

Supplemental: Beyond Planar Symmetry: Modeling human perception of reflection and rotation symmetries in the wild

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1. Figure 6 update

To make our evaluation complete, we use two ways to scale:

- Local Scaling: scaling each heatmap image output to have a range of 0-1.
- Global Scaling: scaling ALL output heatmap values using ONE scalar for ALL images to a range of 0-1. If nothing was detected, then everything is marked as incorrect.

The updated Figure 6 from the paper is shown in Figure 1. If there are no positive pixel detections on an image, the precision is set to 0.

2. P-Values

We examine the P-Values for all the comparisons (both local and global scaling). Sym-NETs obtain significant improvements over all other detectors on the datasets tested.

Reflection	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym-VGG	0.38	N/A	0.006
Sym-ResNet	0.41	0.006	N/A
LE	0.12	1.4e-55	4.6e-62
MIL	0.19	3.4e-34	3.8e-40
SRF	0.15	2.1e-46	3.4e-53
FSDS	0.22	2.6e-31	5.5e-38

Rotation	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym	0.38	N/A	8e-08
Sym-Re	0.32	8e-08	N/A
LE	0.025	1.5e-40	7.3e-35

Table 1: F-Measure values and P-values for MS-COCO [1] where the Sym-NET output has been locally scaled. Significant improvements are shown in bold.

Reflection	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym-VGG	0.37	N/A	0.001
Sym-ResNet	0.4	0.001	N/A
LE	0.12	3.3e-60	3.8e-61
MIL	0.19	6e-39	3.1e-41
SRF	0.15	2.3e-51	7.8e-53
FSDS	0.22	4.1e-32	4.3e-38

Rotation	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym	0.38	N/A	8e-08
Sym-Re	0.32	8e-08	N/A
LE	0.025	1.5e-40	7.3e-35

Table 2: F-Measure values and P-values for MS-COCO [1] where the Sym-NET output has been globally scaled. Significant improvements are shown in bold.

These are shown in Tables 1, 2, 3, and 4.

3. Dataset results

We show the dataset results on 100 (top 50 and bottom 50) images for the MS-COCO dataset [1] for both reflection and rotation symmetries in Tables 5 and 6 sorted by the F-measures. The precision-recall and F-measure values shown for each image are the maximum F-measure values for each image. The complete results for the Symmetry Competition dataset are shown in Tables 7 and 8 for reflection and rotation, sorted from the single symmetry images and progressing into more complex ones.

4. Reflection Symmetry Stress Test

We stress test the Sym-NETs for one side of the reflection symmetry by progressively adding more Gaussian noise ($\mu:0 \sigma:0.1$) to one side of the reflection symmetry (Ta-

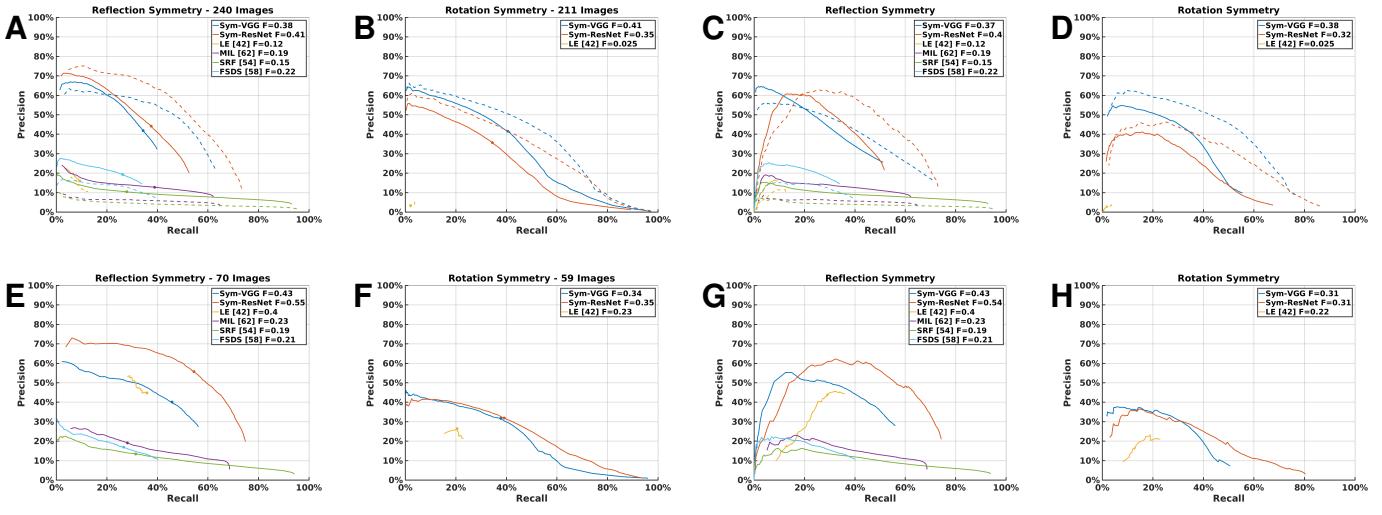


Figure 1: The updated graphs for Figure 6 (**Left 2 Columns**: all networks and algorithms are locally scaled and **Right 2 Columns**: all networks and algorithms are globally scaled). This is the comparison of the precision-recall curves for the state-of-the-art symmetry detection algorithms. **A, B, C, and D**: The comparison on MS-COCO images for all GT labels (solid line) and for the subset of 200 images with GT labels containing at least 20 labelers (dashed). **E, F, G and H**: the comparison on the previous symmetry competition [2]. Reflection is on the left and rotation is on the right. LE stands for Loy and Eklundh’s algorithm [3], MIL stands for the Multiple Instance method by Tsogkas and Kokkinos [6], SRF stands for the Structured Random Forest method by Teo *et al.* [5], and FSDS stands for Deep Skeleton by Shen *et al.* [4]. The legend in the graph displays the maximum F-measure for each of the detectors. Best viewed electronically.

Reflection	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym-VGG	0.43	N/A	2e-06
Sym-ResNet	0.55	2e-06	N/A
LE	0.4	0.27	0.00014
MIL	0.23	6e-09	2.1e-14
SRF	0.19	1.9e-10	3.1e-16
FSDS	0.21	2.1e-10	3.9e-16

Rotation	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym-VGG	0.34	N/A	0.88
Sym-ResNet	0.35	0.88	N/A
LE	0.23	0.069	0.024

Table 3: F-Measure values and P-values for Symmetry Competition [2] where the Sym-NET output has been locally scaled. Significant improvements are shown in bold.

Reflection	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym-VGG	0.43	N/A	4.5e-05
Sym-ResNet	0.54	4.5e-05	N/A
LE	0.4	0.28	0.00078
MIL	0.23	4.3e-09	2.7e-14
SRF	0.19	8.5e-11	4e-16
FSDS	0.21	3.9e-10	9.3e-16

Rotation	Maximum F-Measure	Sym-Vgg P-Value	Sym-Resnet P-Value
Sym-VGG	0.31	N/A	0.99
Sym-ResNet	0.31	0.99	N/A
LE	0.22	0.025	0.018

Table 4: F-Measure values and P-values for Symmetry Competition [2] where the Sym-NET output has been globally scaled. Significant improvements are shown in bold.

ble 9). We choose images with a single major reflection symmetry within the image.

We observe that some reflection symmetries’ robustness to noise does **not** monotonically decrease the precision-recall (though in general it does go down as the amount

of noise goes up). One surprising result is shown in Table 9-2 Sym-VGG where the networks actually increases the F-measure values because the major symmetry is found much closer to the ground-truth symmetry and some False Positives reflection symmetries are eliminated. In Table 9-22,

Sym-VGG switches to a nearby lesser symmetry, though Sym-Resnet still finds the symmetry reliably.

5. Network Inner Layer Visualization

We visualize the network activations in Figure 7 of the paper and here we extend that visualization by deconvolving the activation back into the original image using a variation on Zeiler and Fergus' method [7] (Figure 2). We deconvolve the entire layer's activation for specific images in order see what is salient to the network at each layer. The visualizations show for reflection symmetry that certain objects such as eyes or the top of the tower are recognizable throughout the network; whereas for rotation, the areas around each detected rotation symmetry is more evident.

Table 5: Examples of reflection symmetry with the original image, ground-truth, ground-truth heatmap (with the number of labelers in the center of the reflection symmetries), the output for Sym-NET, the precision (prec.), the recall (rec.), and the F-Measure values (F) for the maximum per image F-measure and the maximum of the Sym-NET output (max) on a subset of 100 (the top 50 and bottom 50) images from the MS-COCO [1] testing images.

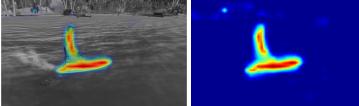
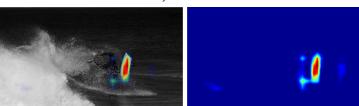
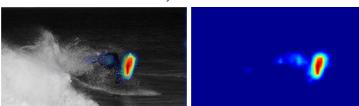
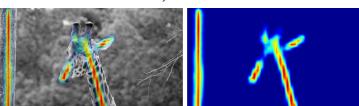
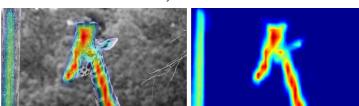
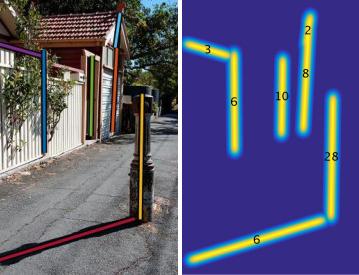
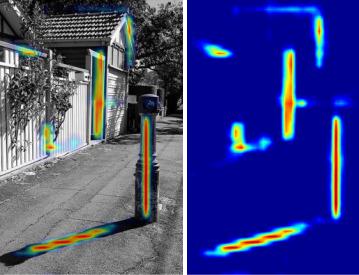
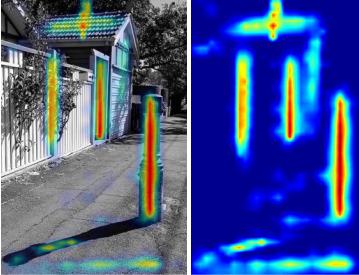
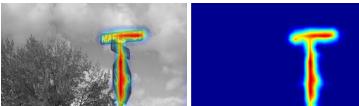
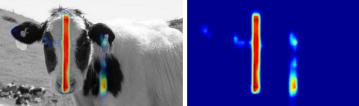
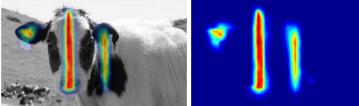
Table 5 – Reflection MS-COCO Testing Set

Top 50 Images

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
5-1				Prec: 0.96, Rec.: 0.78 F: 0.86, Max: 1.11		Prec: 0.90, Rec.: 0.94 F: 0.92, Max: 1.26
5-2				Prec: 0.94, Rec.: 0.84 F: 0.89, Max: 1.08		Prec: 0.90, Rec.: 0.80 F: 0.85, Max: 1.16
5-3				Prec: 0.73, Rec.: 0.85 F: 0.79, Max: 1.03		Prec: 0.91, Rec.: 0.94 F: 0.93, Max: 1.05
5-4				Prec: 0.77, Rec.: 0.75 F: 0.76, Max: 1.17		Prec: 0.87, Rec.: 0.77 F: 0.82, Max: 1.06
5-5				Prec: 1.00, Rec.: 0.75 F: 0.86, Max: 0.89		Prec: 0.92, Rec.: 0.73 F: 0.82, Max: 1.25
5-6				Prec: 1.00, Rec.: 0.86 F: 0.92, Max: 1.10		Prec: 0.88, Rec.: 0.51 F: 0.64, Max: 1.21
5-7				Prec: 0.80, Rec.: 0.62 F: 0.70, Max: 1.14		Prec: 0.73, Rec.: 0.73 F: 0.73, Max: 1.13

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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-8				
			Prec: 0.68, Rec.: 0.58 F: 0.63, Max: 1.08	Prec: 0.86, Rec.: 0.82 F: 0.84, Max: 1.15
5-9				
			Prec: 1.00, Rec.: 1.00 F: 1.00, Max: 1.01	Prec: 0.83, Rec.: 0.92 F: 0.87, Max: 1.10
5-10				
			Prec: 0.66, Rec.: 0.59 F: 0.62, Max: 1.12	Prec: 0.83, Rec.: 0.75 F: 0.79, Max: 1.21
5-11				
			Prec: 0.87, Rec.: 0.51 F: 0.65, Max: 1.12	Prec: 0.63, Rec.: 0.72 F: 0.67, Max: 1.05
5-12				
			Prec: 0.86, Rec.: 0.48 F: 0.62, Max: 1.11	Prec: 0.83, Rec.: 0.57 F: 0.68, Max: 1.15
5-13				
			Prec: 0.90, Rec.: 0.52 F: 0.66, Max: 1.08	Prec: 0.82, Rec.: 0.54 F: 0.65, Max: 1.15
5-14				
			Prec: 0.61, Rec.: 0.76 F: 0.68, Max: 0.93	Prec: 0.92, Rec.: 0.54 F: 0.68, Max: 1.11

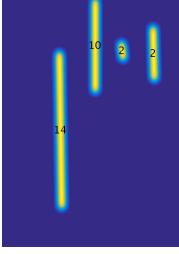
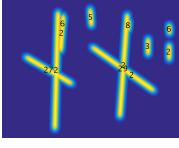
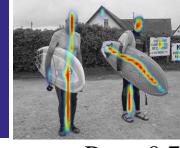
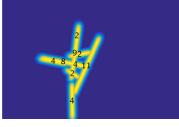
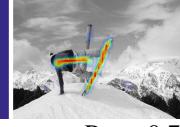
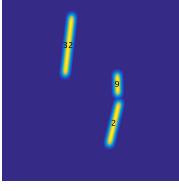
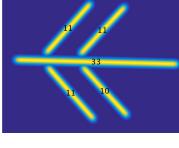
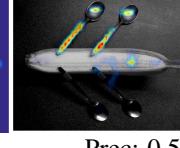
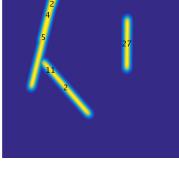
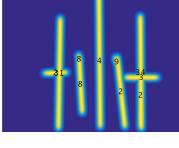
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-15				
			Prec: 0.73, Rec.: 0.52 F: 0.61, Max: 1.10	Prec: 0.69, Rec.: 0.74 F: 0.71, Max: 1.06
5-16				
			Prec: 0.98, Rec.: 0.51 F: 0.67, Max: 1.05	Prec: 0.93, Rec.: 0.43 F: 0.59, Max: 1.13
5-17				
			Prec: 0.62, Rec.: 0.68 F: 0.65, Max: 1.08	Prec: 0.93, Rec.: 0.56 F: 0.70, Max: 1.21
5-18				
			Prec: 0.65, Rec.: 0.68 F: 0.66, Max: 1.06	Prec: 0.66, Rec.: 0.72 F: 0.68, Max: 1.16
5-19				
			Prec: 0.72, Rec.: 0.58 F: 0.64, Max: 1.05	Prec: 0.78, Rec.: 0.72 F: 0.75, Max: 1.07
5-20				
			Prec: 0.80, Rec.: 0.50 F: 0.62, Max: 1.02	Prec: 0.75, Rec.: 0.64 F: 0.69, Max: 1.09

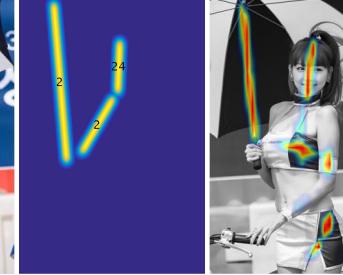
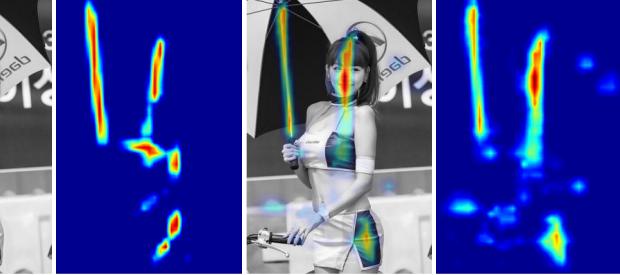
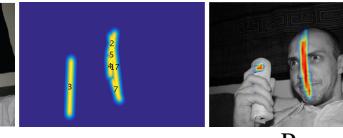
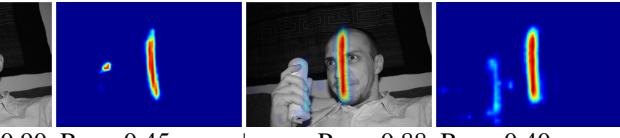
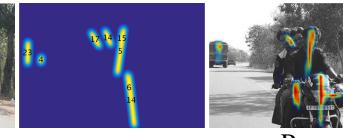
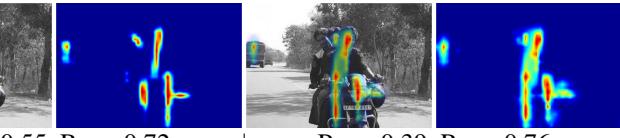
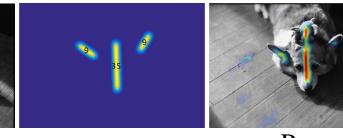
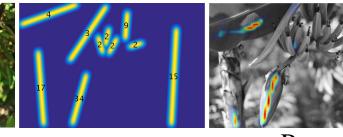
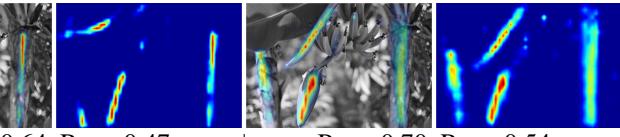
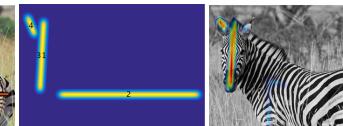
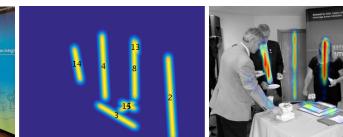
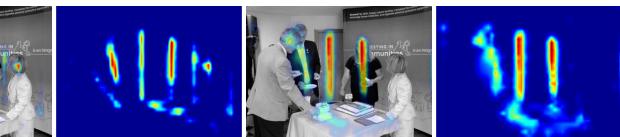
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-21				
			Prec: 0.78, Rec.: 0.56 F: 0.65, Max: 0.78	Prec: 0.87, Rec.: 0.55 F: 0.68, Max: 0.98
5-22				
			Prec: 0.78, Rec.: 0.54 F: 0.64, Max: 1.11	Prec: 0.68, Rec.: 0.50 F: 0.58, Max: 1.33
5-23				
			Prec: 0.76, Rec.: 0.35 F: 0.48, Max: 1.13	Prec: 0.83, Rec.: 0.66 F: 0.73, Max: 1.05
5-24				
			Prec: 0.58, Rec.: 0.46 F: 0.52, Max: 1.03	Prec: 0.75, Rec.: 0.77 F: 0.76, Max: 1.21
5-25				
			Prec: 0.53, Rec.: 0.56 F: 0.54, Max: 1.15	Prec: 0.83, Rec.: 0.71 F: 0.77, Max: 1.12
5-26				
			Prec: 0.69, Rec.: 0.66 F: 0.68, Max: 1.03	Prec: 0.45, Rec.: 0.56 F: 0.50, Max: 1.14
5-27				
			Prec: 0.82, Rec.: 0.62 F: 0.70, Max: 1.11	Prec: 0.59, Rec.: 0.41 F: 0.48, Max: 1.12

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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-28				
			Prec: 0.71, Rec.: 0.62 F: 0.66, Max: 1.11	Prec: 0.59, Rec.: 0.66 F: 0.62, Max: 1.24
5-29				
			Prec: 0.90, Rec.: 0.45 F: 0.60, Max: 1.06	Prec: 0.88, Rec.: 0.40 F: 0.55, Max: 1.16
5-30				
			Prec: 0.55, Rec.: 0.72 F: 0.62, Max: 1.02	Prec: 0.39, Rec.: 0.76 F: 0.52, Max: 1.06
5-31				
			Prec: 0.66, Rec.: 0.62 F: 0.64, Max: 1.09	Prec: 0.96, Rec.: 0.54 F: 0.69, Max: 1.27
5-32				
			Prec: 0.64, Rec.: 0.47 F: 0.54, Max: 1.11	Prec: 0.70, Rec.: 0.54 F: 0.61, Max: 1.18
5-33				
			Prec: 0.94, Rec.: 0.37 F: 0.53, Max: 1.08	Prec: 0.86, Rec.: 0.59 F: 0.70, Max: 1.14
5-34				
			Prec: 0.78, Rec.: 0.52 F: 0.62, Max: 1.16	Prec: 0.90, Rec.: 0.45 F: 0.60, Max: 1.11

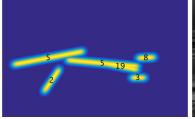
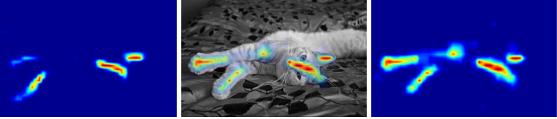
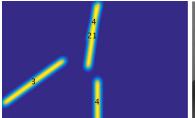
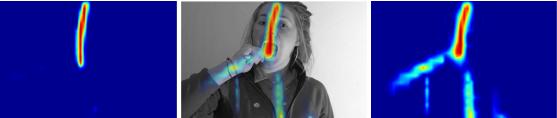
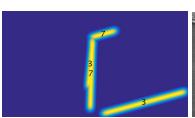
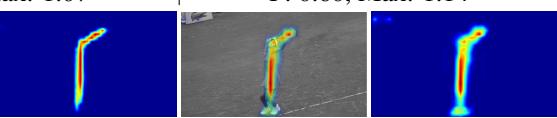
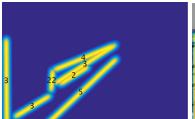
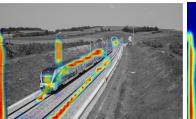
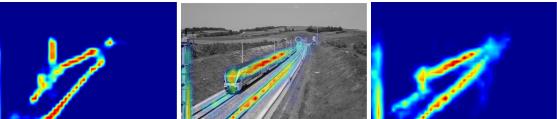
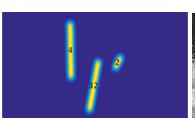
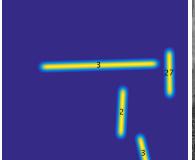
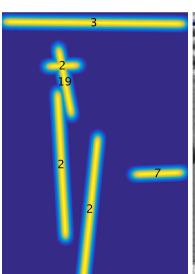
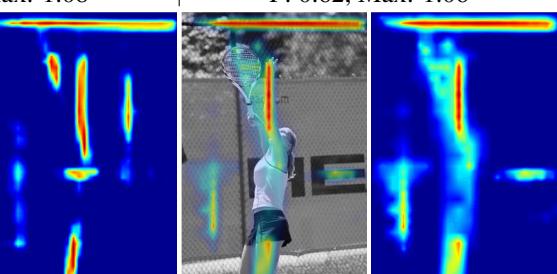
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-35				
			Prec: 0.73, Rec.: 0.48 F: 0.58, Max: 1.08	Prec: 0.92, Rec.: 0.46 F: 0.61, Max: 1.05
5-36				
			Prec: 0.99, Rec.: 0.74 F: 0.84, Max: 1.05	Prec: 0.86, Rec.: 0.51 F: 0.64, Max: 1.07
5-37				
			Prec: 0.78, Rec.: 0.52 F: 0.63, Max: 1.09	Prec: 0.65, Rec.: 0.42 F: 0.51, Max: 1.08
5-38				
			Prec: 0.83, Rec.: 0.84 F: 0.83, Max: 1.12	Prec: 0.30, Rec.: 0.31 F: 0.30, Max: 0.85
5-39				
			Prec: 1.00, Rec.: 0.88 F: 0.93, Max: 1.10	Prec: 0.59, Rec.: 0.75 F: 0.66, Max: 1.13
5-40				
			Prec: 0.67, Rec.: 0.40 F: 0.50, Max: 1.06	Prec: 0.83, Rec.: 0.47 F: 0.60, Max: 1.12
5-41				
			Prec: 0.68, Rec.: 0.36 F: 0.47, Max: 1.12	Prec: 0.68, Rec.: 0.79 F: 0.73, Max: 1.10

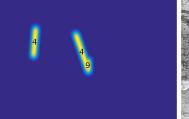
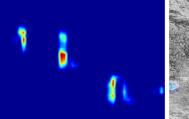
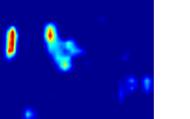
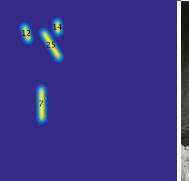
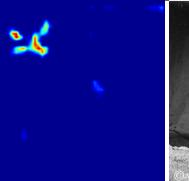
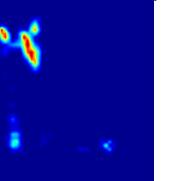
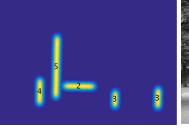
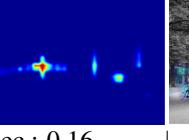
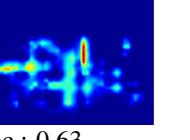
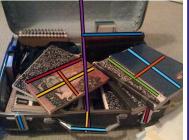
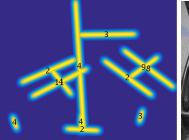
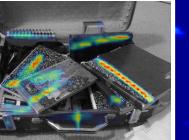
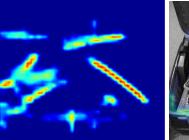
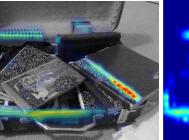
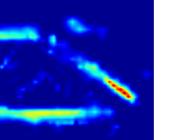
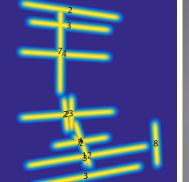
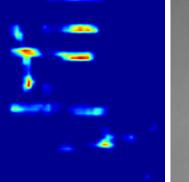
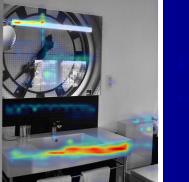
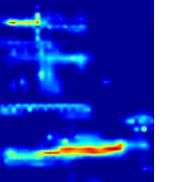
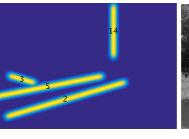
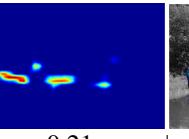
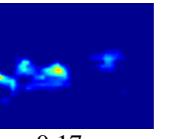
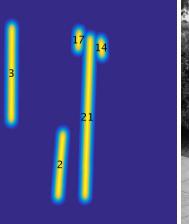
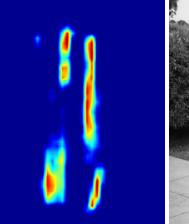
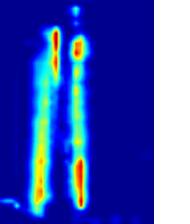
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
5-42			Prec: 0.58, Rec.: 0.44 F: 0.50, Max: 1.09	Prec: 0.68, Rec.: 0.55 F: 0.61, Max: 1.06
				
5-43			Prec: 0.58, Rec.: 0.44 F: 0.50, Max: 1.07	Prec: 0.62, Rec.: 0.58 F: 0.60, Max: 1.14
				
5-44			Prec: 0.89, Rec.: 0.43 F: 0.58, Max: 1.10	Prec: 0.68, Rec.: 0.40 F: 0.50, Max: 1.15
				
5-45			Prec: 0.59, Rec.: 0.60 F: 0.59, Max: 1.08	Prec: 0.47, Rec.: 0.57 F: 0.52, Max: 1.13
				
5-46			Prec: 0.73, Rec.: 0.46 F: 0.56, Max: 1.14	Prec: 0.84, Rec.: 0.42 F: 0.56, Max: 1.07
				
5-47			Prec: 0.59, Rec.: 0.41 F: 0.48, Max: 1.08	Prec: 0.54, Rec.: 0.75 F: 0.62, Max: 1.06
				
5-48			Prec: 0.56, Rec.: 0.50 F: 0.53, Max: 1.07	Prec: 0.51, Rec.: 0.53 F: 0.52, Max: 1.06

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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
						
5-49			Prec: 0.27, Rec.: 0.56 F: 0.37, Max: 0.64		Prec: 0.61, Rec.: 0.92 F: 0.73, Max: 0.81	
Bottom 50 Images						
						
5-50			Prec: 0.51, Rec.: 0.50 F: 0.50, Max: 1.02		Prec: 0.71, Rec.: 0.54 F: 0.61, Max: 1.03	
						
5-51			Prec: 0.31, Rec.: 0.16 F: 0.21, Max: 1.02		Prec: 0.17, Rec.: 0.63 F: 0.26, Max: 1.08	
						
5-52			Prec: 0.31, Rec.: 0.28 F: 0.29, Max: 1.15		Prec: 0.18, Rec.: 0.34 F: 0.23, Max: 1.07	
						
5-53			Prec: 0.43, Rec.: 0.21 F: 0.28, Max: 0.96		Prec: 0.37, Rec.: 0.30 F: 0.33, Max: 1.02	
						
5-54			Prec: 0.57, Rec.: 0.21 F: 0.31, Max: 1.10		Prec: 0.22, Rec.: 0.17 F: 0.19, Max: 1.04	
						
5-55			Prec: 0.32, Rec.: 0.16 F: 0.22, Max: 1.04		Prec: 0.42, Rec.: 0.24 F: 0.30, Max: 1.10	

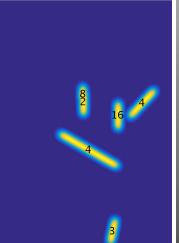
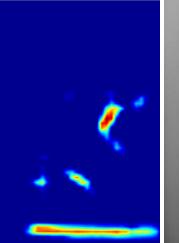
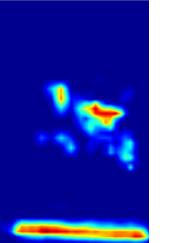
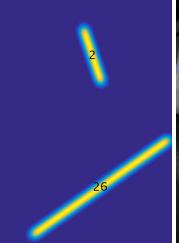
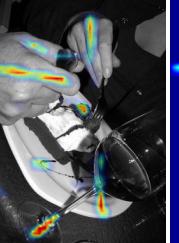
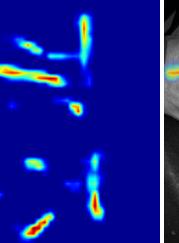
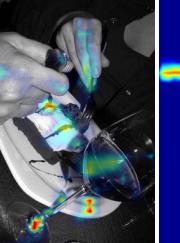
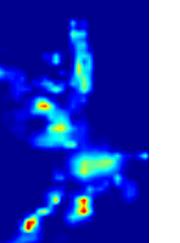
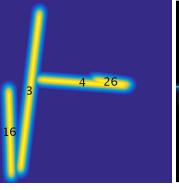
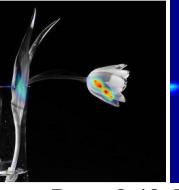
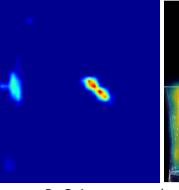
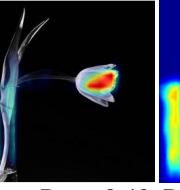
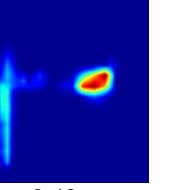
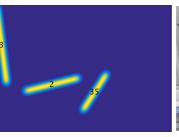
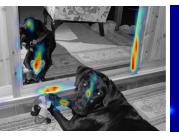
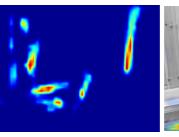
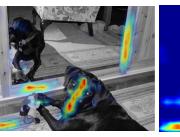
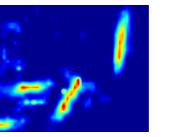
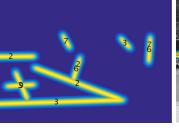
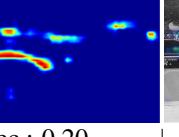
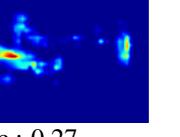
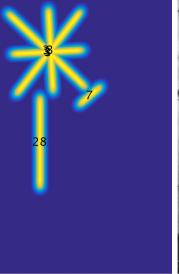
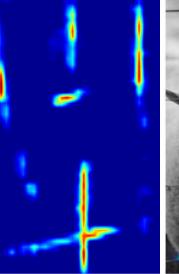
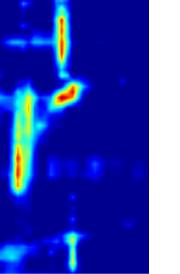
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-56				
			Prec: 0.20, Rec.: 0.07 F: 0.10, Max: 0.65	Prec: 0.48, Rec.: 0.27 F: 0.35, Max: 0.66
5-57				
			Prec: 0.35, Rec.: 0.17 F: 0.23, Max: 0.90	Prec: 0.25, Rec.: 0.33 F: 0.28, Max: 0.71
5-58				
			Prec: 0.96, Rec.: 0.15 F: 0.26, Max: 1.04	Prec: 0.17, Rec.: 0.54 F: 0.25, Max: 1.09
5-59				
			Prec: 0.83, Rec.: 0.16 F: 0.26, Max: 1.08	Prec: 0.26, Rec.: 0.17 F: 0.21, Max: 1.07
5-60				
			Prec: 0.16, Rec.: 0.06 F: 0.09, Max: 0.80	Prec: 0.33, Rec.: 0.34 F: 0.34, Max: 0.64
5-61				
			Prec: 0.43, Rec.: 0.21 F: 0.29, Max: 1.03	Prec: 0.27, Rec.: 0.37 F: 0.31, Max: 0.84
5-62				
			Prec: 0.29, Rec.: 0.21 F: 0.24, Max: 0.80	Prec: 0.31, Rec.: 0.26 F: 0.28, Max: 1.10
5-63				
			Prec: 0.19, Rec.: 0.17 F: 0.18, Max: 0.91	Prec: 0.31, Rec.: 0.59 F: 0.41, Max: 1.14

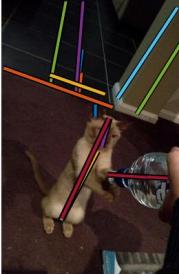
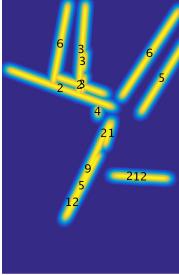
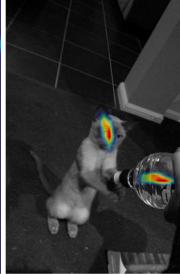
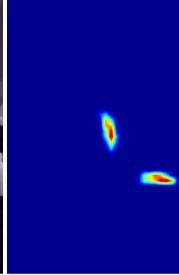
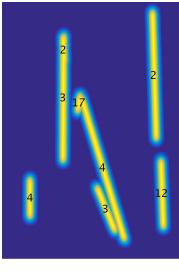
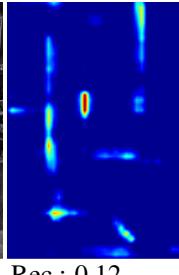
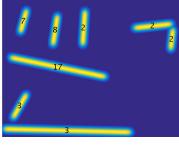
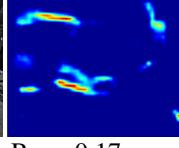
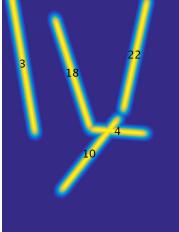
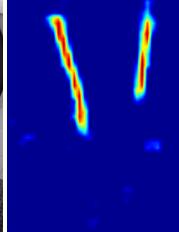
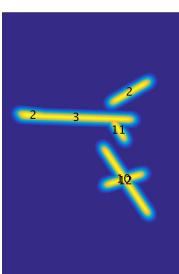
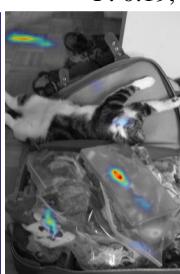
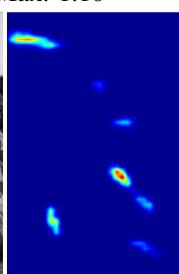
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
						
5-64			Prec: 0.14, Rec.: 0.33 F: 0.20, Max: 1.02		Prec: 0.18, Rec.: 0.54 F: 0.27, Max: 0.86	
						
5-65			Prec: 0.15, Rec.: 0.39 F: 0.22, Max: 1.04		Prec: 0.13, Rec.: 0.28 F: 0.18, Max: 0.91	
						
5-66			Prec: 0.40, Rec.: 0.21 F: 0.27, Max: 1.22		Prec: 0.40, Rec.: 0.43 F: 0.41, Max: 1.05	
						
5-67			Prec: 0.11, Rec.: 0.12 F: 0.11, Max: 1.07		Prec: 0.31, Rec.: 0.28 F: 0.30, Max: 1.05	
						
5-68			Prec: 0.23, Rec.: 0.20 F: 0.21, Max: 0.97		Prec: 0.23, Rec.: 0.27 F: 0.25, Max: 1.01	
						
5-69			Prec: 0.09, Rec.: 0.10 F: 0.09, Max: 1.10		Prec: 0.27, Rec.: 0.33 F: 0.30, Max: 1.12	

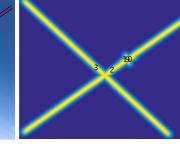
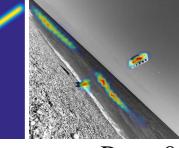
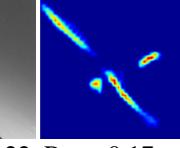
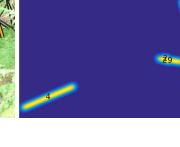
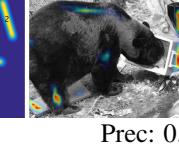
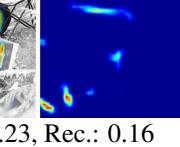
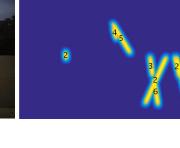
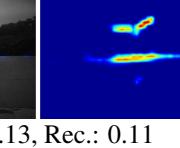
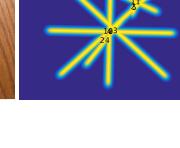
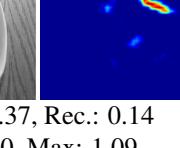
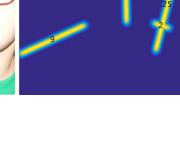
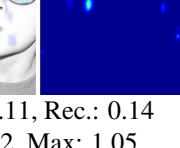
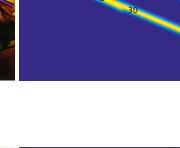
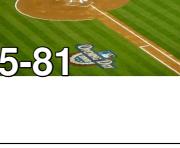
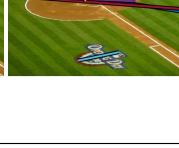
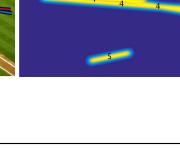
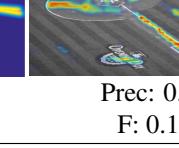
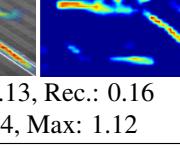
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
5-70		Prec: 0.68, Rec.: 0.09 F: 0.16, Max: 0.99		Prec: 0.34, Rec.: 0.17 F: 0.23, Max: 1.01
				
5-71		Prec: 0.21, Rec.: 0.12 F: 0.15, Max: 1.06		Prec: 0.20, Rec.: 0.29 F: 0.24, Max: 1.05
				
5-72		Prec: 0.20, Rec.: 0.17 F: 0.18, Max: 1.05		Prec: 0.21, Rec.: 0.58 F: 0.31, Max: 1.03
				
5-73		Prec: 0.28, Rec.: 0.15 F: 0.19, Max: 1.10		Prec: 0.18, Rec.: 0.21 F: 0.19, Max: 0.95
				
5-74		Prec: 0.31, Rec.: 0.19 F: 0.24, Max: 1.02		Prec: 0.11, Rec.: 0.52 F: 0.18, Max: 0.97

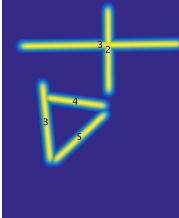
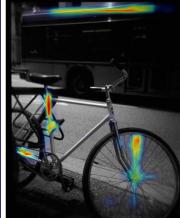
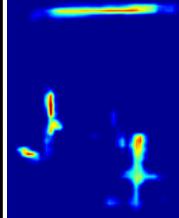
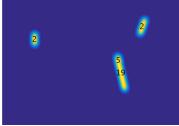
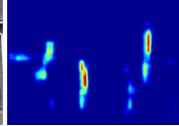
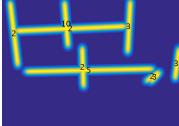
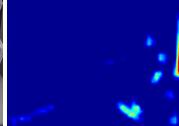
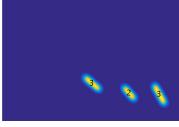
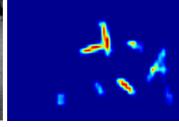
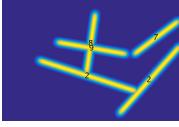
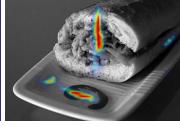
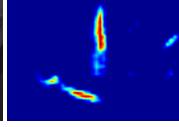
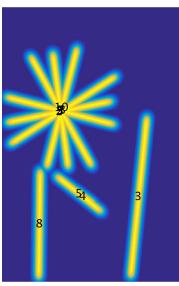
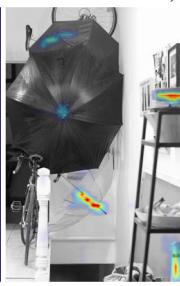
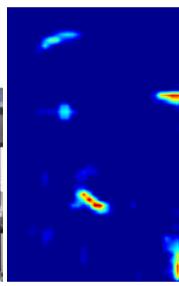
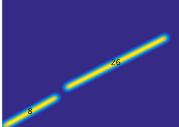
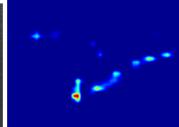
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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
5-75			Prec: 0.22, Rec.: 0.17 F: 0.19, Max: 1.19	Prec: 0.18, Rec.: 0.15 F: 0.16, Max: 1.14
				
5-76			Prec: 0.23, Rec.: 0.16 F: 0.19, Max: 1.12	Prec: 0.39, Rec.: 0.18 F: 0.24, Max: 0.99
				
5-77			Prec: 0.13, Rec.: 0.11 F: 0.12, Max: 1.03	Prec: 0.55, Rec.: 0.18 F: 0.27, Max: 1.06
				
5-78			Prec: 0.37, Rec.: 0.14 F: 0.20, Max: 1.09	Prec: 0.43, Rec.: 0.23 F: 0.30, Max: 1.14
				
5-79			Prec: 0.11, Rec.: 0.14 F: 0.12, Max: 1.05	Prec: 0.26, Rec.: 0.27 F: 0.26, Max: 1.10
				
5-80			Prec: 0.06, Rec.: 0.03 F: 0.04, Max: 0.98	Prec: 0.23, Rec.: 0.37 F: 0.29, Max: 1.03
				
5-81			Prec: 0.13, Rec.: 0.16 F: 0.14, Max: 1.12	Prec: 0.15, Rec.: 0.13 F: 0.14, Max: 1.37

Continued on next page

Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
5-82			Prec: 0.24, Rec.: 0.13 F: 0.16, Max: 1.07	Prec: 0.23, Rec.: 0.18 F: 0.20, Max: 1.04
				
5-83			Prec: 0.10, Rec.: 0.58 F: 0.18, Max: 1.06	Prec: 0.13, Rec.: 0.26 F: 0.18, Max: 1.10
				
5-84			Prec: 0.19, Rec.: 0.08 F: 0.12, Max: 1.02	Prec: 0.09, Rec.: 0.17 F: 0.12, Max: 0.88
				
5-85			Prec: 0.09, Rec.: 0.48 F: 0.16, Max: 1.05	Prec: 0.08, Rec.: 0.79 F: 0.14, Max: 1.27
				
5-86			Prec: 0.21, Rec.: 0.12 F: 0.15, Max: 1.04	Prec: 0.15, Rec.: 0.23 F: 0.18, Max: 1.21
				
5-87			Prec: 0.25, Rec.: 0.15 F: 0.19, Max: 1.04	Prec: 0.15, Rec.: 0.24 F: 0.18, Max: 0.97
				
5-88			Prec: 0.14, Rec.: 0.05 F: 0.07, Max: 0.44	Prec: 0.15, Rec.: 0.37 F: 0.22, Max: 0.98

Continued on next page

Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-89				
			Prec: 0.09, Rec.: 0.39 F: 0.15, Max: 1.04	Prec: 0.59, Rec.: 0.24 F: 0.34, Max: 1.00
5-90				
			Prec: 0.08, Rec.: 0.18 F: 0.11, Max: 0.91	Prec: 0.13, Rec.: 0.24 F: 0.17, Max: 0.94
5-91				
			Prec: 0.25, Rec.: 0.12 F: 0.16, Max: 0.97	Prec: 0.07, Rec.: 0.12 F: 0.09, Max: 0.93
5-92				
			Prec: 0.20, Rec.: 0.08 F: 0.12, Max: 1.06	Prec: 0.13, Rec.: 0.23 F: 0.17, Max: 1.02
5-93				
			Prec: 0.05, Rec.: 0.13 F: 0.07, Max: 0.88	Prec: 0.14, Rec.: 0.13 F: 0.14, Max: 0.85
5-94				
			Prec: 0.22, Rec.: 0.12 F: 0.15, Max: 0.44	Prec: 0.10, Rec.: 0.05 F: 0.07, Max: 1.02
5-95				
			Prec: 0.59, Rec.: 0.04 F: 0.07, Max: 0.89	Prec: 0.48, Rec.: 0.04 F: 0.07, Max: 0.97
5-96				
			Prec: 0.21, Rec.: 0.04 F: 0.07, Max: 0.40	Prec: 0.06, Rec.: 0.18 F: 0.09, Max: 0.84

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Table 5 – Reflection MS-COCO Testing Set - Continued from previous page

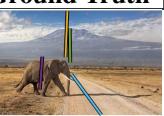
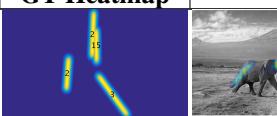
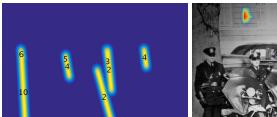
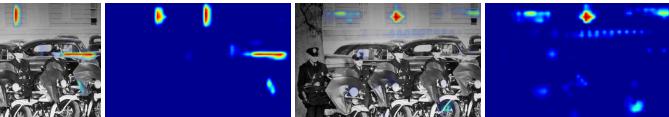
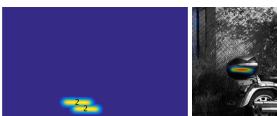
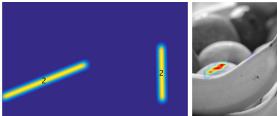
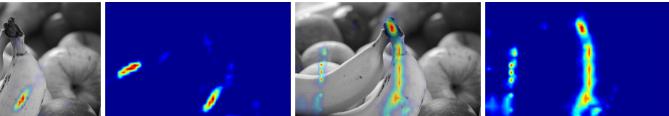
Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
5-97				
			Prec: 0.20, Rec.: 0.02 F: 0.04, Max: 1.15	Prec: 0.05, Rec.: 0.06 F: 0.05, Max: 0.94
5-98				
			Prec: 0.04, Rec.: 0.02 F: 0.03, Max: 0.98	Prec: 0.04, Rec.: 0.14 F: 0.07, Max: 0.89
5-99				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.21	Prec: 0.13, Rec.: 0.52 F: 0.21, Max: 1.07
5-100				
			Prec: 0.00, Rec.: 0.01 F: 0.01, Max: 1.05	Prec: 0.04, Rec.: 0.17 F: 0.07, Max: 1.08

Table 6: Examples of rotation symmetry with the original image, ground-truth, ground-truth heatmap (with the number of labelers to the left of the center of the rotation symmetries), the output for Sym-NET, the precision (prec.), the recall (rec.), and the F-Measure values (F) for the maximum per image F-measure and the maximum of the Sym-NET output (max) on a subset of 100 images from the MS-COCO [1] testing images.

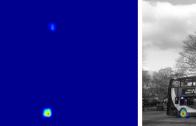
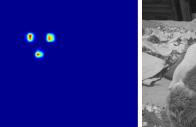
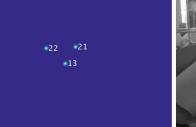
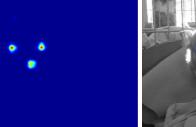
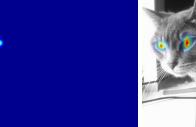
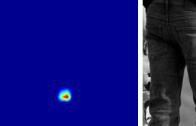
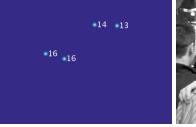
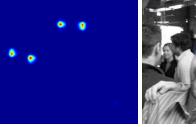
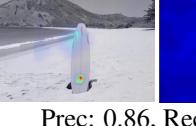
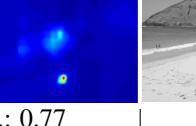
Table 6 – *Rotation MS-COCO Testing Set*

Top 50 Images

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
6-1				Prec: 0.82, Rec.: 0.90 F: 0.86, Max: 1.14		Prec: 0.72, Rec.: 0.88 F: 0.79, Max: 1.00
6-2				Prec: 0.86, Rec.: 0.85 F: 0.86, Max: 1.34		Prec: 0.72, Rec.: 0.74 F: 0.73, Max: 1.06
6-3				Prec: 0.73, Rec.: 0.94 F: 0.82, Max: 1.22		Prec: 0.72, Rec.: 0.81 F: 0.76, Max: 1.08
6-4				Prec: 0.82, Rec.: 0.85 F: 0.84, Max: 1.09		Prec: 0.67, Rec.: 0.81 F: 0.73, Max: 1.03
6-5				Prec: 0.74, Rec.: 0.81 F: 0.77, Max: 1.27		Prec: 0.74, Rec.: 0.75 F: 0.75, Max: 1.09
6-6				Prec: 0.75, Rec.: 0.83 F: 0.79, Max: 1.22		Prec: 0.80, Rec.: 0.63 F: 0.71, Max: 1.03
6-7				Prec: 0.77, Rec.: 0.89 F: 0.83, Max: 1.30		Prec: 0.54, Rec.: 0.77 F: 0.63, Max: 1.12

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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
6-8				
			Prec: 0.73, Rec.: 0.94 F: 0.82, Max: 1.05	Prec: 0.57, Rec.: 0.83 F: 0.68, Max: 0.94
6-9				
			Prec: 0.78, Rec.: 0.79 F: 0.79, Max: 1.02	Prec: 0.56, Rec.: 0.89 F: 0.68, Max: 1.24
6-10				
			Prec: 0.85, Rec.: 0.88 F: 0.86, Max: 1.23	Prec: 0.66, Rec.: 0.62 F: 0.64, Max: 1.10
6-11				
			Prec: 0.80, Rec.: 0.73 F: 0.76, Max: 1.09	Prec: 0.52, Rec.: 0.88 F: 0.66, Max: 1.12
6-12				
			Prec: 0.73, Rec.: 0.82 F: 0.78, Max: 1.15	Prec: 0.66, Rec.: 0.85 F: 0.74, Max: 0.74
6-13				
			Prec: 0.77, Rec.: 0.88 F: 0.82, Max: 1.25	Prec: 0.52, Rec.: 0.70 F: 0.60, Max: 1.02
6-14				
			Prec: 0.86, Rec.: 0.77 F: 0.81, Max: 0.00	Prec: 0.83, Rec.: 0.70 F: 0.76, Max: 0.84

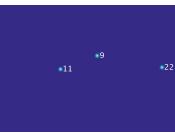
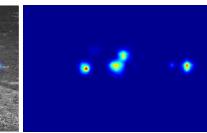
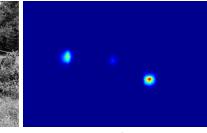
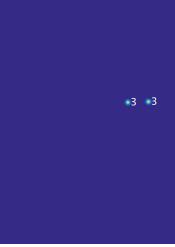
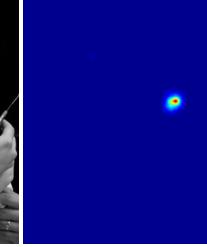
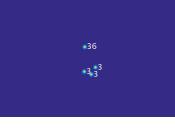
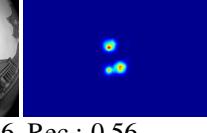
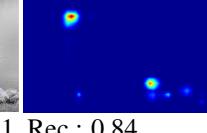
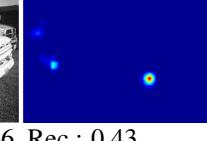
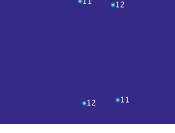
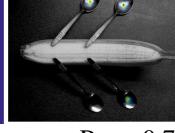
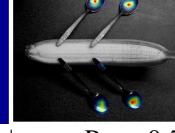
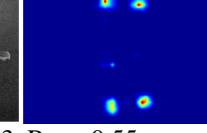
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
6-15				
		*9*9		
			Prec: 0.64, Rec.: 0.80 F: 0.71, Max: 1.11	Prec: 0.73, Rec.: 0.56 F: 0.63, Max: 1.03
6-16				
		*10*10		
			Prec: 0.78, Rec.: 0.78 F: 0.78, Max: 1.24	Prec: 0.45, Rec.: 0.87 F: 0.59, Max: 1.03
6-17				
		*9 *9 *7		
			Prec: 0.68, Rec.: 0.88 F: 0.77, Max: 1.30	Prec: 0.49, Rec.: 0.61 F: 0.54, Max: 1.04
6-18				
		*9 *8		
			Prec: 0.78, Rec.: 0.86 F: 0.82, Max: 1.29	Prec: 0.67, Rec.: 0.44 F: 0.54, Max: 1.04
6-19				
		*25 *29 *31		
			Prec: 0.71, Rec.: 0.80 F: 0.76, Max: 1.37	Prec: 0.59, Rec.: 0.77 F: 0.67, Max: 1.95
6-20				
		*31		
			Prec: 0.52, Rec.: 0.75 F: 0.62, Max: 1.07	Prec: 0.61, Rec.: 0.80 F: 0.70, Max: 0.88
6-21				
		*31		
			Prec: 0.48, Rec.: 0.78 F: 0.60, Max: 0.95	Prec: 0.57, Rec.: 0.80 F: 0.66, Max: 1.30

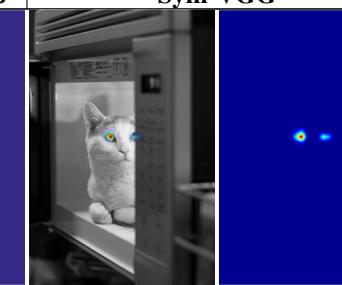
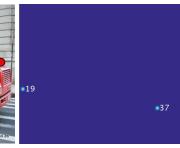
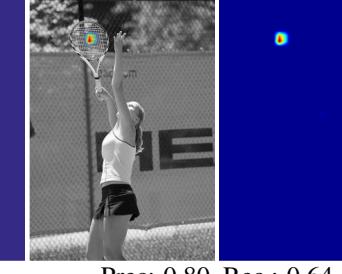
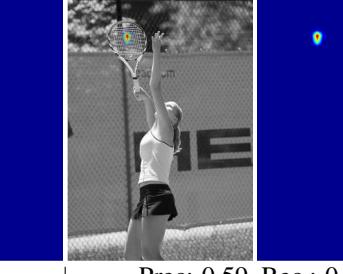
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
6-22						
			Prec: 0.63, Rec.: 0.85 F: 0.72, Max: 1.33		Prec: 0.49, Rec.: 0.64 F: 0.56, Max: 1.00	
6-23						
			Prec: 0.69, Rec.: 0.83 F: 0.76, Max: 1.28		Prec: 0.53, Rec.: 0.64 F: 0.58, Max: 1.00	
6-24						
			Prec: 0.70, Rec.: 0.81 F: 0.75, Max: 1.23		Prec: 0.64, Rec.: 0.48 F: 0.55, Max: 1.04	
6-25						
			Prec: 0.69, Rec.: 0.55 F: 0.61, Max: 1.21		Prec: 0.76, Rec.: 0.56 F: 0.64, Max: 1.09	
6-26						
			Prec: 0.81, Rec.: 0.84 F: 0.82, Max: 1.20		Prec: 0.71, Rec.: 0.84 F: 0.77, Max: 1.15	
6-27						
			Prec: 0.63, Rec.: 0.81 F: 0.71, Max: 1.19		Prec: 0.66, Rec.: 0.43 F: 0.52, Max: 1.25	
6-28						
			Prec: 0.75, Rec.: 0.65 F: 0.70, Max: 1.23		Prec: 0.53, Rec.: 0.55 F: 0.54, Max: 0.87	

Continued on next page

Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
6-29			Prec: 0.68, Rec.: 0.59 F: 0.63, Max: 1.26	Prec: 0.68, Rec.: 0.58 F: 0.62, Max: 1.18
				
6-30			Prec: 0.52, Rec.: 0.79 F: 0.63, Max: 1.17	Prec: 0.59, Rec.: 0.58 F: 0.59, Max: 1.10
				
6-31			Prec: 0.64, Rec.: 0.72 F: 0.67, Max: 1.05	Prec: 0.42, Rec.: 0.72 F: 0.53, Max: 0.99
				
6-32			Prec: 0.73, Rec.: 0.83 F: 0.77, Max: 1.12	Prec: 0.61, Rec.: 0.33 F: 0.42, Max: 1.03
				
6-33			Prec: 0.80, Rec.: 0.64 F: 0.71, Max: 0.84	Prec: 0.59, Rec.: 0.80 F: 0.68, Max: 0.63
				
6-34			Prec: 0.61, Rec.: 0.64 F: 0.62, Max: 0.99	Prec: 0.71, Rec.: 0.89 F: 0.79, Max: 1.07

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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
6-35				
			Prec: 0.65, Rec.: 0.81 F: 0.73, Max: 1.10	Prec: 0.51, Rec.: 0.58 F: 0.54, Max: 0.97
6-36				
			Prec: 0.73, Rec.: 0.65 F: 0.69, Max: 1.23	Prec: 0.42, Rec.: 0.54 F: 0.47, Max: 1.09
6-37				
			Prec: 0.55, Rec.: 0.84 F: 0.66, Max: 1.23	Prec: 0.41, Rec.: 0.67 F: 0.51, Max: 1.32
6-38				
			Prec: 0.61, Rec.: 0.82 F: 0.70, Max: 0.99	Prec: 0.60, Rec.: 0.75 F: 0.66, Max: 0.87
6-39				
			Prec: 0.74, Rec.: 0.61 F: 0.67, Max: 1.07	Prec: 0.50, Rec.: 0.51 F: 0.51, Max: 1.03
6-40				
			Prec: 0.73, Rec.: 0.56 F: 0.63, Max: 1.03	Prec: 0.52, Rec.: 0.49 F: 0.50, Max: 1.14
6-41				
			Prec: 0.58, Rec.: 0.58 F: 0.58, Max: 1.33	Prec: 0.60, Rec.: 0.59 F: 0.60, Max: 1.00
6-42				
			Prec: 0.56, Rec.: 0.83 F: 0.67, Max: 0.97	Prec: 0.51, Rec.: 0.73 F: 0.60, Max: 1.10

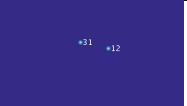
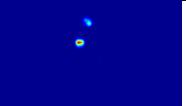
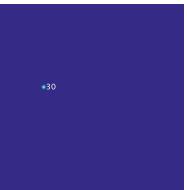
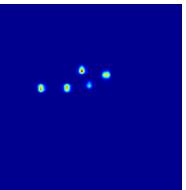
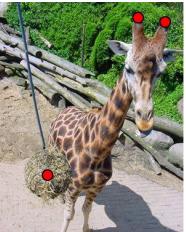
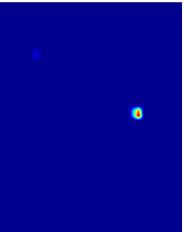
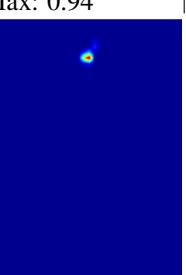
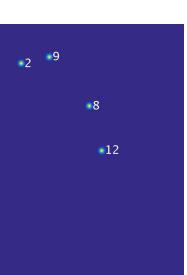
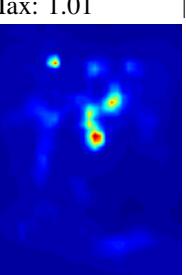
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
6-43				
			Prec: 0.75, Rec.: 0.58 F: 0.65, Max: 1.47	Prec: 0.53, Rec.: 0.75 F: 0.62, Max: 1.41
6-44				
			Prec: 0.77, Rec.: 0.47 F: 0.58, Max: 1.06	Prec: 0.64, Rec.: 0.47 F: 0.54, Max: 1.07
6-45				
			Prec: 0.33, Rec.: 0.85 F: 0.47, Max: 0.02	Prec: 0.65, Rec.: 0.78 F: 0.71, Max: 1.20
6-46				
			Prec: 0.69, Rec.: 0.72 F: 0.71, Max: 1.23	Prec: 0.48, Rec.: 0.39 F: 0.43, Max: 0.91
6-47				
			Prec: 0.72, Rec.: 0.58 F: 0.64, Max: 0.97	Prec: 0.58, Rec.: 0.63 F: 0.61, Max: 1.10
6-48				
			Prec: 0.61, Rec.: 0.80 F: 0.70, Max: 0.88	Prec: 0.62, Rec.: 0.85 F: 0.72, Max: 0.77
6-49				
			Prec: 0.75, Rec.: 0.57 F: 0.64, Max: 1.06	Prec: 0.42, Rec.: 0.56 F: 0.48, Max: 1.03

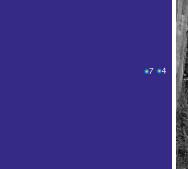
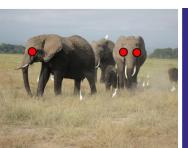
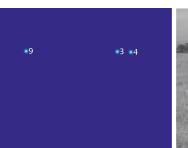
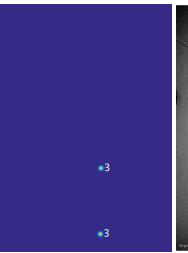
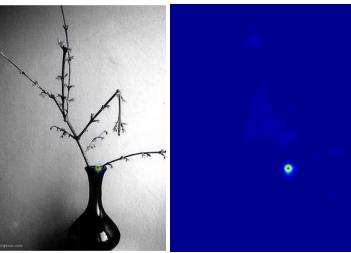
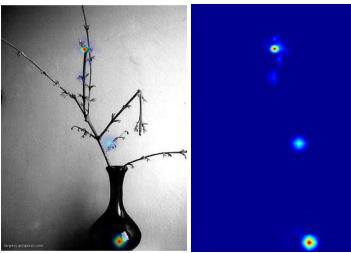
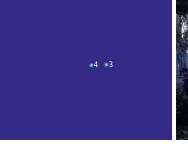
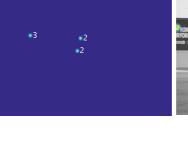
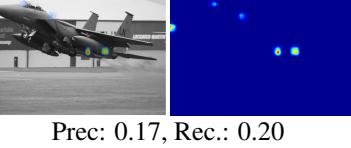
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
Bottom 50 Images				
		 31 12		
6-50			Prec: 0.64, Rec.: 0.47 F: 0.54, Max: 1.06	Prec: 0.79, Rec.: 0.48 F: 0.59, Max: 0.57
		 30		
6-51			Prec: 0.17, Rec.: 0.51 F: 0.25, Max: 1.18	Prec: 0.01, Rec.: 0.95 F: 0.03, Max: 0.99
		 3 3 24		
6-52			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.94	Prec: 0.66, Rec.: 0.22 F: 0.33, Max: 0.55
		 3		
6-53			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.01	Prec: 0.42, Rec.: 0.30 F: 0.35, Max: 0.47
		 2 9 8 12		
6-54			Prec: 0.03, Rec.: 0.35 F: 0.06, Max: 0.01	Prec: 0.27, Rec.: 0.24 F: 0.25, Max: 0.69

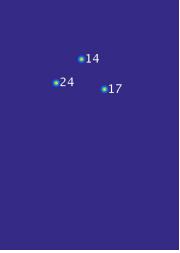
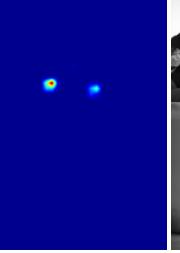
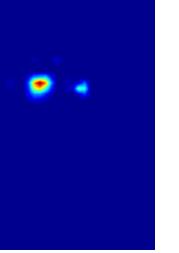
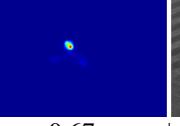
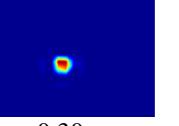
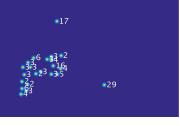
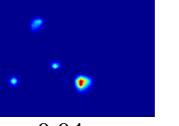
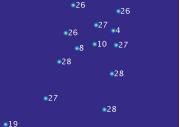
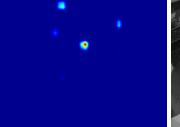
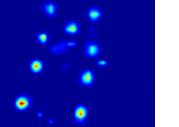
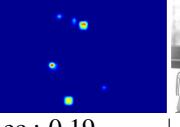
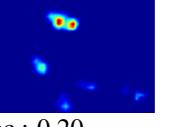
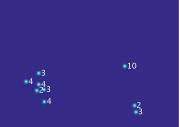
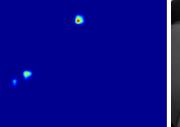
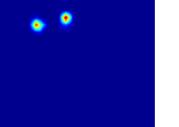
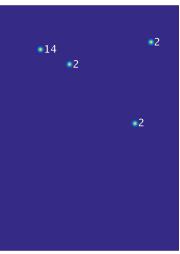
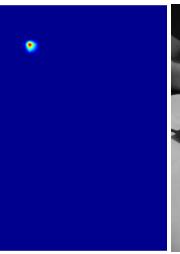
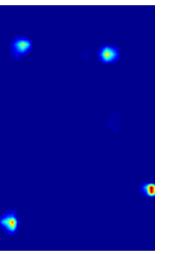
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
6-55			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.30	Prec: 0.27, Rec.: 0.41 F: 0.33, Max: 0.43
				
6-56			Prec: 0.02, Rec.: 0.63 F: 0.04, Max: 0.01	Prec: 0.31, Rec.: 0.30 F: 0.31, Max: 0.31
				
6-57			Prec: 0.30, Rec.: 0.31 F: 0.31, Max: 0.03	Prec: 0.02, Rec.: 0.25 F: 0.04, Max: 0.24
				
6-58			Prec: 0.01, Rec.: 0.36 F: 0.01, Max: 0.00	Prec: 0.39, Rec.: 0.35 F: 0.37, Max: 0.26
				
6-59			Prec: 0.14, Rec.: 0.98 F: 0.25, Max: 0.06	Prec: 0.15, Rec.: 0.57 F: 0.23, Max: 0.49
				
6-60			Prec: 0.17, Rec.: 0.20 F: 0.19, Max: 1.24	Prec: 0.03, Rec.: 0.27 F: 0.06, Max: 0.94

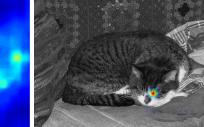
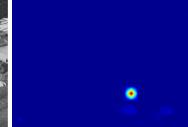
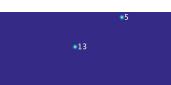
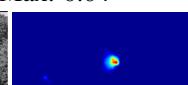
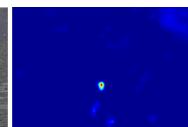
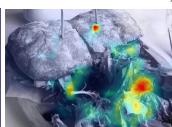
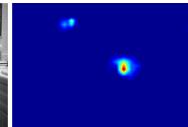
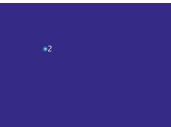
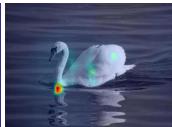
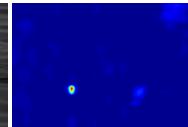
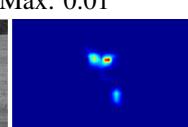
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
						
6-61				Prec: 0.28, Rec.: 0.53 F: 0.37, Max: 0.86		Prec: 0.20, Rec.: 0.58 F: 0.29, Max: 0.85
						
6-62				Prec: 0.05, Rec.: 0.67 F: 0.10, Max: 0.13		Prec: 0.11, Rec.: 0.30 F: 0.16, Max: 0.30
						
6-63				Prec: 0.45, Rec.: 0.05 F: 0.08, Max: 1.11		Prec: 0.28, Rec.: 0.04 F: 0.08, Max: 0.89
						
6-64				Prec: 0.42, Rec.: 0.15 F: 0.22, Max: 1.13		Prec: 0.14, Rec.: 0.54 F: 0.23, Max: 1.18
						
6-65				Prec: 0.10, Rec.: 0.19 F: 0.13, Max: 0.94		Prec: 0.05, Rec.: 0.20 F: 0.07, Max: 0.80
						
6-66				Prec: 0.22, Rec.: 0.20 F: 0.21, Max: 0.77		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.07
						
6-67				Prec: 0.21, Rec.: 0.24 F: 0.22, Max: 0.96		Prec: 0.03, Rec.: 0.25 F: 0.05, Max: 0.56

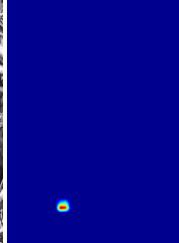
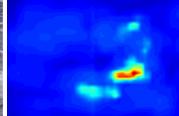
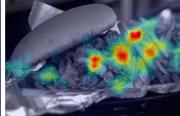
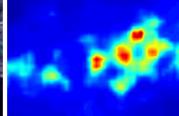
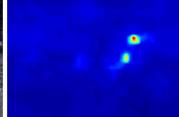
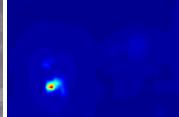
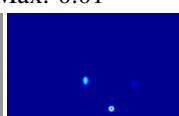
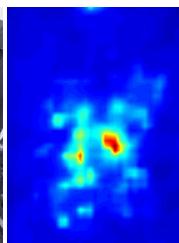
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG		Sym-ResNet	
6-68						
			Prec: 0.03, Rec.: 0.28 F: 0.06, Max: 0.00		Prec: 0.03, Rec.: 0.12 F: 0.05, Max: 0.04	
6-69						
			Prec: 0.02, Rec.: 0.41 F: 0.03, Max: 0.00		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.40	
6-70						
			Prec: 0.02, Rec.: 1.00 F: 0.03, Max: 0.00		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.02	
6-71						
			Prec: 0.00, Rec.: 0.99 F: 0.01, Max: 0.00		Prec: 0.00, Rec.: 0.58 F: 0.00, Max: 0.00	
6-72						
			Prec: 0.00, Rec.: 1.00 F: 0.01, Max: 0.01		Prec: 0.03, Rec.: 0.46 F: 0.06, Max: 0.05	
6-73						
			Prec: 0.01, Rec.: 1.00 F: 0.01, Max: 0.00		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.01	
6-74						
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.98		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.76	

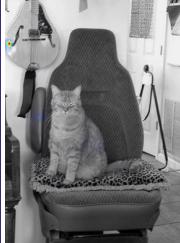
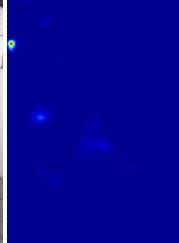
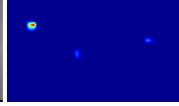
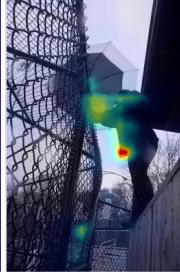
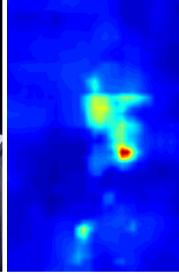
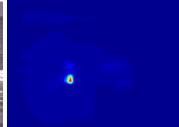
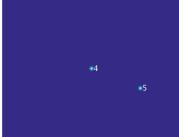
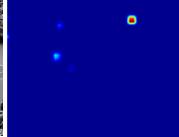
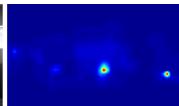
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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
 6-75				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.35	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.04
 6-76				
			Prec: 0.01, Rec.: 0.98 F: 0.03, Max: 0.00	Prec: 0.03, Rec.: 0.93 F: 0.06, Max: 0.43
 6-77				
			Prec: 0.00, Rec.: 1.00 F: 0.00, Max: 0.00	Prec: 0.00, Rec.: 0.98 F: 0.00, Max: 0.00
 6-78				
			Prec: 0.01, Rec.: 0.57 F: 0.03, Max: 0.00	Prec: 0.05, Rec.: 0.49 F: 0.10, Max: 0.46
 6-79				
			Prec: 0.03, Rec.: 0.81 F: 0.06, Max: 0.01	Prec: 0.06, Rec.: 0.96 F: 0.12, Max: 0.40
 6-80				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.30	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.06
 6-81				
			Prec: 0.00, Rec.: 1.00 F: 0.00, Max: 0.00	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.66

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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
 6-82				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.04	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.48
 6-83				
			Prec: 0.03, Rec.: 0.36 F: 0.06, Max: 0.78	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.95
 6-84				
			Prec: 0.01, Rec.: 0.99 F: 0.02, Max: 0.00	Prec: 0.01, Rec.: 0.46 F: 0.02, Max: 0.29
 6-85				
			Prec: 0.01, Rec.: 0.32 F: 0.02, Max: 0.01	Prec: 0.02, Rec.: 0.42 F: 0.03, Max: 0.13
 6-86				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.42	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.82
 6-87				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.09	Prec: 0.01, Rec.: 0.61 F: 0.03, Max: 0.27
 6-88				
			Prec: 0.02, Rec.: 0.52 F: 0.04, Max: 0.01	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.56

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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
6-89				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00	Prec: 0.06, Rec.: 0.89 F: 0.11, Max: 0.88
6-90				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.34	Prec: 0.08, Rec.: 0.28 F: 0.12, Max: 0.26
6-91				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.80	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.76
6-92				
			Prec: 0.00, Rec.: 1.00 F: 0.00, Max: 0.00	Prec: 0.00, Rec.: 0.01 F: 0.00, Max: 0.16
6-93				
			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.04	Prec: 0.00, Rec.: 0.90 F: 0.00, Max: 0.00
6-94				
			Prec: 0.01, Rec.: 0.94 F: 0.01, Max: 0.01	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.69

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Table 6 – Rotation MS-COCO Testing Set - Continued from previous page

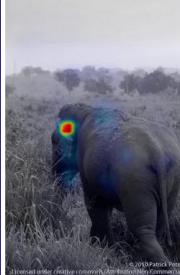
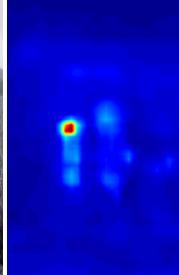
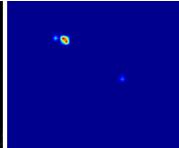
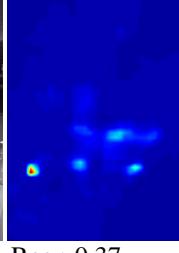
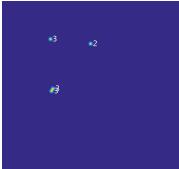
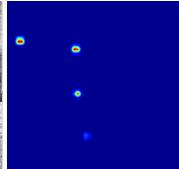
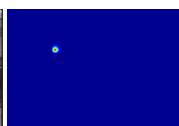
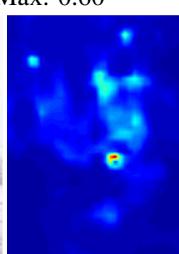
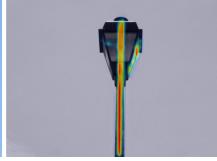
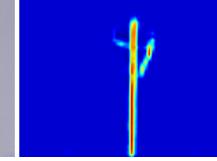
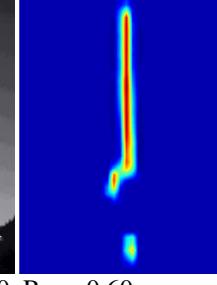
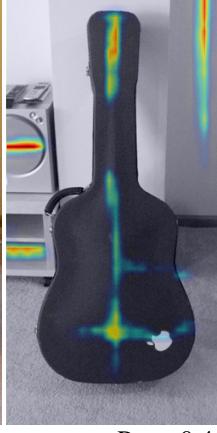
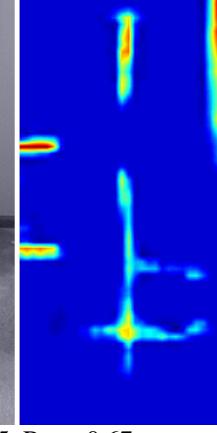
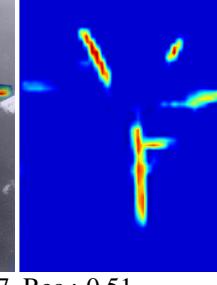
Original Image	Ground Truth	GT Heatmap	Sym-VGG	Sym-ResNet
				
6-95			Prec: 0.00, Rec.: 0.44 F: 0.01, Max: 0.00	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.31
				
6-96			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.64	Prec: 0.02, Rec.: 0.40 F: 0.03, Max: 0.40
				
6-97			Prec: 0.01, Rec.: 0.37 F: 0.02, Max: 0.01	Prec: 0.02, Rec.: 0.09 F: 0.03, Max: 0.08
				
6-98			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.88	Prec: 0.05, Rec.: 0.63 F: 0.10, Max: 0.73
				
6-99			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.60	Prec: 0.05, Rec.: 0.82 F: 0.10, Max: 0.96
				
6-100			Prec: 0.03, Rec.: 0.77 F: 0.06, Max: 0.01	Prec: 0.02, Rec.: 0.99 F: 0.04, Max: 0.60

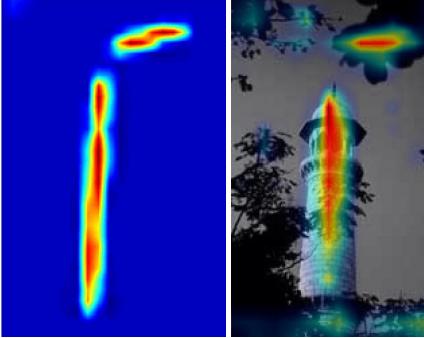
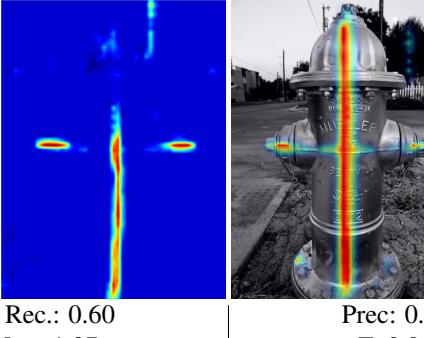
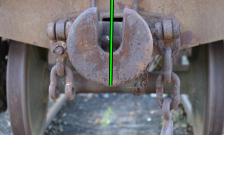
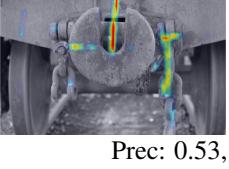
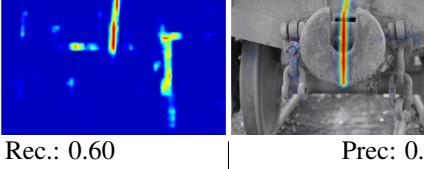
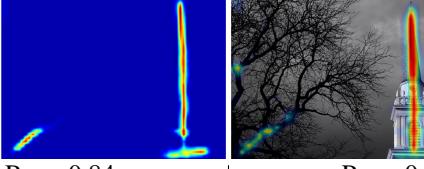
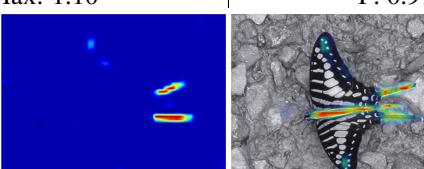
Table 7: Examples of reflection symmetry with the original image, ground-truth, the output for Sym-NET, the output for Sym-VGG, the precision (prec.), the recall (rec.), and the F-Measure values (F) for the maximum per image F-measure and the maximum of the Sym-NET output (max) a subset of 100 (the top 50 and bottom 50) images from the MS-COCO sorted by the descending overall F-measure.

Table 7 – Reflection Symmetry Competition Testing Set

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-1		Prec: 1.00, Rec.: 0.89 F: 0.94, Max: 1.12	Prec: 0.99, Rec.: 0.95 F: 0.97, Max: 0.22
			
7-2		Prec: 1.00, Rec.: 0.60 F: 0.75, Max: 1.12	Prec: 0.84, Rec.: 0.57 F: 0.68, Max: 0.73
			
7-3		Prec: 0.45, Rec.: 0.67 F: 0.53, Max: 1.10	Prec: 0.91, Rec.: 0.90 F: 0.91, Max: 1.06
			
7-4		Prec: 0.57, Rec.: 0.51 F: 0.54, Max: 1.10	Prec: 0.65, Rec.: 0.61 F: 0.63, Max: 0.80

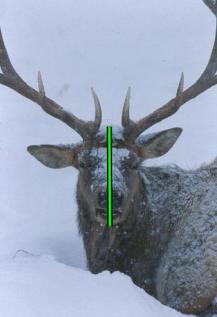
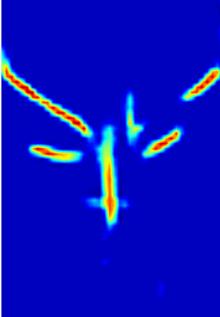
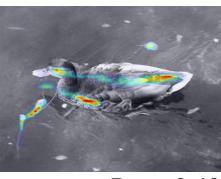
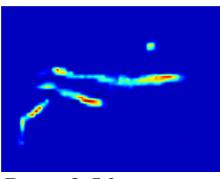
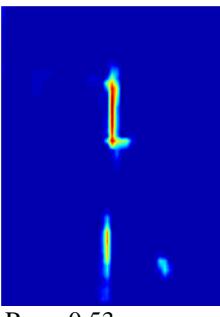
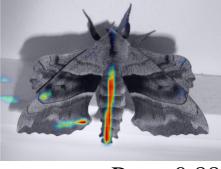
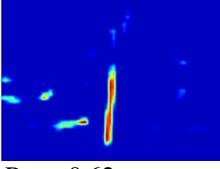
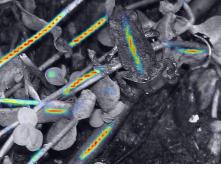
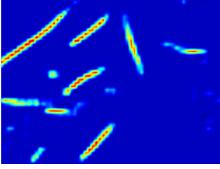
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-5		Prec: 0.37, Rec.: 0.46 F: 0.41, Max: 1.01	Prec: 0.65, Rec.: 0.90 F: 0.76, Max: 0.64
			
7-6		Prec: 0.66, Rec.: 0.60 F: 0.63, Max: 1.07	Prec: 0.92, Rec.: 0.89 F: 0.91, Max: 1.03
			
7-7		Prec: 0.53, Rec.: 0.60 F: 0.56, Max: 1.08	Prec: 0.98, Rec.: 0.95 F: 0.97, Max: 1.18
			
7-8		Prec: 0.94, Rec.: 0.84 F: 0.89, Max: 1.10	Prec: 0.90, Rec.: 0.91 F: 0.91, Max: 1.00
			
7-9		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.02	Prec: 0.79, Rec.: 0.84 F: 0.81, Max: 0.72

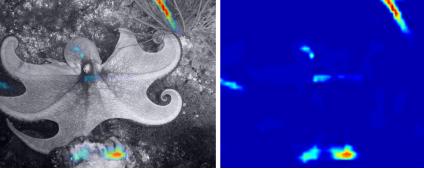
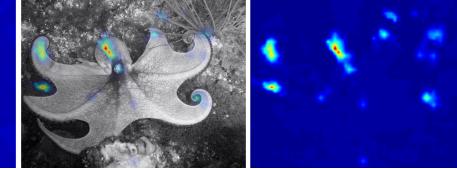
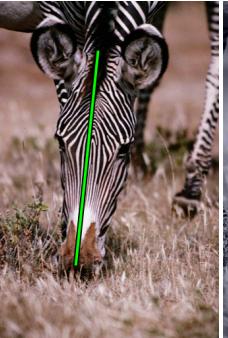
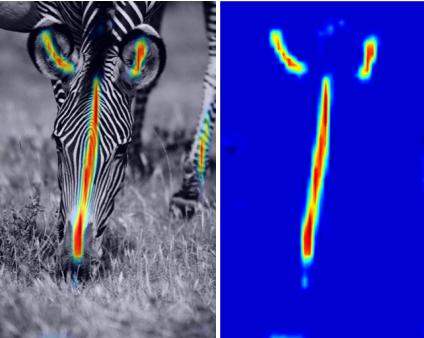
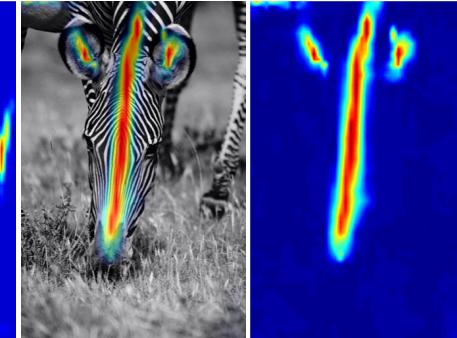
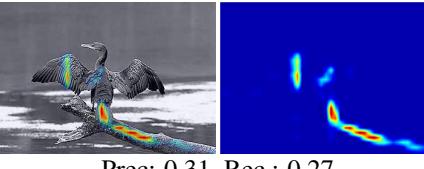
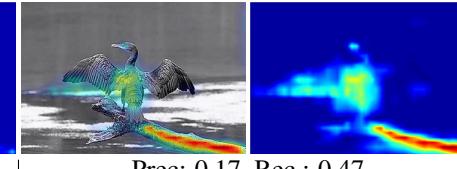
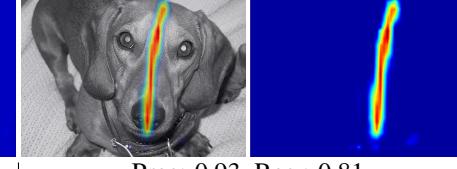
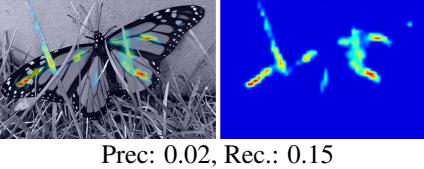
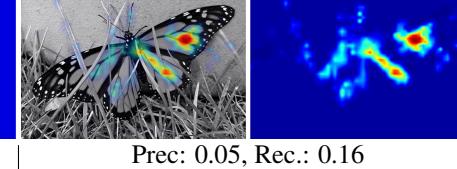
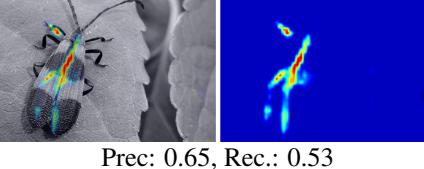
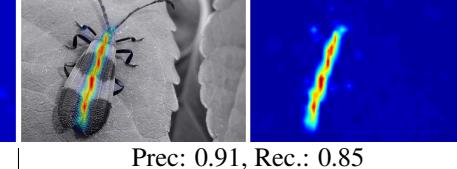
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-10		Prec: 0.28, Rec.: 0.45 F: 0.35, Max: 1.14	Prec: 0.34, Rec.: 0.61 F: 0.44, Max: 0.46
			
7-11		Prec: 0.40, Rec.: 0.56 F: 0.46, Max: 1.01	Prec: 0.59, Rec.: 0.50 F: 0.54, Max: 0.72
			
7-12		Prec: 0.98, Rec.: 0.53 F: 0.69, Max: 1.11	Prec: 0.75, Rec.: 0.73 F: 0.74, Max: 1.18
			
7-13		Prec: 0.88, Rec.: 0.62 F: 0.73, Max: 0.98	Prec: 0.82, Rec.: 0.48 F: 0.61, Max: 0.68
			
7-14		Prec: 0.14, Rec.: 0.47 F: 0.22, Max: 1.20	Prec: 0.20, Rec.: 0.29 F: 0.24, Max: 0.30

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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
 7-15		 Prec: 0.10, Rec.: 0.21 F: 0.13, Max: 0.99	 Prec: 0.16, Rec.: 0.40 F: 0.23, Max: 0.99
 7-16		 Prec: 0.38, Rec.: 0.34 F: 0.36, Max: 1.04	 Prec: 0.32, Rec.: 0.31 F: 0.31, Max: 0.57
 7-17		 Prec: 0.31, Rec.: 0.27 F: 0.29, Max: 1.07	 Prec: 0.17, Rec.: 0.47 F: 0.25, Max: 0.48
 7-18		 Prec: 0.54, Rec.: 0.65 F: 0.59, Max: 1.06	 Prec: 0.93, Rec.: 0.81 F: 0.87, Max: 0.97
 7-19		 Prec: 0.02, Rec.: 0.15 F: 0.03, Max: 0.96	 Prec: 0.05, Rec.: 0.16 F: 0.08, Max: 0.37
 7-20		 Prec: 0.65, Rec.: 0.53 F: 0.58, Max: 1.06	 Prec: 0.91, Rec.: 0.85 F: 0.88, Max: 0.03

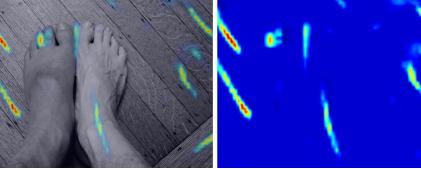
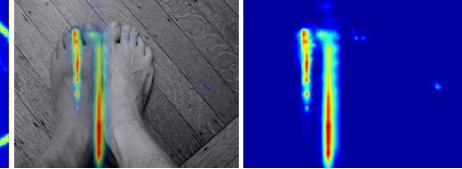
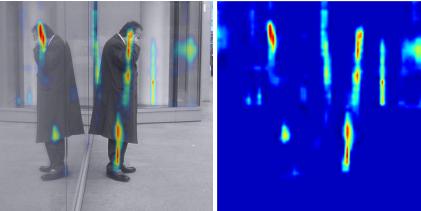
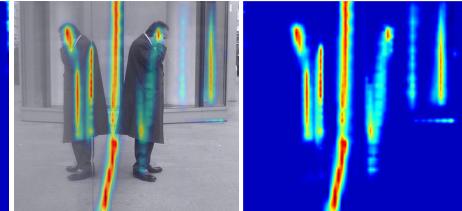
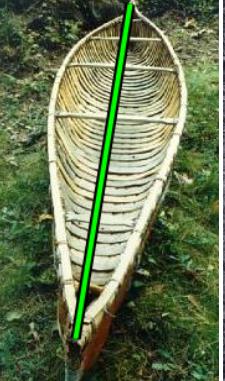
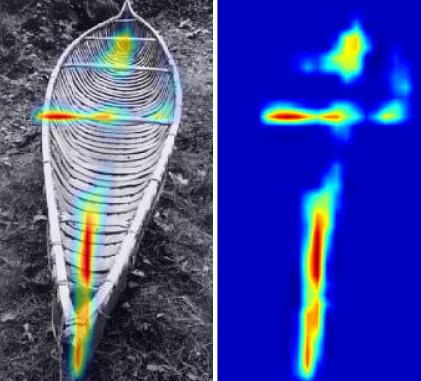
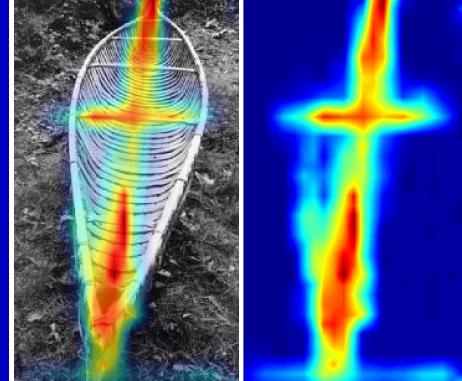
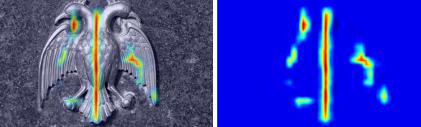
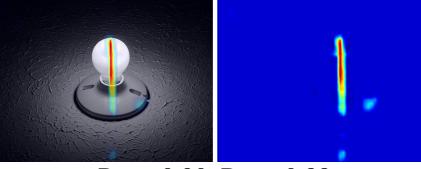
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG		Sym-ResNet	
7-21					Prec: 0.80, Rec.: 0.75 F: 0.78, Max: 1.04 Prec: 0.99, Rec.: 0.78 F: 0.87, Max: 1.13
7-22					Prec: 0.07, Rec.: 0.21 F: 0.10, Max: 1.12 Prec: 0.01, Rec.: 0.05 F: 0.01, Max: 0.44
7-23					Prec: 0.58, Rec.: 0.52 F: 0.55, Max: 1.06 Prec: 1.00, Rec.: 0.83 F: 0.90, Max: 1.09
7-24					Prec: 0.29, Rec.: 0.53 F: 0.38, Max: 1.12 Prec: 0.49, Rec.: 0.60 F: 0.54, Max: 1.12
7-25					Prec: 0.79, Rec.: 0.57 F: 0.66, Max: 1.05 Prec: 0.70, Rec.: 0.80 F: 0.75, Max: 0.35

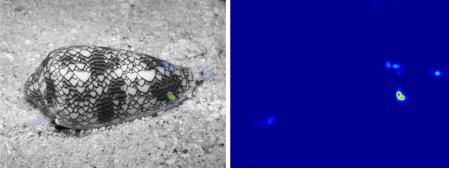
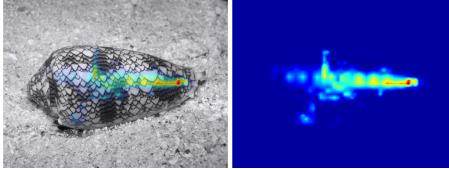
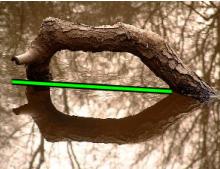
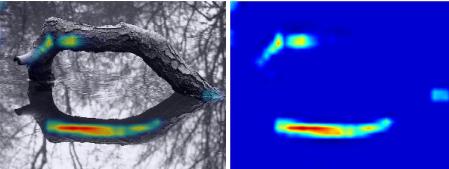
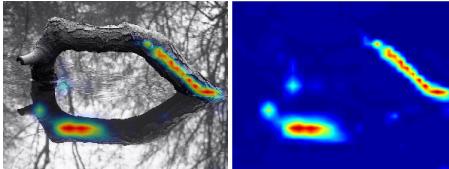
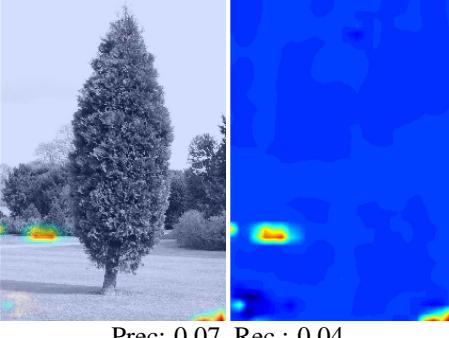
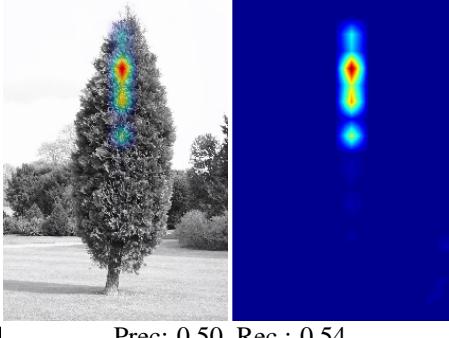
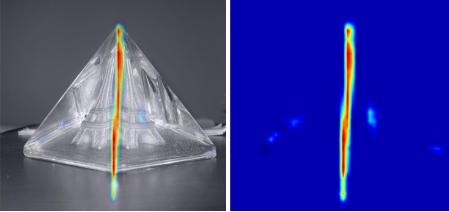
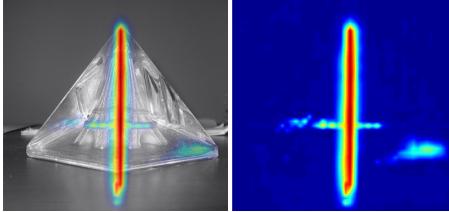
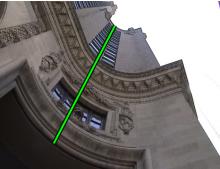
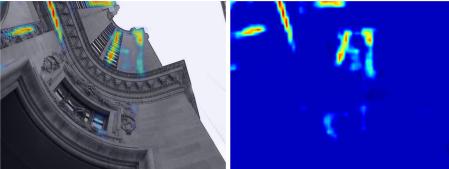
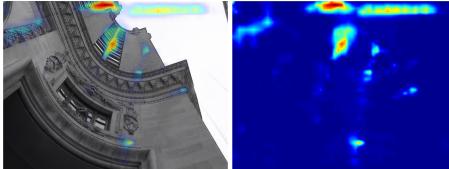
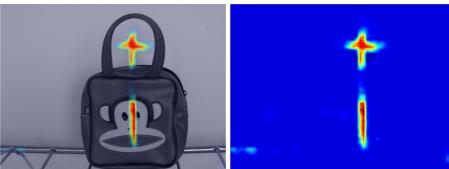
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-26		Prec: 0.08, Rec.: 0.32 F: 0.13, Max: 0.98	Prec: 0.61, Rec.: 0.87 F: 0.72, Max: 0.80
			
7-27		Prec: 0.02, Rec.: 0.13 F: 0.03, Max: 1.02	Prec: 0.61, Rec.: 0.70 F: 0.65, Max: 0.32
			
7-28		Prec: 0.46, Rec.: 0.39 F: 0.43, Max: 1.08	Prec: 0.47, Rec.: 0.75 F: 0.58, Max: 0.59
			
7-29		Prec: 0.81, Rec.: 0.81 F: 0.81, Max: 1.12	Prec: 0.98, Rec.: 0.77 F: 0.86, Max: 0.73
			
7-30		Prec: 0.90, Rec.: 0.88 F: 0.89, Max: 1.08	Prec: 0.77, Rec.: 0.82 F: 0.80, Max: 0.99

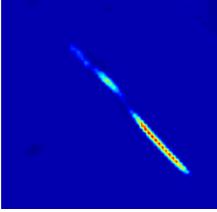
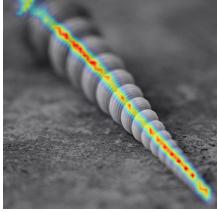
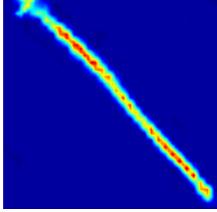
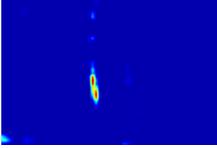
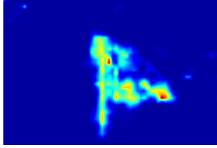
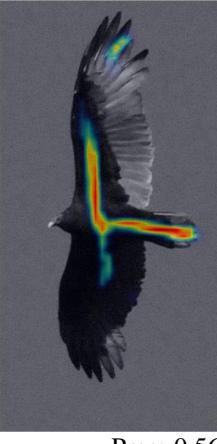
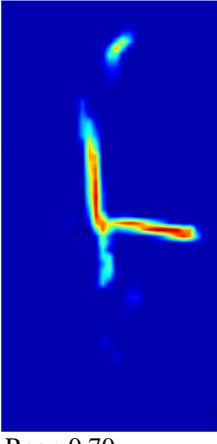
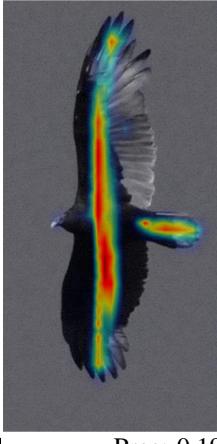
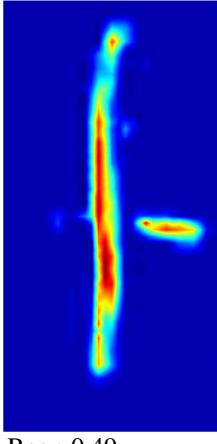
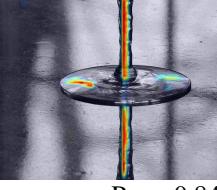
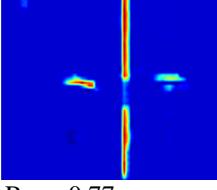
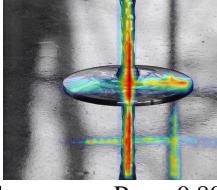
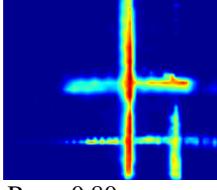
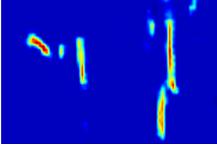
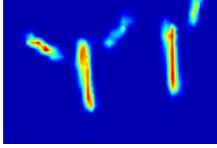
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-31		Prec: 0.15, Rec.: 0.07 F: 0.10, Max: 0.26	Prec: 0.27, Rec.: 0.21 F: 0.24, Max: 0.39
			
7-32		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.09	Prec: 0.09, Rec.: 0.31 F: 0.14, Max: 0.94
			
7-33		Prec: 0.07, Rec.: 0.04 F: 0.05, Max: 0.13	Prec: 0.50, Rec.: 0.54 F: 0.52, Max: 0.00
			
7-34		Prec: 1.00, Rec.: 0.98 F: 0.99, Max: 1.00	Prec: 1.00, Rec.: 0.94 F: 0.97, Max: 0.18
			
7-35		Prec: 0.04, Rec.: 0.12 F: 0.05, Max: 1.12	Prec: 0.40, Rec.: 0.23 F: 0.29, Max: 0.00
			
7-36		Prec: 0.70, Rec.: 0.59 F: 0.64, Max: 1.03	Prec: 0.87, Rec.: 0.84 F: 0.85, Max: 1.05

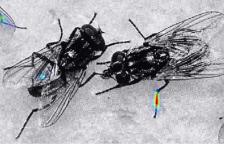
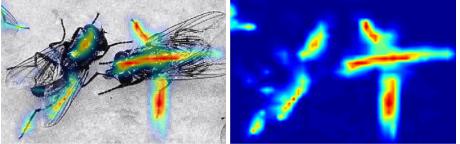
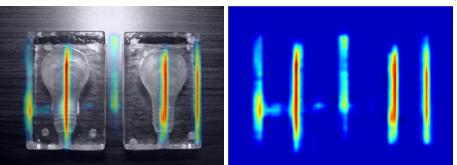
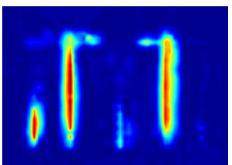
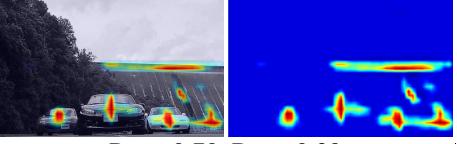
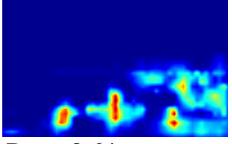
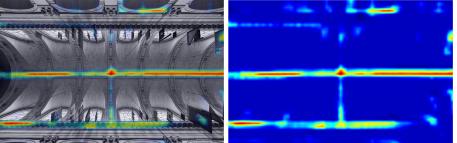
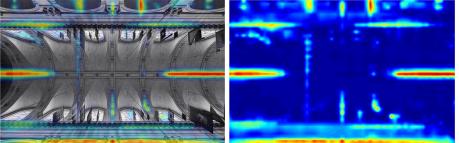
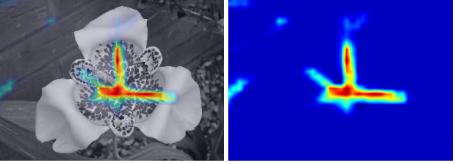
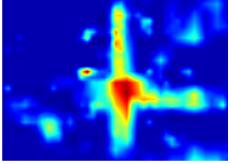
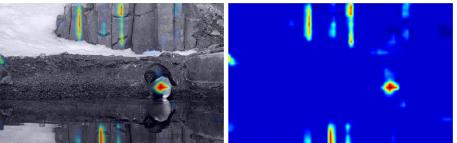
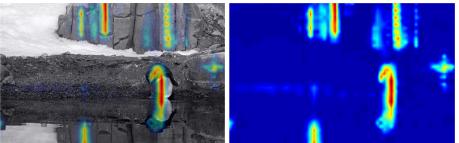
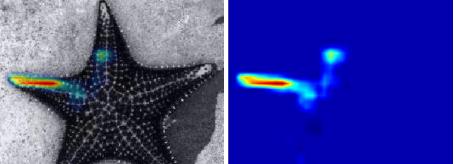
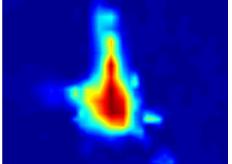
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG		Sym-ResNet	
					
7-37		Prec: 0.74, Rec.: 0.68 F: 0.71, Max: 1.16		Prec: 0.79, Rec.: 0.84 F: 0.82, Max: 0.00	
					
7-38		Prec: 0.09, Rec.: 0.09 F: 0.09, Max: 0.43		Prec: 0.38, Rec.: 0.48 F: 0.43, Max: 0.00	
					
7-39		Prec: 0.56, Rec.: 0.70 F: 0.62, Max: 1.11		Prec: 0.19, Rec.: 0.49 F: 0.27, Max: 0.03	
					
7-40		Prec: 0.84, Rec.: 0.77 F: 0.80, Max: 1.01		Prec: 0.80, Rec.: 0.80 F: 0.80, Max: 0.69	
					
7-41		Prec: 0.54, Rec.: 0.56 F: 0.55, Max: 0.97		Prec: 0.84, Rec.: 0.73 F: 0.78, Max: 1.02	

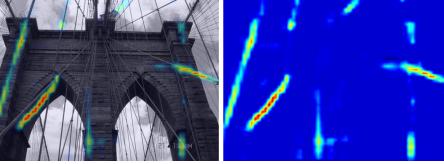
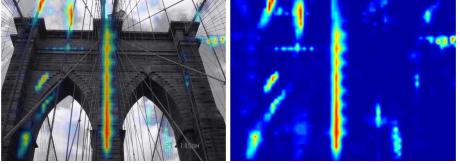
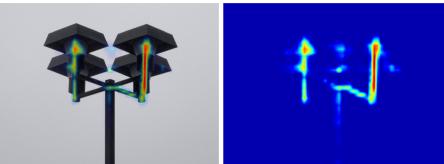
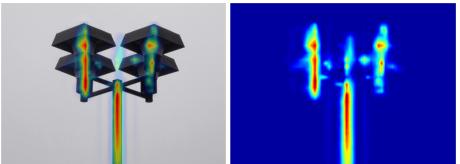
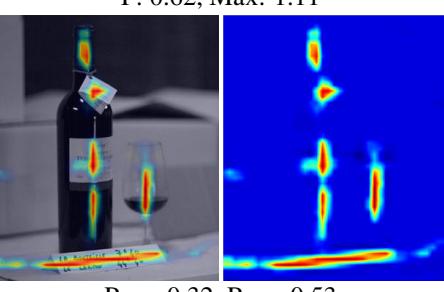
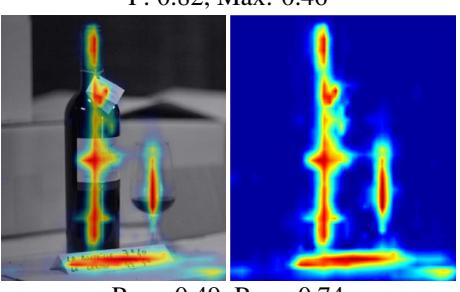
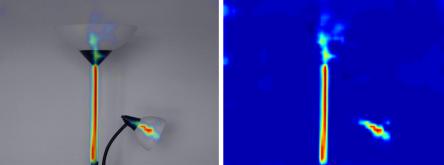
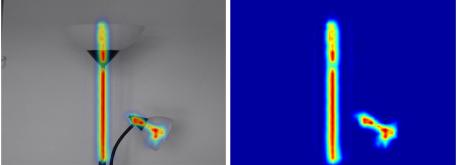
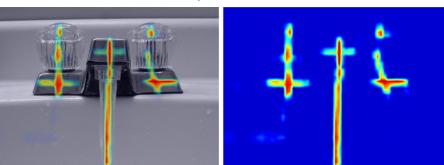
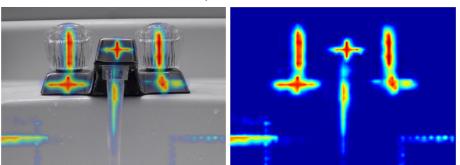
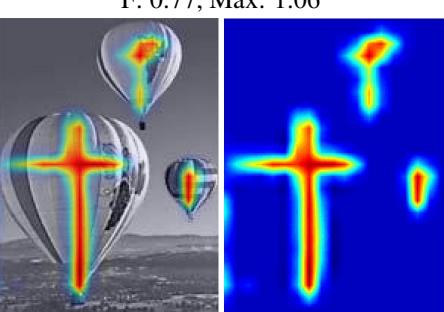
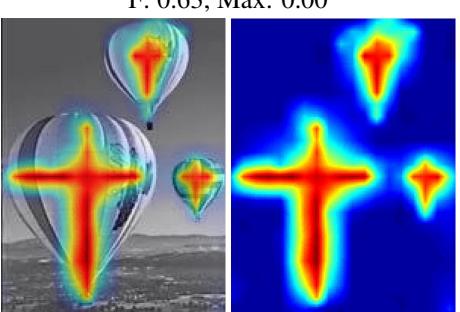
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-42		Prec: 0.06, Rec.: 0.03 F: 0.04, Max: 0.81	Prec: 0.21, Rec.: 0.27 F: 0.24, Max: 0.14
			
7-43		Prec: 0.64, Rec.: 0.73 F: 0.68, Max: 1.16	Prec: 0.63, Rec.: 0.75 F: 0.69, Max: 0.97
			
7-44		Prec: 0.70, Rec.: 0.39 F: 0.50, Max: 1.02	Prec: 0.93, Rec.: 0.64 F: 0.76, Max: 0.15
			
7-45		Prec: 0.60, Rec.: 0.62 F: 0.61, Max: 1.14	Prec: 0.90, Rec.: 0.24 F: 0.38, Max: 0.82
			
7-46		Prec: 0.52, Rec.: 0.38 F: 0.44, Max: 0.98	Prec: 0.65, Rec.: 0.39 F: 0.49, Max: 0.72
			
7-47		Prec: 0.01, Rec.: 0.01 F: 0.01, Max: 1.04	Prec: 0.04, Rec.: 0.15 F: 0.06, Max: 0.44
			
7-48		Prec: 0.25, Rec.: 0.10 F: 0.14, Max: 0.99	Prec: 0.32, Rec.: 0.36 F: 0.34, Max: 0.00

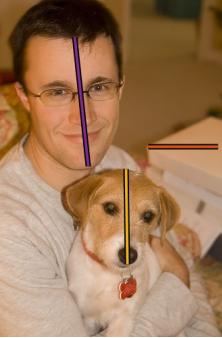
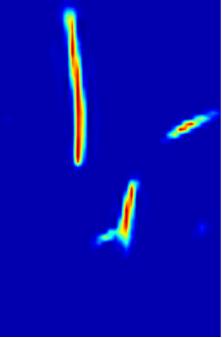
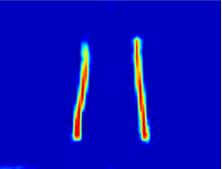
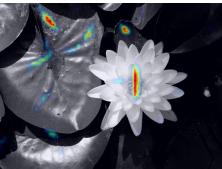
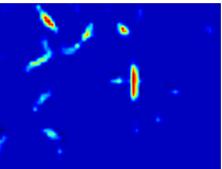
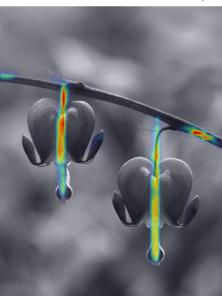
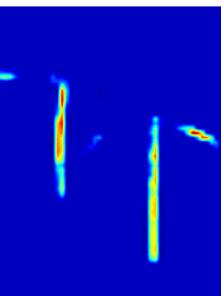
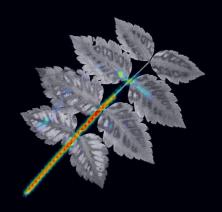
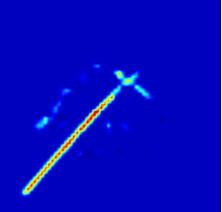
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-49		Prec: 0.12, Rec.: 0.15 F: 0.13, Max: 1.14	Prec: 0.36, Rec.: 0.27 F: 0.31, Max: 0.00
			
7-50		Prec: 0.60, Rec.: 0.63 F: 0.62, Max: 1.11	Prec: 0.86, Rec.: 0.78 F: 0.82, Max: 0.46
			
7-51		Prec: 0.32, Rec.: 0.53 F: 0.40, Max: 1.08	Prec: 0.49, Rec.: 0.74 F: 0.59, Max: 0.62
			
7-52		Prec: 0.91, Rec.: 0.87 F: 0.89, Max: 1.08	Prec: 0.90, Rec.: 0.90 F: 0.90, Max: 0.43
			
7-53		Prec: 0.77, Rec.: 0.77 F: 0.77, Max: 1.06	Prec: 0.52, Rec.: 0.80 F: 0.63, Max: 0.00
			
7-54		Prec: 0.62, Rec.: 0.68 F: 0.65, Max: 1.06	Prec: 0.45, Rec.: 0.73 F: 0.56, Max: 0.91

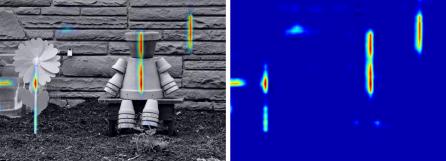
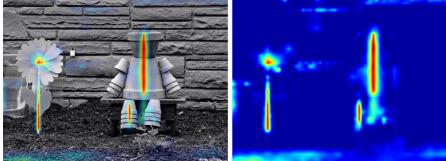
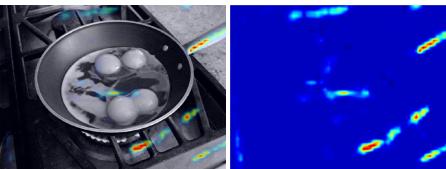
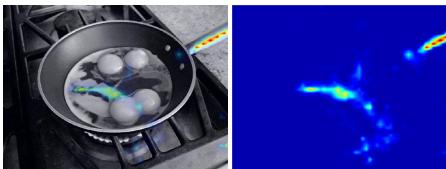
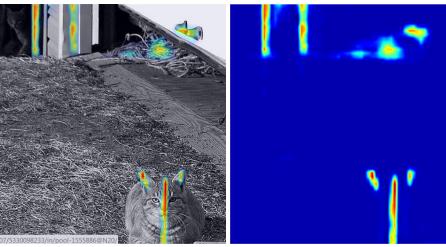
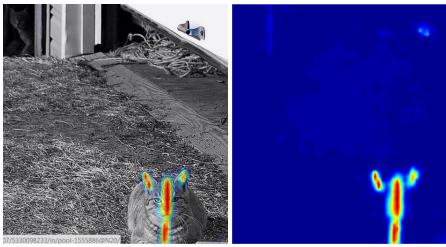
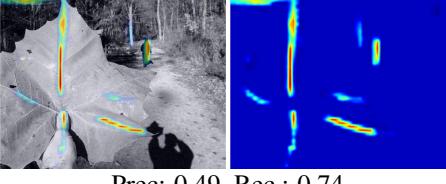
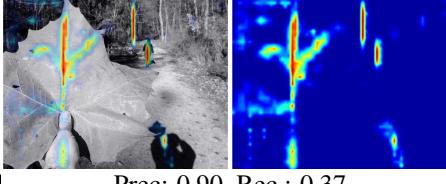
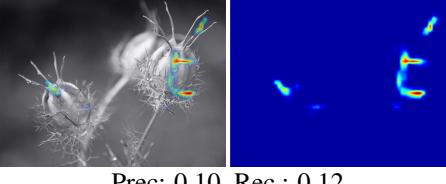
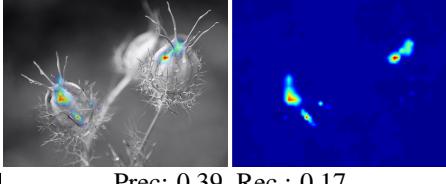
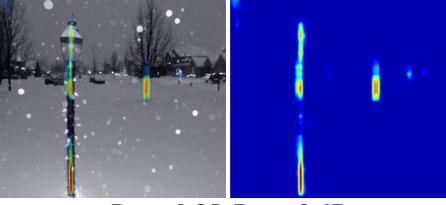
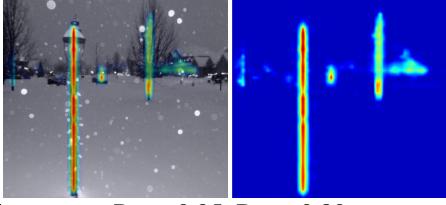
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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-55		Prec: 0.75, Rec.: 0.44 F: 0.55, Max: 1.09	Prec: 0.79, Rec.: 0.71 F: 0.75, Max: 1.28
			
7-56		Prec: 0.63, Rec.: 0.41 F: 0.49, Max: 1.07	Prec: 0.80, Rec.: 0.46 F: 0.59, Max: 1.32
			
7-57		Prec: 0.10, Rec.: 0.13 F: 0.11, Max: 1.02	Prec: 0.55, Rec.: 0.06 F: 0.11, Max: 0.78
			
7-58		Prec: 0.73, Rec.: 0.94 F: 0.82, Max: 1.13	Prec: 0.44, Rec.: 0.89 F: 0.59, Max: 0.44
			
7-59		Prec: 0.78, Rec.: 0.28 F: 0.41, Max: 1.23	Prec: 0.58, Rec.: 0.70 F: 0.64, Max: 0.44

Continued on next page

Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-60		Prec: 0.55, Rec.: 0.46 F: 0.50, Max: 1.16	Prec: 0.76, Rec.: 0.65 F: 0.70, Max: 1.19
			
7-61		Prec: 0.11, Rec.: 0.19 F: 0.14, Max: 0.95	Prec: 0.24, Rec.: 0.20 F: 0.22, Max: 1.08
			
7-62		Prec: 0.62, Rec.: 0.37 F: 0.47, Max: 1.12	Prec: 0.95, Rec.: 0.58 F: 0.72, Max: 1.10
			
7-63		Prec: 0.49, Rec.: 0.74 F: 0.59, Max: 1.11	Prec: 0.90, Rec.: 0.37 F: 0.53, Max: 0.10
			
7-64		Prec: 0.10, Rec.: 0.12 F: 0.11, Max: 0.99	Prec: 0.39, Rec.: 0.17 F: 0.24, Max: 0.42
			
7-65		Prec: 0.85, Rec.: 0.67 F: 0.75, Max: 1.12	Prec: 0.95, Rec.: 0.80 F: 0.87, Max: 1.12

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Table 7 – Reflection Symmetry Competition Testing Set - Continued from previous page

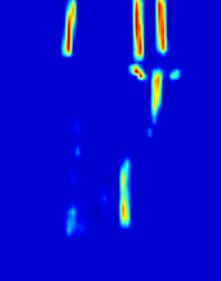
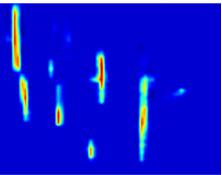
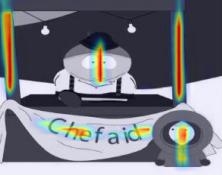
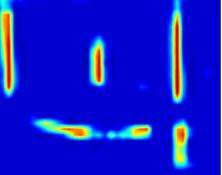
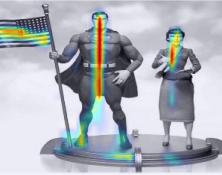
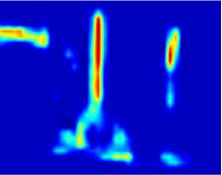
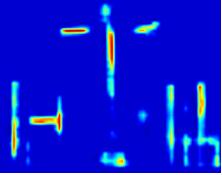
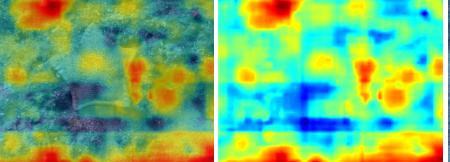
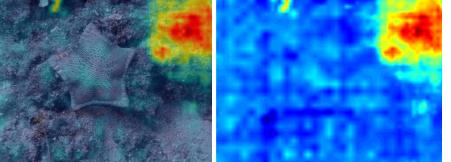
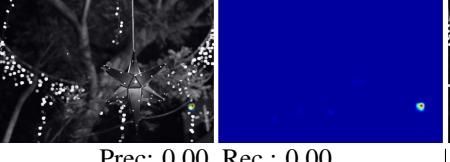
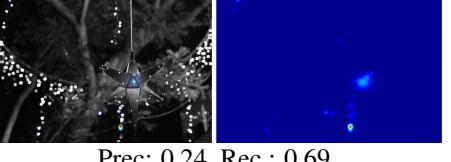
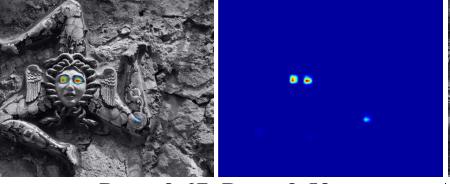
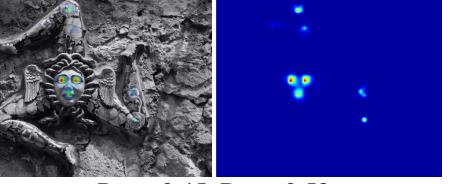
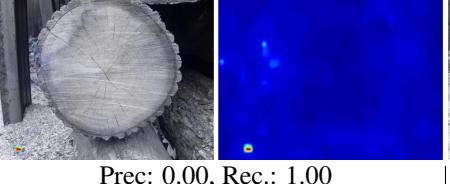
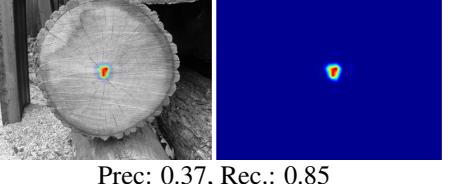
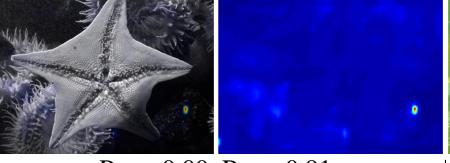
Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
7-66		Prec: 0.19, Rec.: 0.71 F: 0.31, Max: 1.11	Prec: 0.14, Rec.: 0.87 F: 0.25, Max: 0.65
			
7-67		Prec: 0.68, Rec.: 0.50 F: 0.57, Max: 1.12	Prec: 0.28, Rec.: 0.28 F: 0.28, Max: 0.48
			
7-68		Prec: 0.27, Rec.: 0.22 F: 0.24, Max: 1.06	Prec: 0.28, Rec.: 0.39 F: 0.33, Max: 1.04
			
7-69		Prec: 0.73, Rec.: 0.29 F: 0.42, Max: 1.10	Prec: 0.79, Rec.: 0.69 F: 0.74, Max: 0.50
			
7-70		Prec: 0.57, Rec.: 0.70 F: 0.63, Max: 1.10	Prec: 0.81, Rec.: 0.88 F: 0.85, Max: 1.10

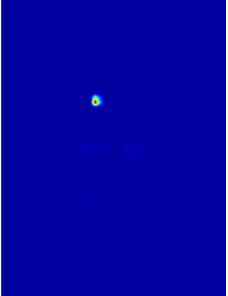
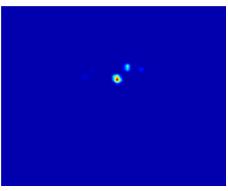
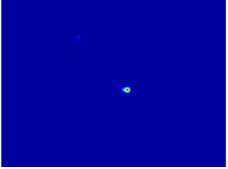
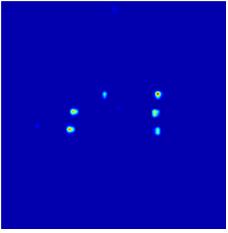
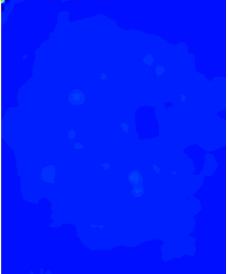
Table 8: Examples of rotation symmetry with the original image, ground-truth, the output for Sym-NET, the precision (prec.), the recall (rec.), and the F-Measure values (F) for the maximum per image F-measure and the maximum of the Sym-NET output (max) on the Symmetry Competition [2] testing images sorted by the descending overall F-measure.

Table 8 – Rotation Symmetry Competition Testing Set

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-1		Prec: 0.00, Rec.: 0.99 F: 0.00, Max: 0.00	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.00
			
8-2		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.28	Prec: 0.24, Rec.: 0.69 F: 0.35, Max: 0.82
			
8-3		Prec: 0.67, Rec.: 0.59 F: 0.63, Max: 0.61	Prec: 0.45, Rec.: 0.59 F: 0.51, Max: 0.89
			
8-4		Prec: 0.46, Rec.: 0.56 F: 0.50, Max: 1.44	Prec: 0.57, Rec.: 0.73 F: 0.64, Max: 1.26
			
8-5		Prec: 0.00, Rec.: 1.00 F: 0.00, Max: 0.00	Prec: 0.37, Rec.: 0.85 F: 0.51, Max: 0.67
			
8-6		Prec: 0.00, Rec.: 0.91 F: 0.00, Max: 0.00	Prec: 0.02, Rec.: 0.43 F: 0.04, Max: 0.00

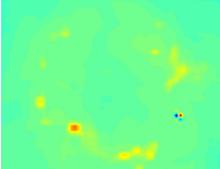
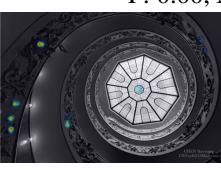
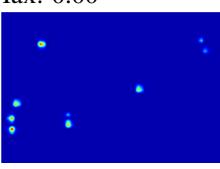
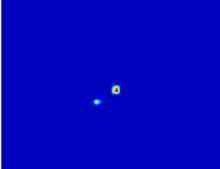
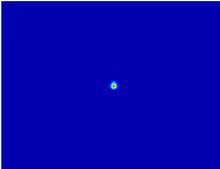
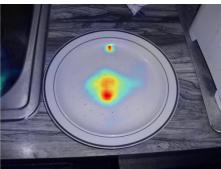
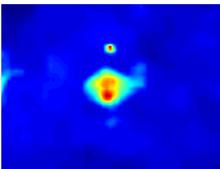
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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-7		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.15	Prec: 0.03, Rec.: 0.95 F: 0.05, Max: 0.57
			
8-8		Prec: 0.76, Rec.: 0.83 F: 0.79, Max: 1.13	Prec: 0.35, Rec.: 0.59 F: 0.44, Max: 0.94
			
8-9		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.28	Prec: 0.10, Rec.: 0.34 F: 0.15, Max: 0.55
			
8-10		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.31	Prec: 0.23, Rec.: 0.89 F: 0.37, Max: 1.23
			
8-11		Prec: 0.01, Rec.: 0.54 F: 0.01, Max: 0.03	Prec: 0.28, Rec.: 0.41 F: 0.33, Max: 0.38

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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-12		Prec: 0.00, Rec.: 1.00 F: 0.00, Max: 0.00	Prec: 0.37, Rec.: 0.64 F: 0.47, Max: 0.71
			
8-13		Prec: 0.10, Rec.: 0.72 F: 0.17, Max: 1.11	Prec: 0.40, Rec.: 0.77 F: 0.53, Max: 1.28
			
8-14		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.77	Prec: 0.01, Rec.: 0.50 F: 0.01, Max: 0.00
			
8-15		Prec: 0.59, Rec.: 0.39 F: 0.47, Max: 0.70	Prec: 0.11, Rec.: 0.67 F: 0.19, Max: 0.71
			
8-16		Prec: 0.92, Rec.: 0.95 F: 0.93, Max: 1.20	Prec: 0.87, Rec.: 0.95 F: 0.91, Max: 1.36
			
8-17		Prec: 0.04, Rec.: 0.95 F: 0.08, Max: 0.00	Prec: 0.32, Rec.: 0.69 F: 0.44, Max: 1.17
			
8-18		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.21	Prec: 0.17, Rec.: 0.88 F: 0.29, Max: 0.39

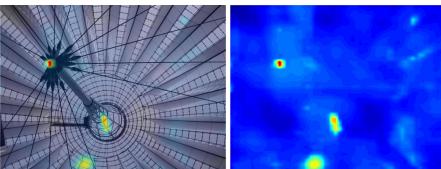
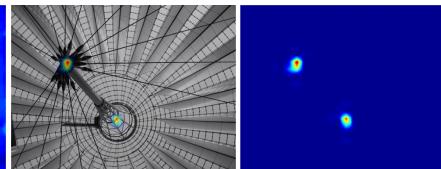
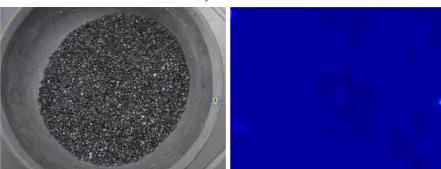
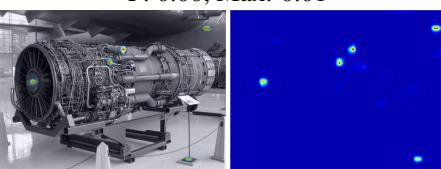
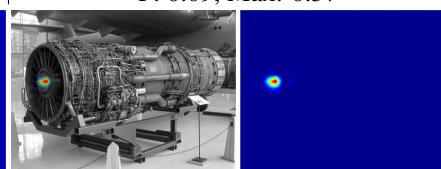
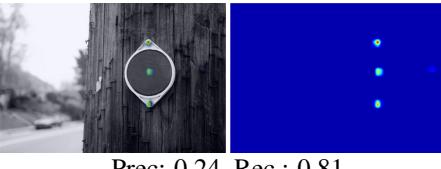
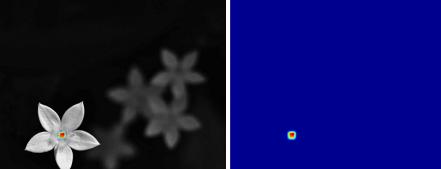
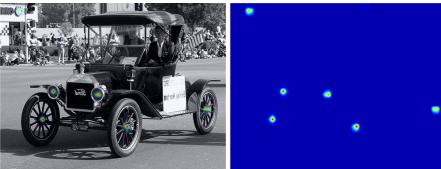
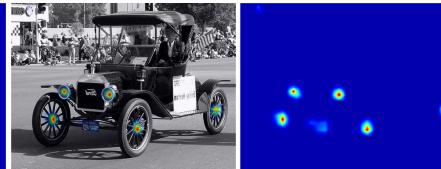
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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
8-19		Prec: 0.84, Rec.: 0.94 F: 0.89, Max: 1.24	Prec: 0.66, Rec.: 0.83 F: 0.74, Max: 0.77
8-20		Prec: 0.73, Rec.: 0.81 F: 0.77, Max: 1.18	Prec: 0.59, Rec.: 0.69 F: 0.64, Max: 1.19
8-21		Prec: 0.00, Rec.: 0.60 F: 0.01, Max: 0.05	Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.82
8-22		Prec: 0.37, Rec.: 0.49 F: 0.42, Max: 1.04	Prec: 0.32, Rec.: 0.32 F: 0.32, Max: 0.90
8-23		Prec: 0.01, Rec.: 0.74 F: 0.02, Max: 0.00	Prec: 0.55, Rec.: 0.72 F: 0.62, Max: 1.19
8-24		Prec: 0.30, Rec.: 0.27 F: 0.28, Max: 1.10	Prec: 0.11, Rec.: 0.32 F: 0.16, Max: 0.64
8-25		Prec: 0.73, Rec.: 0.75 F: 0.74, Max: 0.05	Prec: 0.41, Rec.: 0.88 F: 0.55, Max: 0.52

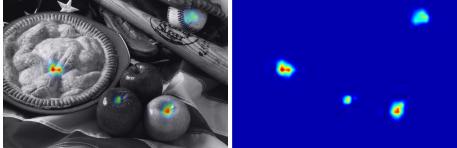
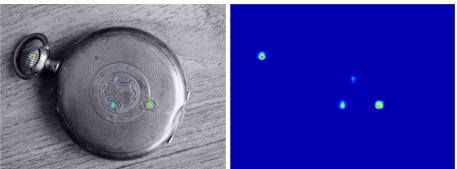
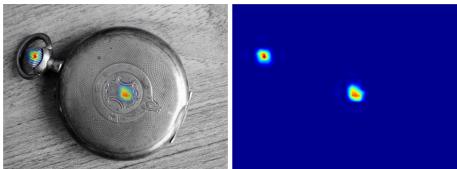
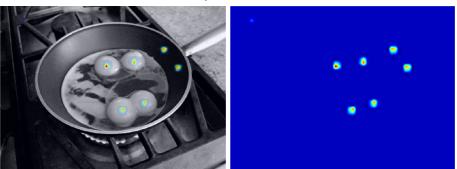
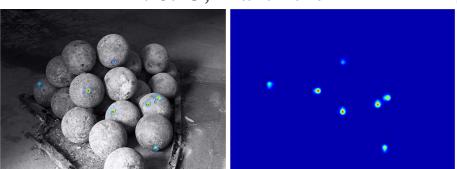
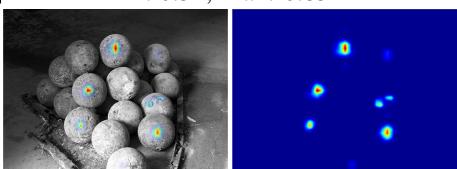
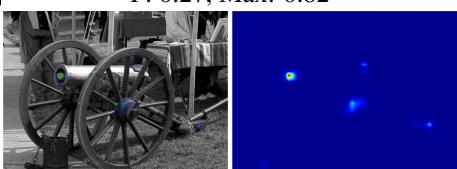
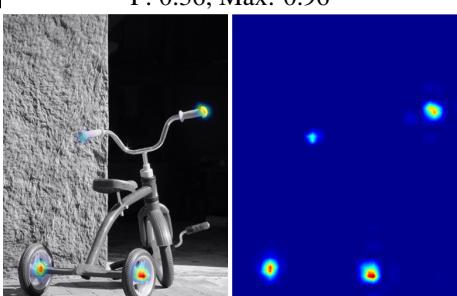
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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-26		Prec: 0.05, Rec.: 0.66 F: 0.09, Max: 0.00	Prec: 0.22, Rec.: 0.72 F: 0.34, Max: 0.97
			
8-27		Prec: 0.00, Rec.: 1.00 F: 0.00, Max: 0.01	Prec: 0.05, Rec.: 0.95 F: 0.09, Max: 0.37
			
8-28		Prec: 0.15, Rec.: 0.56 F: 0.24, Max: 1.24	Prec: 0.39, Rec.: 0.86 F: 0.54, Max: 1.17
			
8-29		Prec: 0.24, Rec.: 0.81 F: 0.37, Max: 1.28	Prec: 0.26, Rec.: 0.77 F: 0.39, Max: 1.29
			
8-30		Prec: 0.44, Rec.: 0.20 F: 0.27, Max: 0.70	Prec: 0.63, Rec.: 0.20 F: 0.30, Max: 0.61
			
8-31		Prec: 0.64, Rec.: 0.62 F: 0.63, Max: 1.31	Prec: 0.56, Rec.: 0.48 F: 0.51, Max: 1.19

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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
 8-32		 Prec: 0.06, Rec.: 0.17 F: 0.09, Max: 1.16	 Prec: 0.16, Rec.: 0.19 F: 0.18, Max: 0.75
 8-33		 Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.02	 Prec: 0.06, Rec.: 0.78 F: 0.11, Max: 0.58
 8-34		 Prec: 0.38, Rec.: 0.49 F: 0.43, Max: 1.17	 Prec: 0.34, Rec.: 0.34 F: 0.34, Max: 0.83
 8-35		 Prec: 0.30, Rec.: 0.23 F: 0.26, Max: 1.32	 Prec: 0.34, Rec.: 0.23 F: 0.27, Max: 0.82
 8-36		 Prec: 0.33, Rec.: 0.30 F: 0.31, Max: 1.23	 Prec: 0.63, Rec.: 0.25 F: 0.36, Max: 0.96
 8-37		 Prec: 0.59, Rec.: 0.75 F: 0.66, Max: 1.32	 Prec: 0.47, Rec.: 0.59 F: 0.52, Max: 0.87

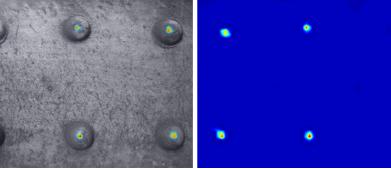
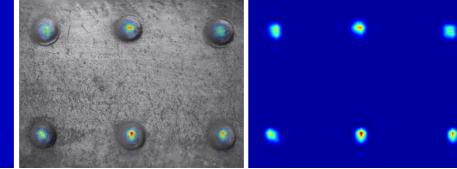
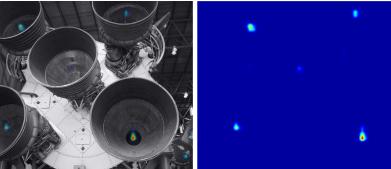
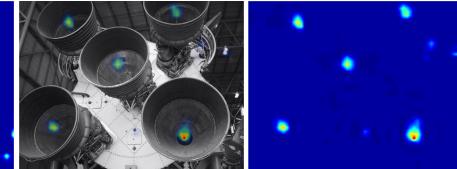
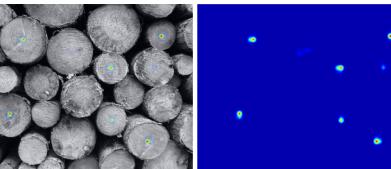
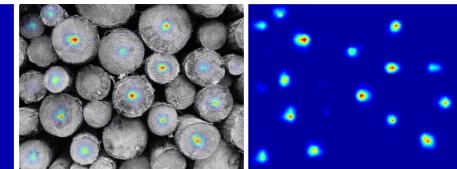
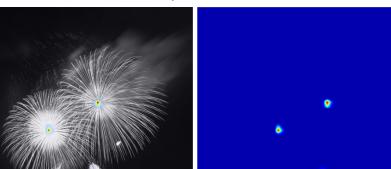
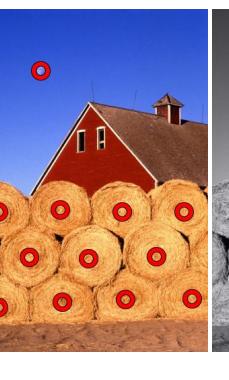
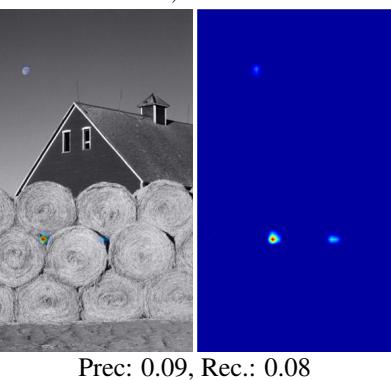
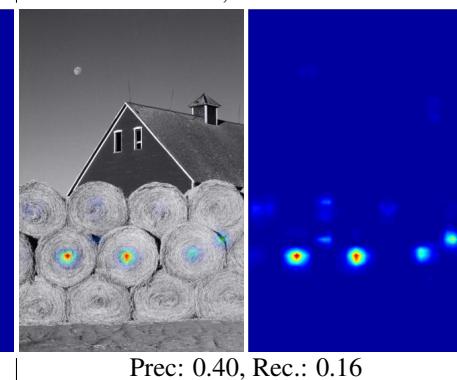
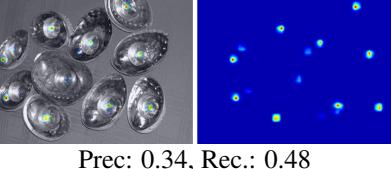
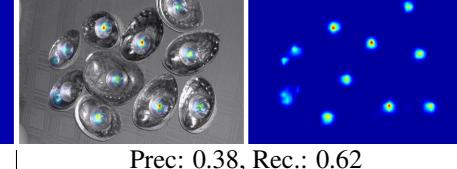
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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
8-38			
		Prec: 0.65, Rec.: 0.68 F: 0.66, Max: 1.15	Prec: 0.69, Rec.: 0.62 F: 0.65, Max: 1.03
8-39			
		Prec: 0.22, Rec.: 0.68 F: 0.33, Max: 0.98	Prec: 0.20, Rec.: 0.59 F: 0.30, Max: 1.01
8-40			
		Prec: 0.29, Rec.: 0.51 F: 0.37, Max: 1.23	Prec: 0.31, Rec.: 0.35 F: 0.33, Max: 1.15
8-41			
		Prec: 0.70, Rec.: 0.65 F: 0.68, Max: 1.33	Prec: 0.58, Rec.: 0.48 F: 0.52, Max: 1.01
8-42			
		Prec: 0.81, Rec.: 0.45 F: 0.58, Max: 1.32	Prec: 0.69, Rec.: 0.57 F: 0.63, Max: 1.13
8-43			
		Prec: 0.29, Rec.: 0.33 F: 0.31, Max: 0.99	Prec: 0.12, Rec.: 0.08 F: 0.09, Max: 0.07
8-44			
		Prec: 0.38, Rec.: 0.16 F: 0.22, Max: 0.87	Prec: 0.51, Rec.: 0.41 F: 0.46, Max: 1.04

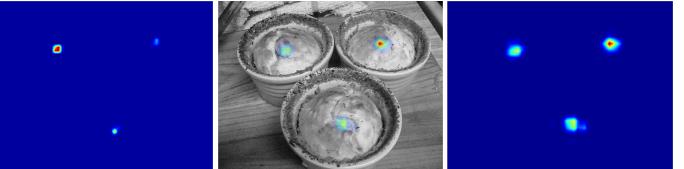
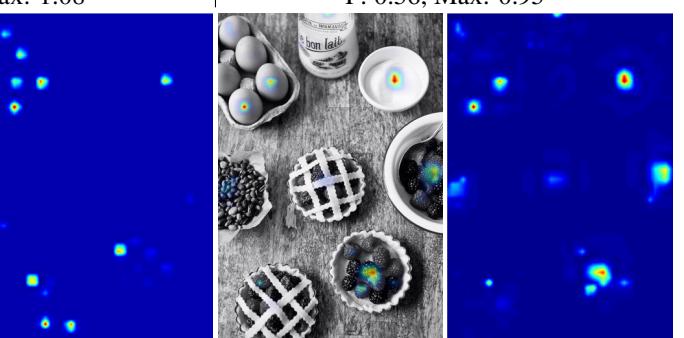
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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-45		Prec: 0.31, Rec.: 0.60 F: 0.40, Max: 1.11	Prec: 0.26, Rec.: 0.73 F: 0.38, Max: 1.22
			
8-46		Prec: 0.02, Rec.: 0.17 F: 0.04, Max: 1.07	Prec: 0.04, Rec.: 0.35 F: 0.07, Max: 0.91
			
8-47		Prec: 0.41, Rec.: 0.22 F: 0.28, Max: 1.15	Prec: 0.40, Rec.: 0.31 F: 0.35, Max: 1.15
			
8-48		Prec: 0.69, Rec.: 0.59 F: 0.64, Max: 1.14	Prec: 0.17, Rec.: 0.51 F: 0.26, Max: 0.50
			
8-49		Prec: 0.09, Rec.: 0.08 F: 0.09, Max: 1.16	Prec: 0.40, Rec.: 0.16 F: 0.23, Max: 1.13
			
8-50		Prec: 0.34, Rec.: 0.48 F: 0.40, Max: 1.10	Prec: 0.38, Rec.: 0.62 F: 0.48, Max: 1.09

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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-51		Prec: 0.58, Rec.: 0.49 F: 0.53, Max: 0.88	Prec: 0.39, Rec.: 0.49 F: 0.43, Max: 1.08
			
8-52		Prec: 0.07, Rec.: 0.44 F: 0.12, Max: 0.65	Prec: 0.05, Rec.: 0.92 F: 0.09, Max: 0.82
			
8-53		Prec: 0.05, Rec.: 0.45 F: 0.10, Max: 0.51	Prec: 0.12, Rec.: 0.98 F: 0.21, Max: 0.64
			
8-54		Prec: 0.54, Rec.: 0.74 F: 0.62, Max: 1.08	Prec: 0.65, Rec.: 0.49 F: 0.56, Max: 0.95
			
8-55		Prec: 0.17, Rec.: 0.30 F: 0.21, Max: 1.17	Prec: 0.45, Rec.: 0.25 F: 0.32, Max: 0.99

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Table 8 – Rotation Symmetry Competition Testing Set - Continued from previous page

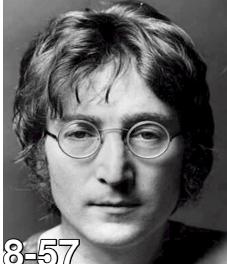
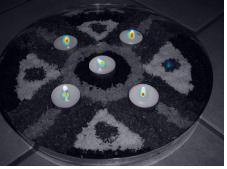
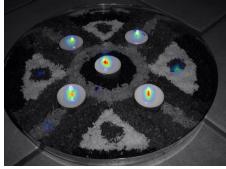
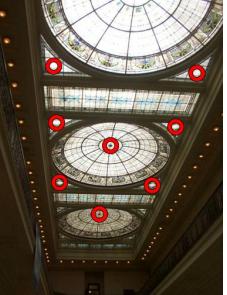
Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			
8-56	Prec: 0.56, Rec.: 0.71 F: 0.62, Max: 1.22	Prec: 0.45, Rec.: 0.67 F: 0.54, Max: 1.17	
			
8-57	Prec: 0.27, Rec.: 0.73 F: 0.40, Max: 1.35	Prec: 0.31, Rec.: 0.80 F: 0.44, Max: 1.11	
			
8-58	Prec: 0.60, Rec.: 0.68 F: 0.64, Max: 1.19	Prec: 0.40, Rec.: 0.76 F: 0.52, Max: 1.26	
			
8-59	Prec: 0.57, Rec.: 0.37 F: 0.45, Max: 1.32	Prec: 0.34, Rec.: 0.12 F: 0.18, Max: 1.19	

Table 9: Examples of reflection symmetry and progressively adding more noise to one side of the symmetry from 4 images in the symmetry competition dataset [2] testing images. Images are shown with the original image, ground-truth, the output for Sym-NET, the precision (prec.), the recall (rec.), and the F-Measure values (F) for the maximum per image F-measure and the maximum of the Sym-NET output (max).

Table 9 – Reflection Symmetry Stress Test						
Original Image	Ground Truth	Sym-VGG	Sym-ResNet			
				Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.01	Prec: 0.45, Rec.: 0.54 F: 0.49, Max: 1.14	
				Prec: 0.30, Rec.: 0.78 F: 0.43, Max: 0.98	Prec: 0.24, Rec.: 0.79 F: 0.37, Max: 0.93	
				Prec: 0.27, Rec.: 0.65 F: 0.38, Max: 0.96	Prec: 0.02, Rec.: 0.10 F: 0.03, Max: 0.92	
				Prec: 0.22, Rec.: 0.53 F: 0.31, Max: 0.92	Prec: 0.03, Rec.: 0.16 F: 0.05, Max: 0.92	
				Prec: 0.23, Rec.: 0.58 F: 0.33, Max: 0.89	Prec: 0.03, Rec.: 0.18 F: 0.06, Max: 0.93	

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Table 9 – Reflection Symmetry Stress Test - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
9-6			
		Prec: 0.19, Rec.: 0.46 F: 0.27, Max: 0.93	Prec: 0.03, Rec.: 0.14 F: 0.05, Max: 0.92
9-7			
		Prec: 0.26, Rec.: 0.62 F: 0.37, Max: 0.91	Prec: 0.04, Rec.: 0.19 F: 0.06, Max: 0.93
9-8			
		Prec: 0.26, Rec.: 0.69 F: 0.38, Max: 0.91	Prec: 0.05, Rec.: 0.23 F: 0.08, Max: 0.92
9-9			
		Prec: 0.26, Rec.: 0.70 F: 0.38, Max: 0.92	Prec: 0.04, Rec.: 0.19 F: 0.07, Max: 0.93
9-10			
		Prec: 0.27, Rec.: 0.70 F: 0.39, Max: 0.91	Prec: 0.03, Rec.: 0.17 F: 0.06, Max: 0.93

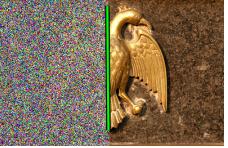
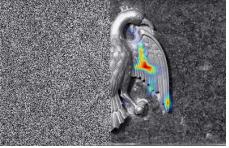
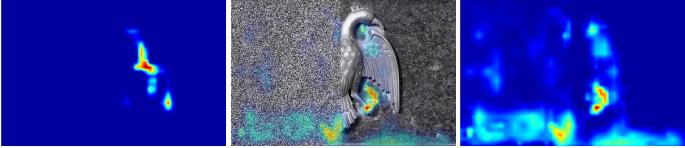
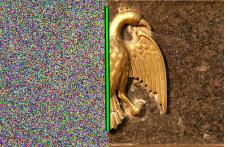
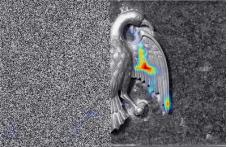
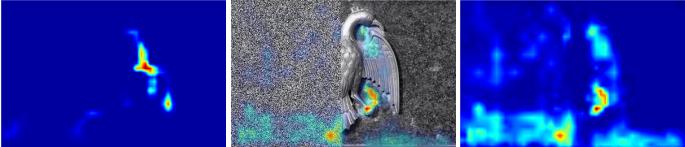
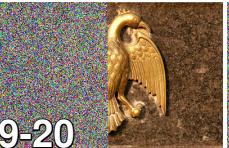
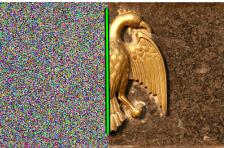
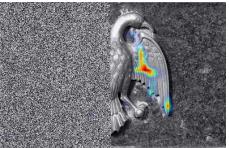
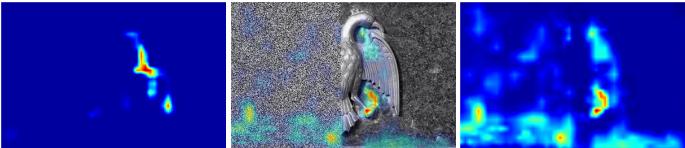
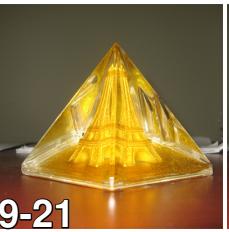
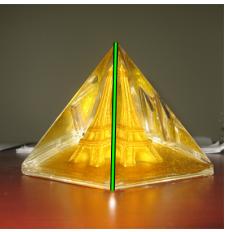
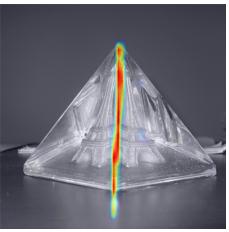
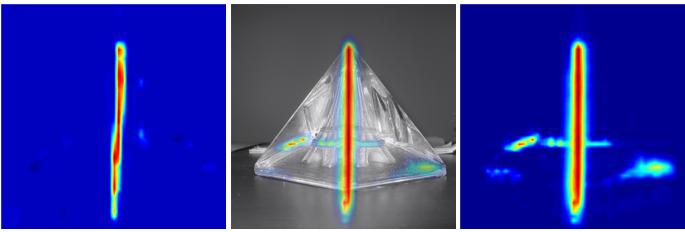
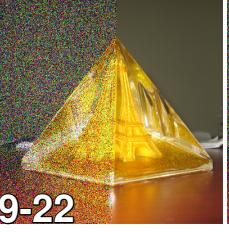
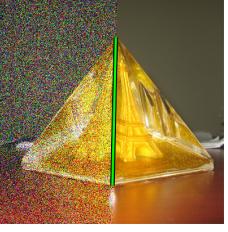
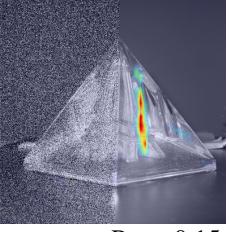
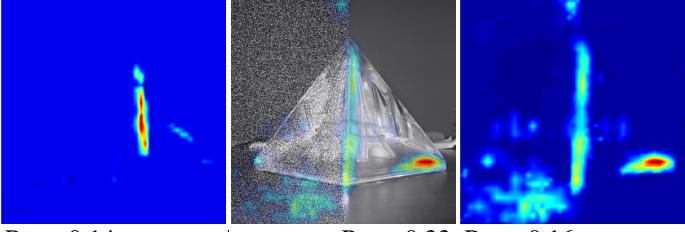
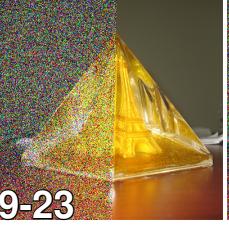
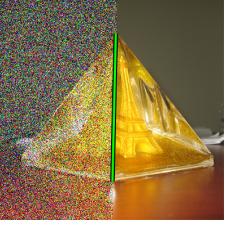
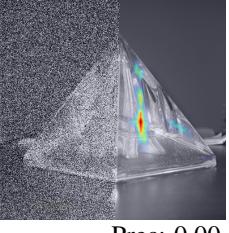
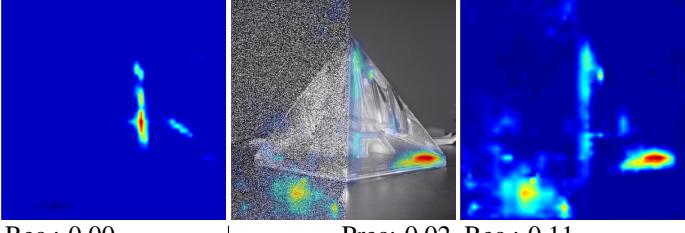
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Table 9 – Reflection Symmetry Stress Test - Continued from previous page

Original Image	Ground Truth	Sym-VGG		Sym-ResNet
9-11			Prec: 0.77, Rec.: 0.71 F: 0.74, Max: 1.11	Prec: 0.98, Rec.: 0.65 F: 0.78, Max: 1.19
9-12			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00	Prec: 0.14, Rec.: 0.13 F: 0.14, Max: 0.83
9-13			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00	Prec: 0.03, Rec.: 0.10 F: 0.04, Max: 0.80
9-14			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00	Prec: 0.02, Rec.: 0.15 F: 0.04, Max: 0.80
9-15			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.01	Prec: 0.06, Rec.: 0.07 F: 0.06, Max: 0.80
9-16			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00	Prec: 0.04, Rec.: 0.32 F: 0.07, Max: 0.81
9-17			Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.99	Prec: 0.14, Rec.: 0.07 F: 0.10, Max: 0.79

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Table 9 – Reflection Symmetry Stress Test - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
			 Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00 Prec: 0.12, Rec.: 0.08 F: 0.09, Max: 0.82
			 Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00 Prec: 0.06, Rec.: 0.07 F: 0.06, Max: 0.81
			 Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 1.00 Prec: 0.05, Rec.: 0.38 F: 0.08, Max: 0.79
			 Prec: 0.98, Rec.: 0.80 F: 0.88, Max: 1.02 Prec: 0.96, Rec.: 0.73 F: 0.83, Max: 1.13
			 Prec: 0.15, Rec.: 0.14 F: 0.15, Max: 0.75 Prec: 0.33, Rec.: 0.16 F: 0.21, Max: 0.72
			 Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.79 Prec: 0.02, Rec.: 0.11 F: 0.03, Max: 0.74

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Table 9 – Reflection Symmetry Stress Test - Continued from previous page

Original Image	Ground Truth	Sym-VGG		Sym-ResNet	
9-24					
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.75		Prec: 0.02, Rec.: 0.09 F: 0.03, Max: 0.73	
9-25					
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.64		Prec: 0.02, Rec.: 0.07 F: 0.03, Max: 0.71	
9-26					
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.55		Prec: 0.02, Rec.: 0.10 F: 0.04, Max: 0.71	
9-27					
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.53		Prec: 0.04, Rec.: 0.09 F: 0.05, Max: 0.72	
9-28					
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.47		Prec: 0.03, Rec.: 0.13 F: 0.05, Max: 0.73	

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Table 9 – Reflection Symmetry Stress Test - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
9-29			
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.40	Prec: 0.03, Rec.: 0.23 F: 0.05, Max: 0.74
9-30			
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.40	Prec: 0.02, Rec.: 0.16 F: 0.03, Max: 0.73
9-31			
		Prec: 0.75, Rec.: 0.53 F: 0.62, Max: 0.97	Prec: 0.80, Rec.: 0.76 F: 0.78, Max: 1.09
9-32			
		Prec: 0.18, Rec.: 0.04 F: 0.06, Max: 1.05	Prec: 0.08, Rec.: 0.43 F: 0.13, Max: 1.00
9-33			
		Prec: 0.07, Rec.: 0.05 F: 0.06, Max: 0.87	Prec: 0.06, Rec.: 0.41 F: 0.10, Max: 0.92
9-34			
		Prec: 0.12, Rec.: 0.05 F: 0.07, Max: 0.77	Prec: 0.04, Rec.: 0.27 F: 0.07, Max: 0.87

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Table 9 – Reflection Symmetry Stress Test - Continued from previous page

Original Image	Ground Truth	Sym-VGG	Sym-ResNet
9-35			
		Prec: 0.01, Rec.: 0.01 F: 0.01, Max: 0.74	Prec: 0.07, Rec.: 0.02 F: 0.03, Max: 0.88
9-36			
		Prec: 0.10, Rec.: 0.03 F: 0.05, Max: 0.63	Prec: 0.01, Rec.: 0.06 F: 0.02, Max: 0.85
9-37			
		Prec: 0.12, Rec.: 0.03 F: 0.05, Max: 0.58	Prec: 0.03, Rec.: 0.11 F: 0.04, Max: 0.80
9-38			
		Prec: 0.01, Rec.: 0.01 F: 0.01, Max: 0.72	Prec: 0.02, Rec.: 0.11 F: 0.03, Max: 0.80
9-39			
		Prec: 0.02, Rec.: 0.02 F: 0.02, Max: 0.52	Prec: 0.03, Rec.: 0.11 F: 0.05, Max: 0.84
9-40			
		Prec: 0.00, Rec.: 0.00 F: 0.00, Max: 0.62	Prec: 0.03, Rec.: 0.12 F: 0.05, Max: 0.84

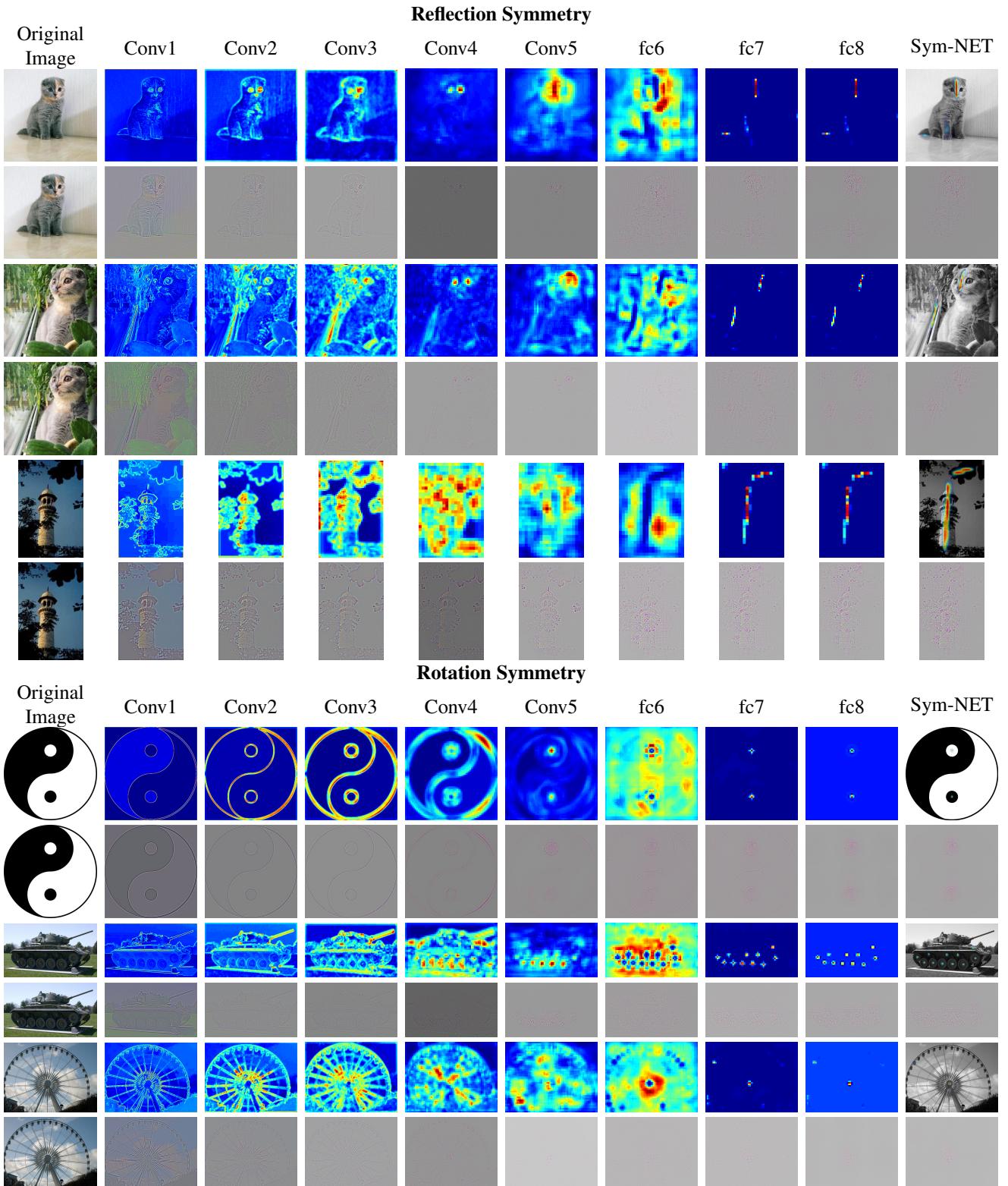


Figure 2: Example activations from Sym-VGG showing visualization of the networks. The activations shown are the sum of all the activation channels as each layer. We also deconvolve the activation back to the input layer using Zeiler and Fergus' method [7] to try to glimpse what the network is picking up on in the image at each layer (gray images). (Best viewed electronically and zoomed in).

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- [7] M. D. Zeiler and R. Fergus. Visualizing and Understanding Convolutional Networks. In *Computer vision–ECCV 2014*, pages 818–833. Springer, 2014. [3](#), [64](#)