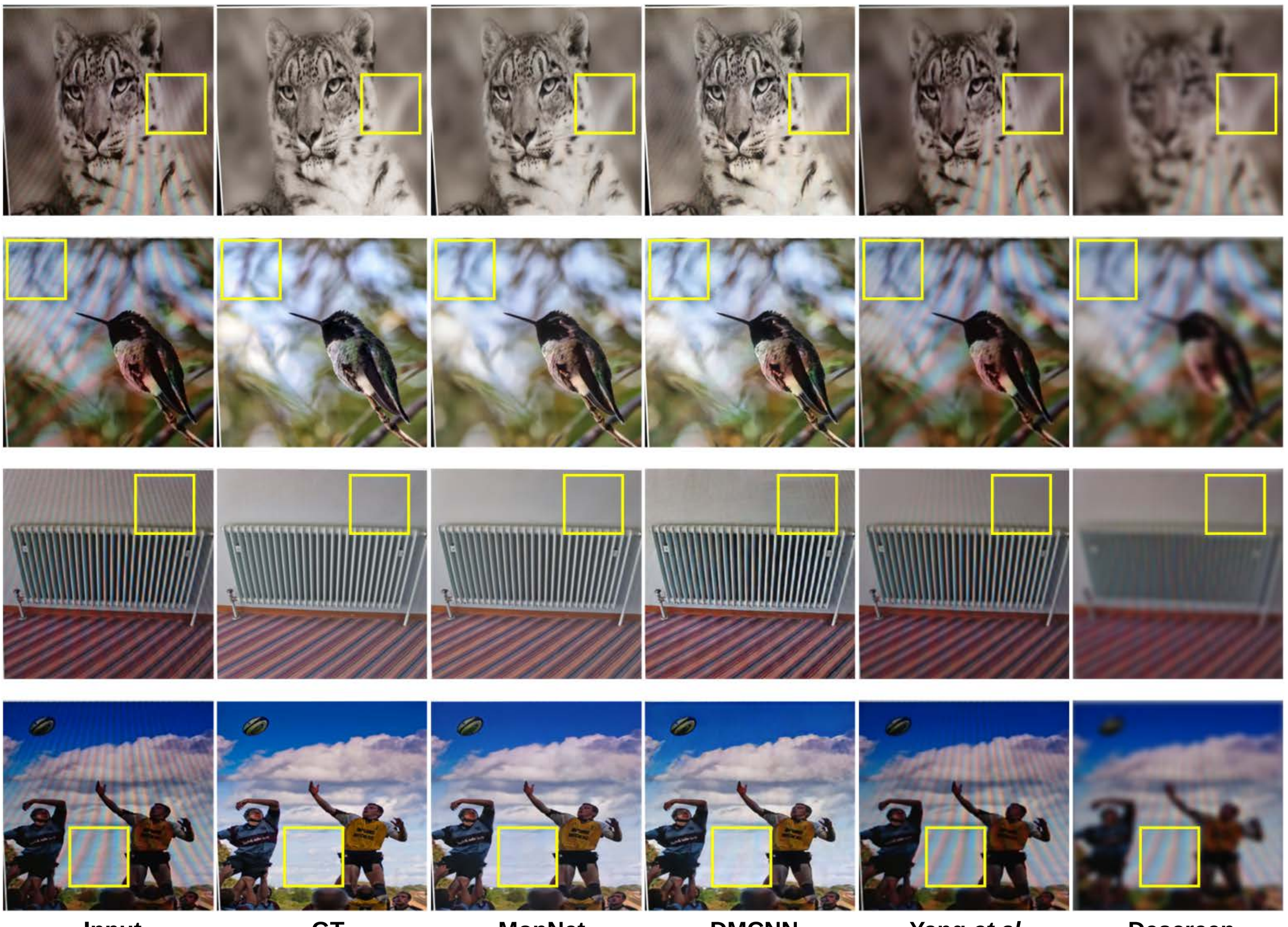
- **Multiple Colour:**



Input | GT | MopNet | DMCNN | Yang *et al.* | Descreen

More Comparison Results

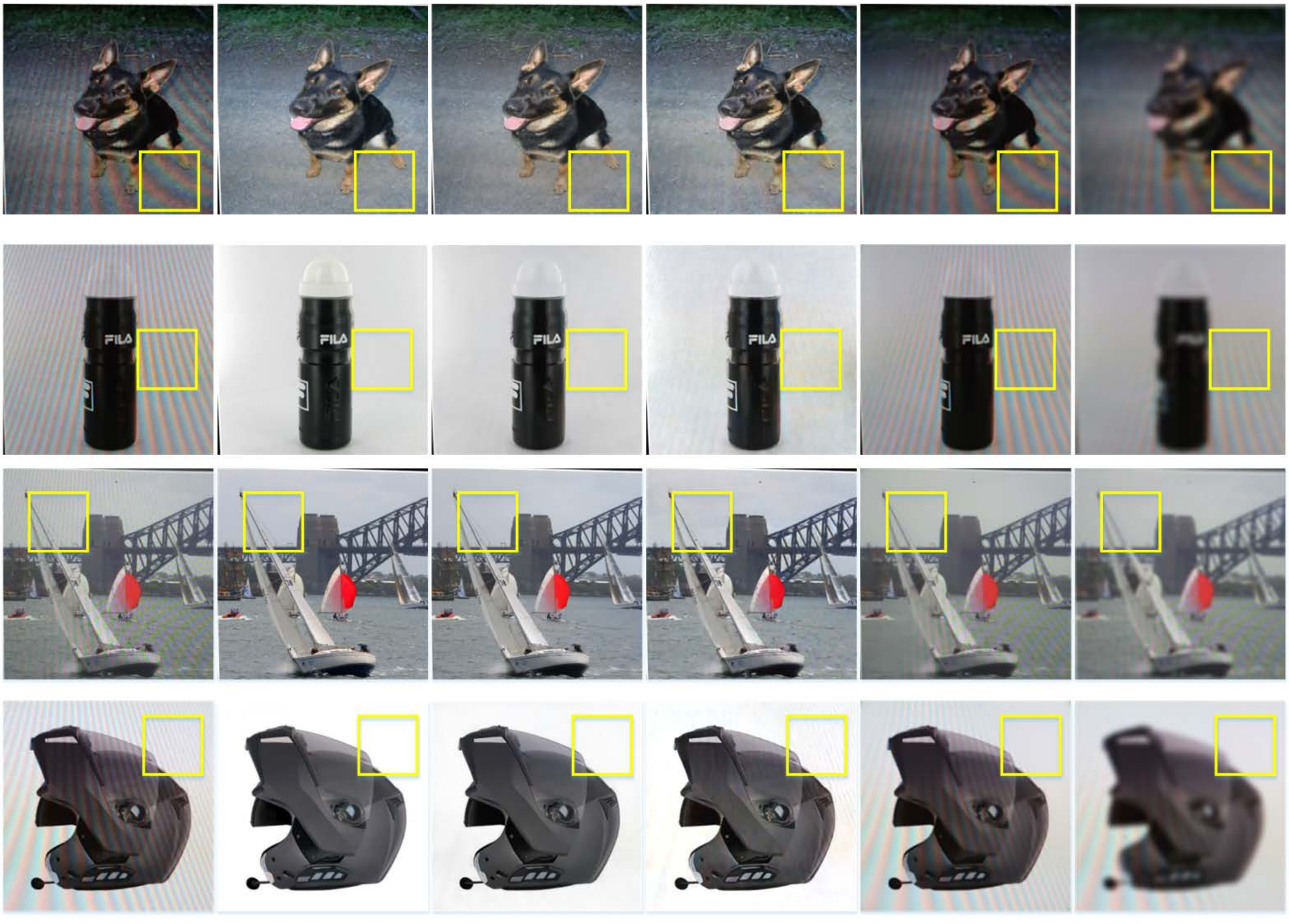
- **Mixed Frequency:**



Input GT MopNet DMCNN Yang *et al.* Descreen

More Comparison Results

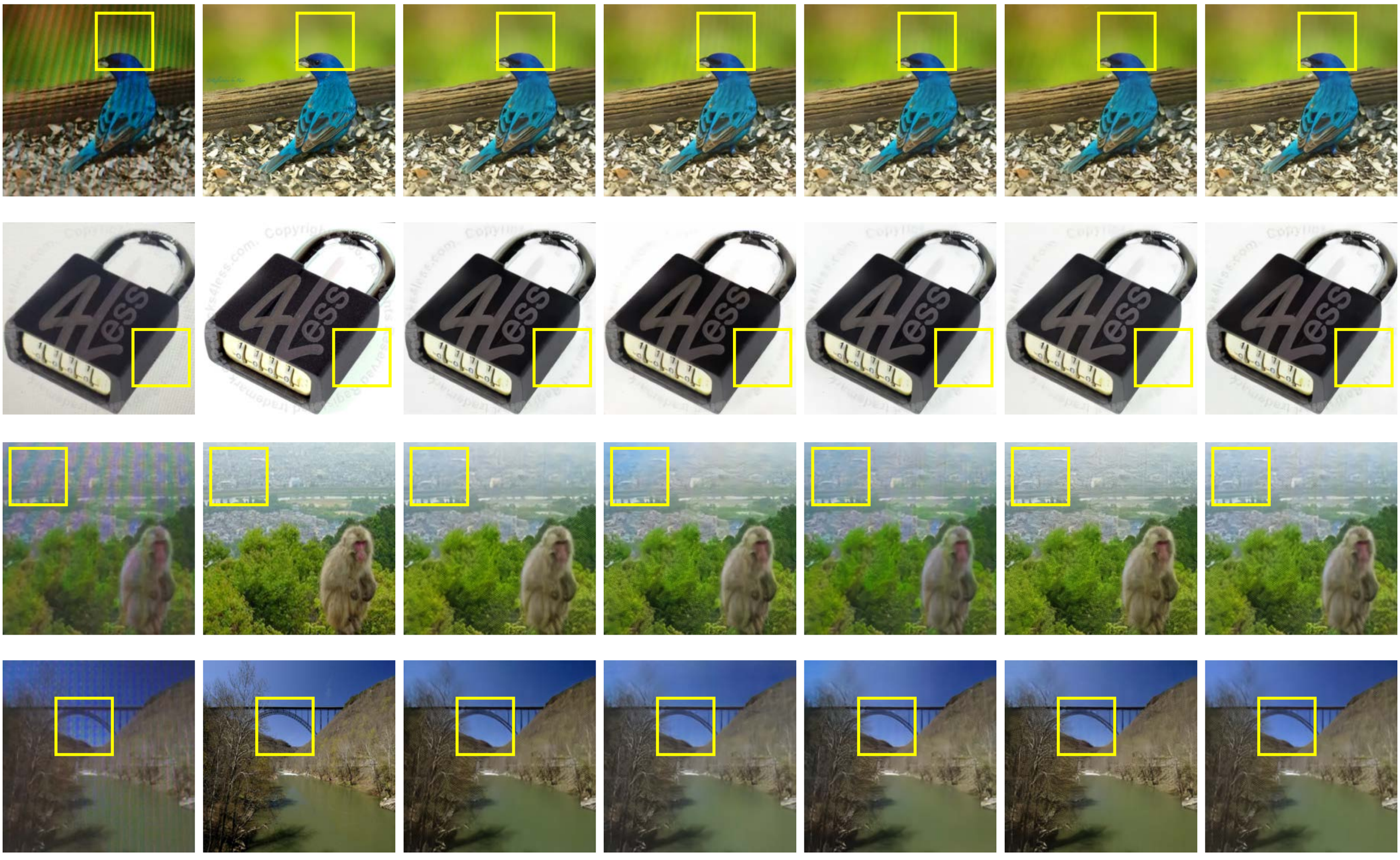
- **Mixed Shape:**



Input GT MopNet DMCNN Yang *et al.* Descreen

More Ablation Results

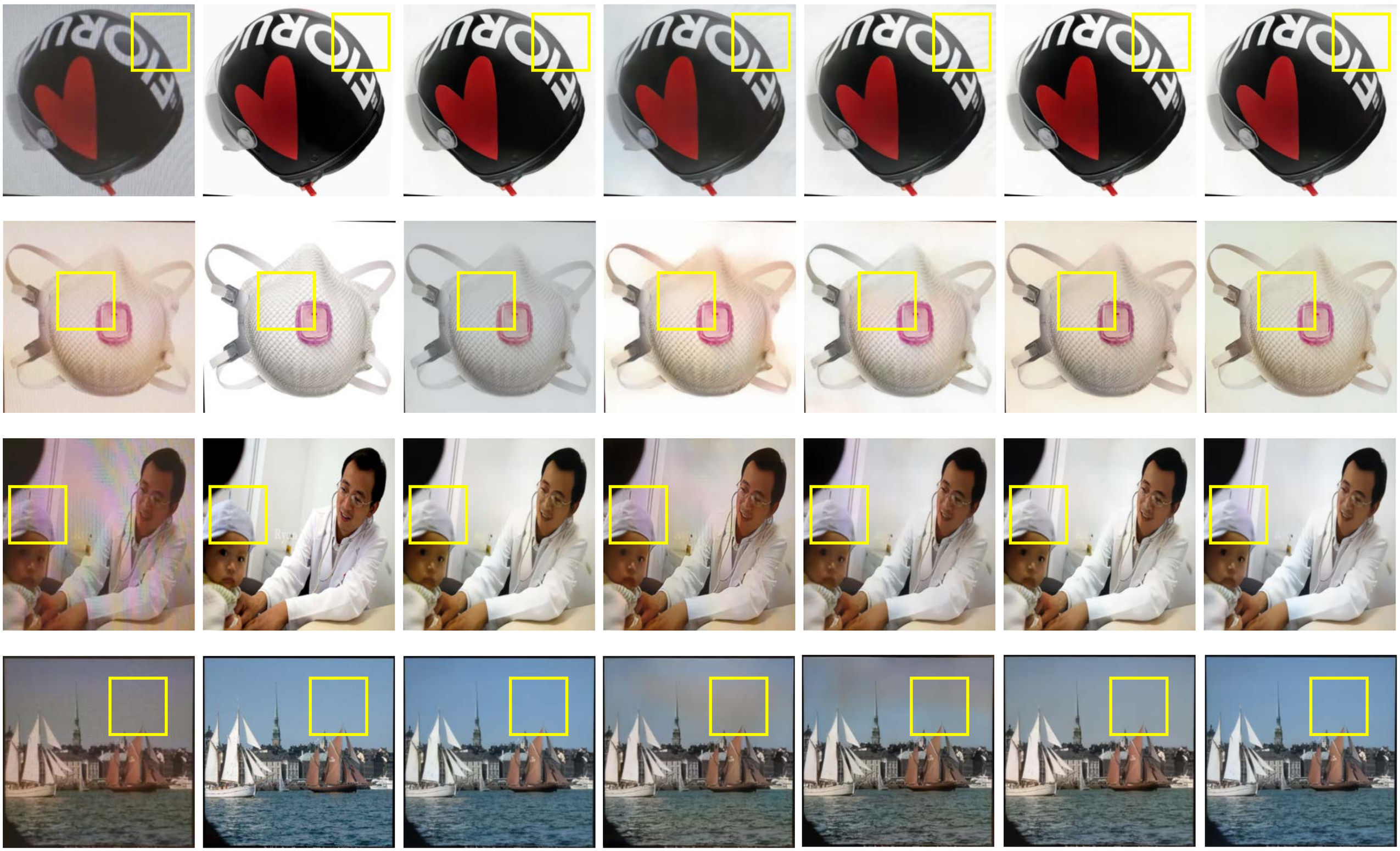
- **Zoom-in for details:**



Input **GT** **MopNet** **B** **B+M** **B+M+C** **B+M+E**

More Ablation Results

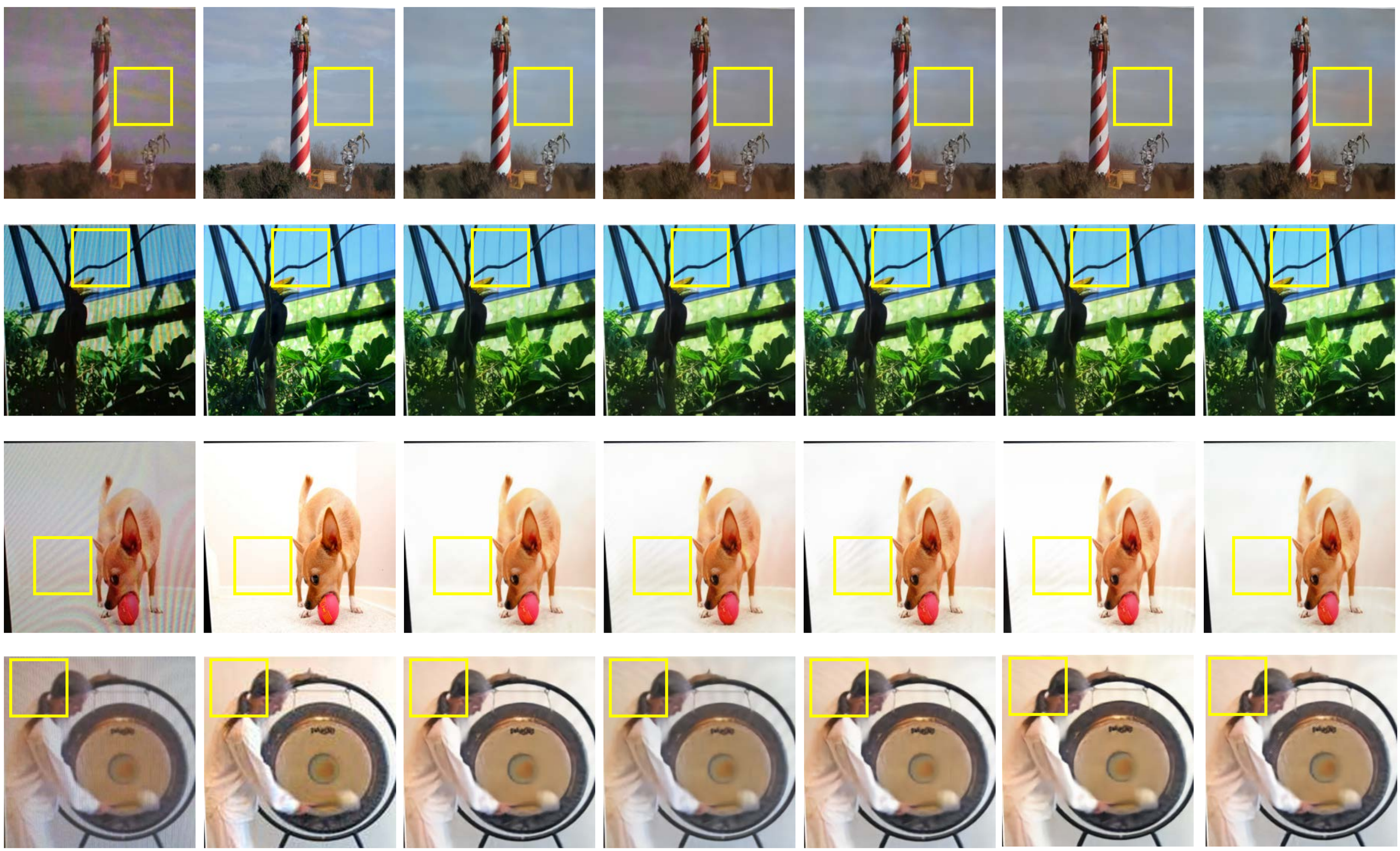
- **Zoom-in for details:**



Input GT MopNet B B+M B+M+C B+M+E

More Ablation Results

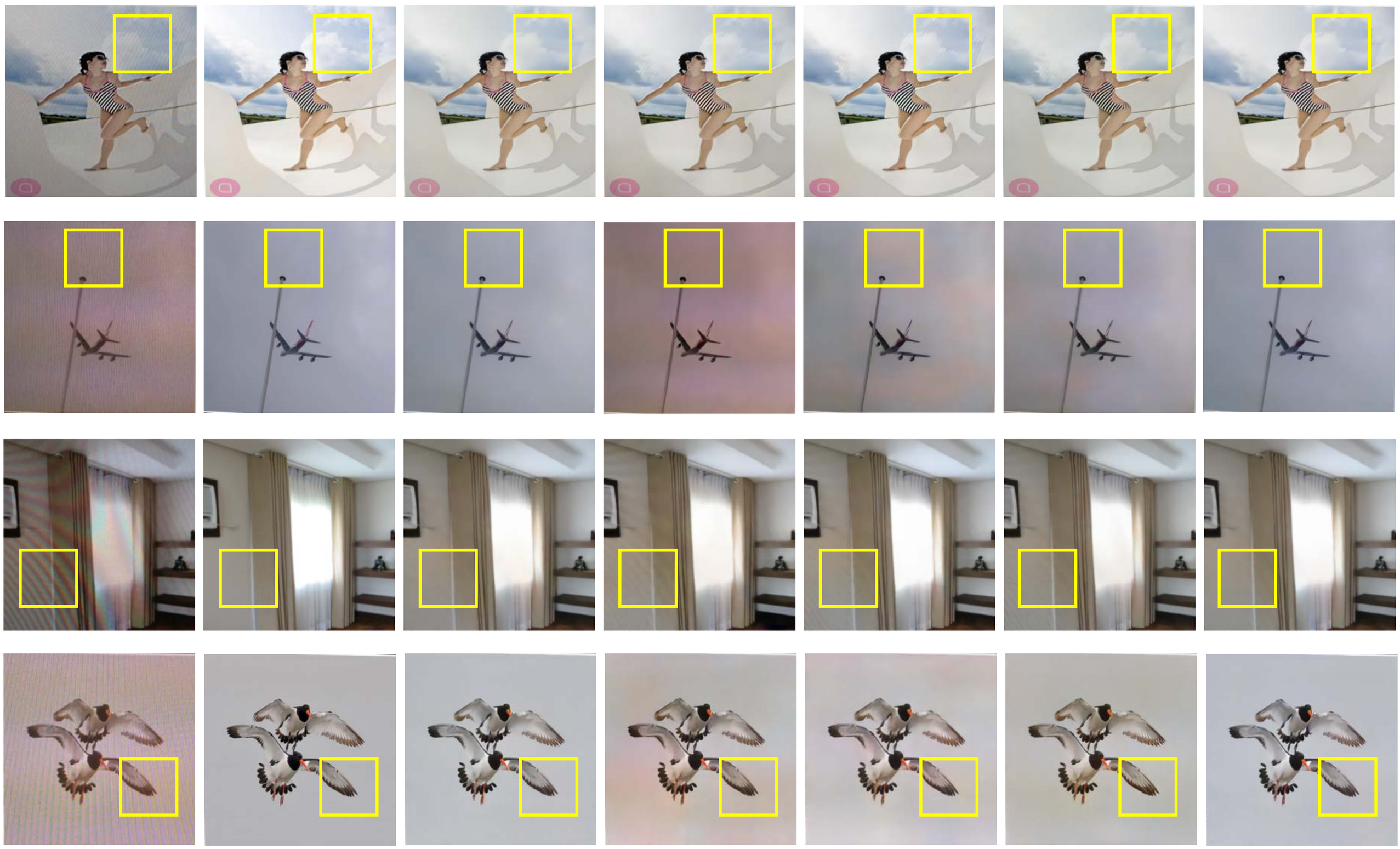
- **Zoom-in for details:**



Input GT MopNet B B+M B+M+C B+M+E

More Ablation Results

- **Zoom-in for details:**

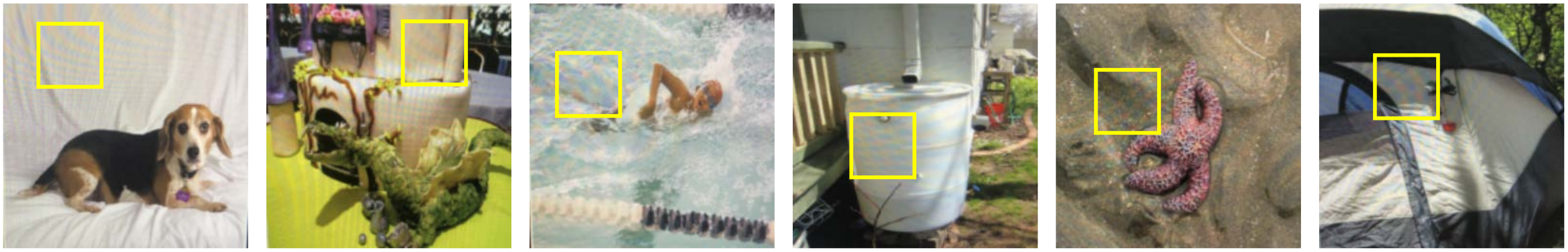


Input GT MopNet B B+M B+M+C B+M+E

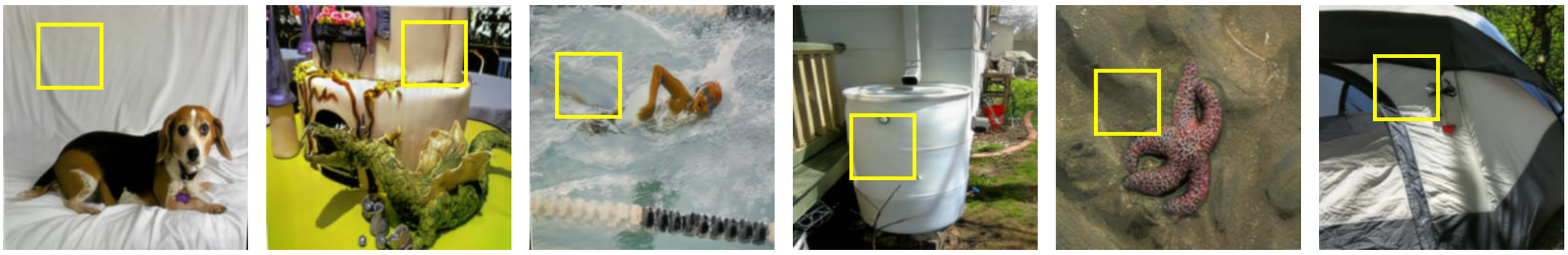
Cross Data Evaluation

- We test MopNet with images captured ourselves:
  - Iphone 8 Plus + DELL P2414H

Input

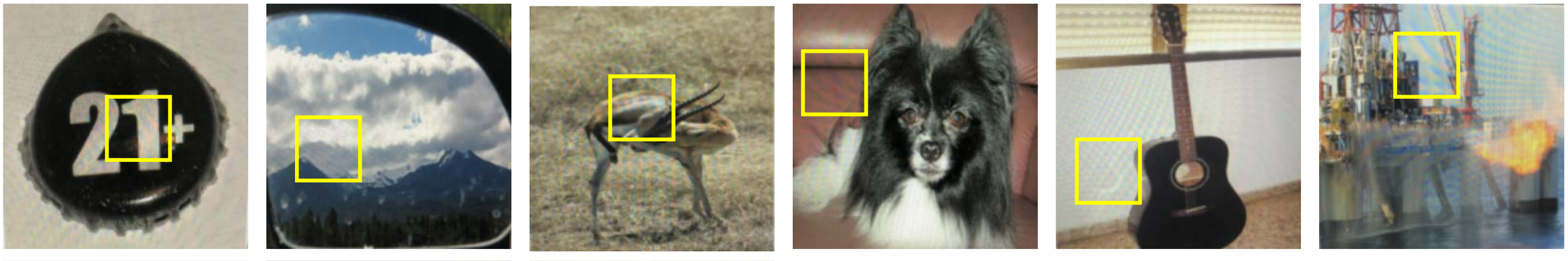


MpNet

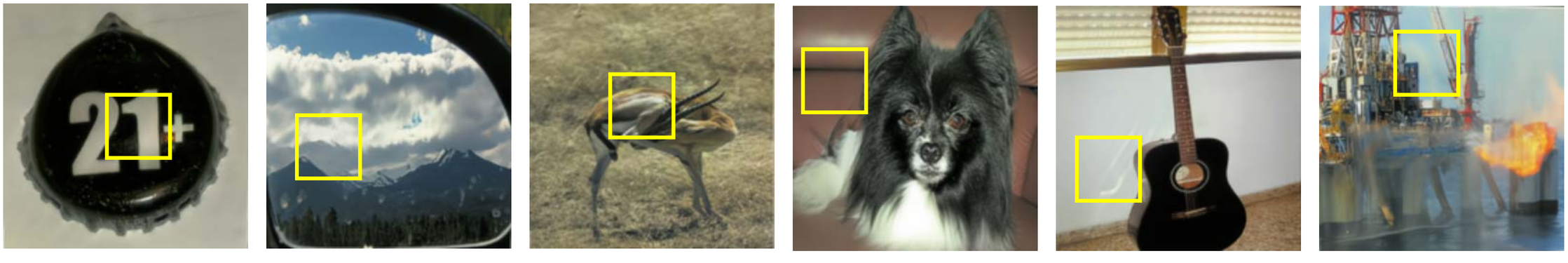


  - Iphone 8 Plus + DELL U2417H

Input



MpNet



Cross Data Evaluation

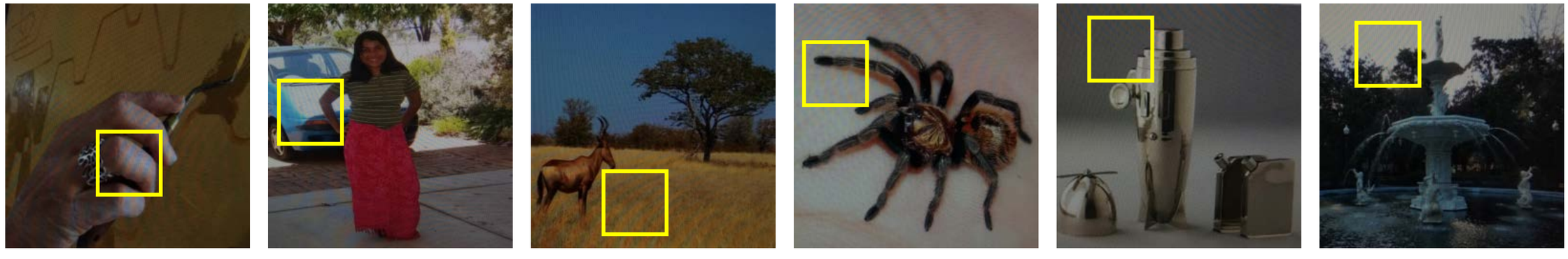
- We test MopNet with images captured ourselves:
  - Redmi Note 5A + DELL P2414H

Input

MpNet

  - Redmi Note 5A + DELL U2417H

Input



MpNet