



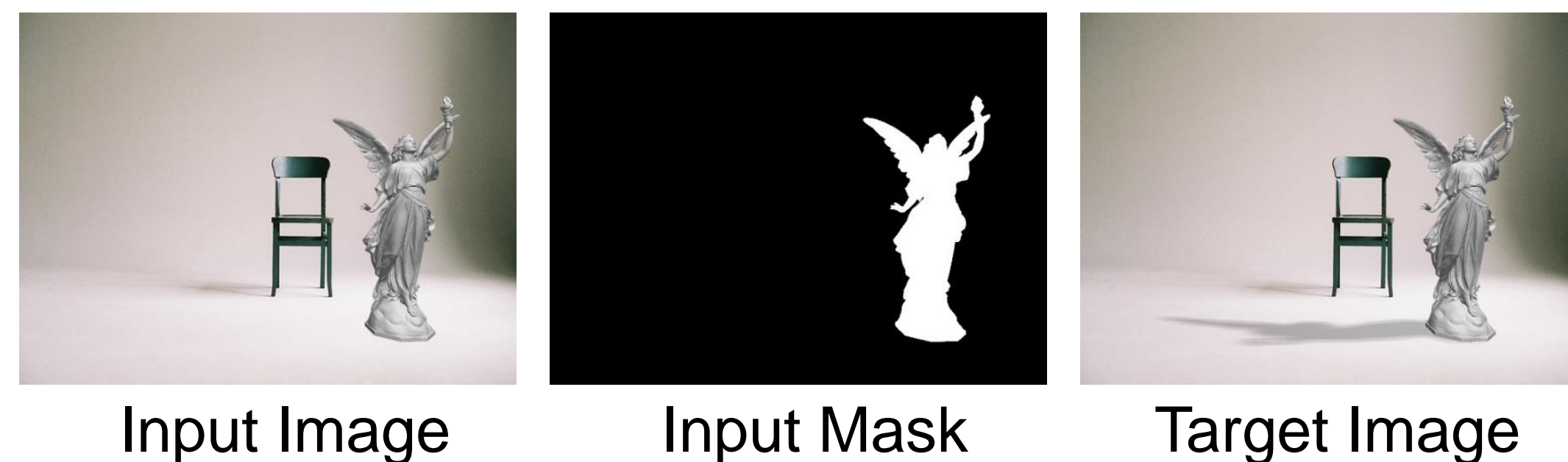
# ARShadowGAN: Shadow Generative Adversarial Network for Augmented Reality in Single Light Scenes

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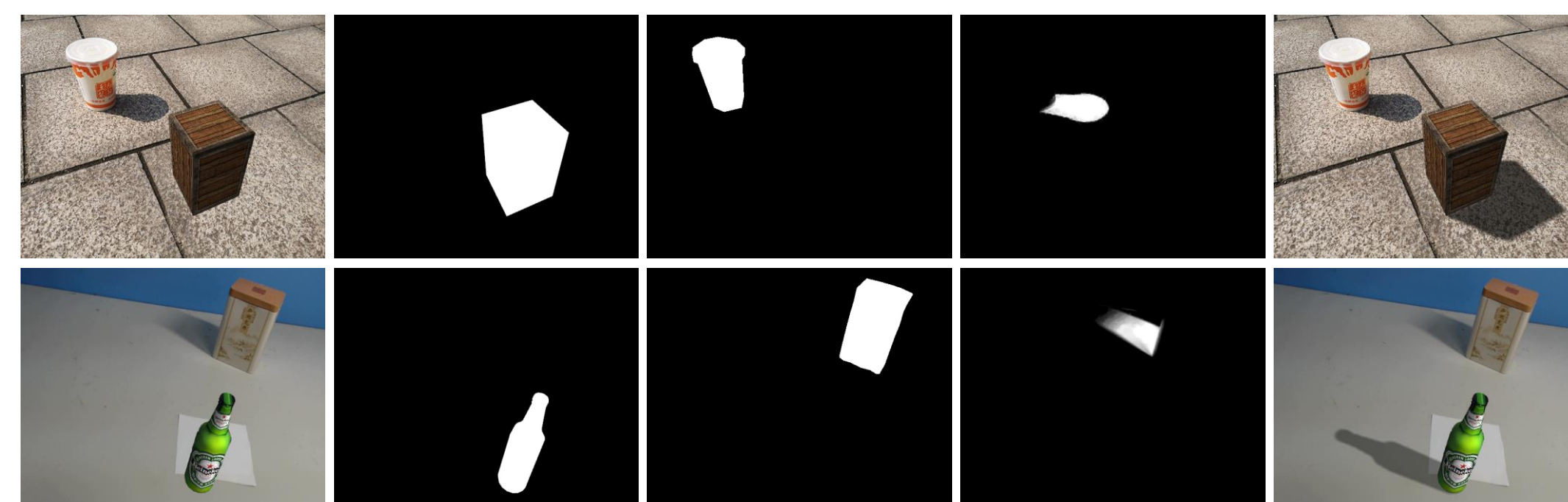
## Motivation

- Generating plausible virtual shadows is important for AR.
- We aim at directly generating virtual shadows without inverse rendering:



## Dataset

- We model indoor lighting as a dominant point light and outdoor lighting as a direction light to construct a large-scale AR shadow image dataset named Shadow-AR dataset.
- Shadow-AR dataset contains 3,000 image quintuples: AR images without virtual shadows, virtual object masks, real shadow and corresponding occluder masks and images with virtual shadows.

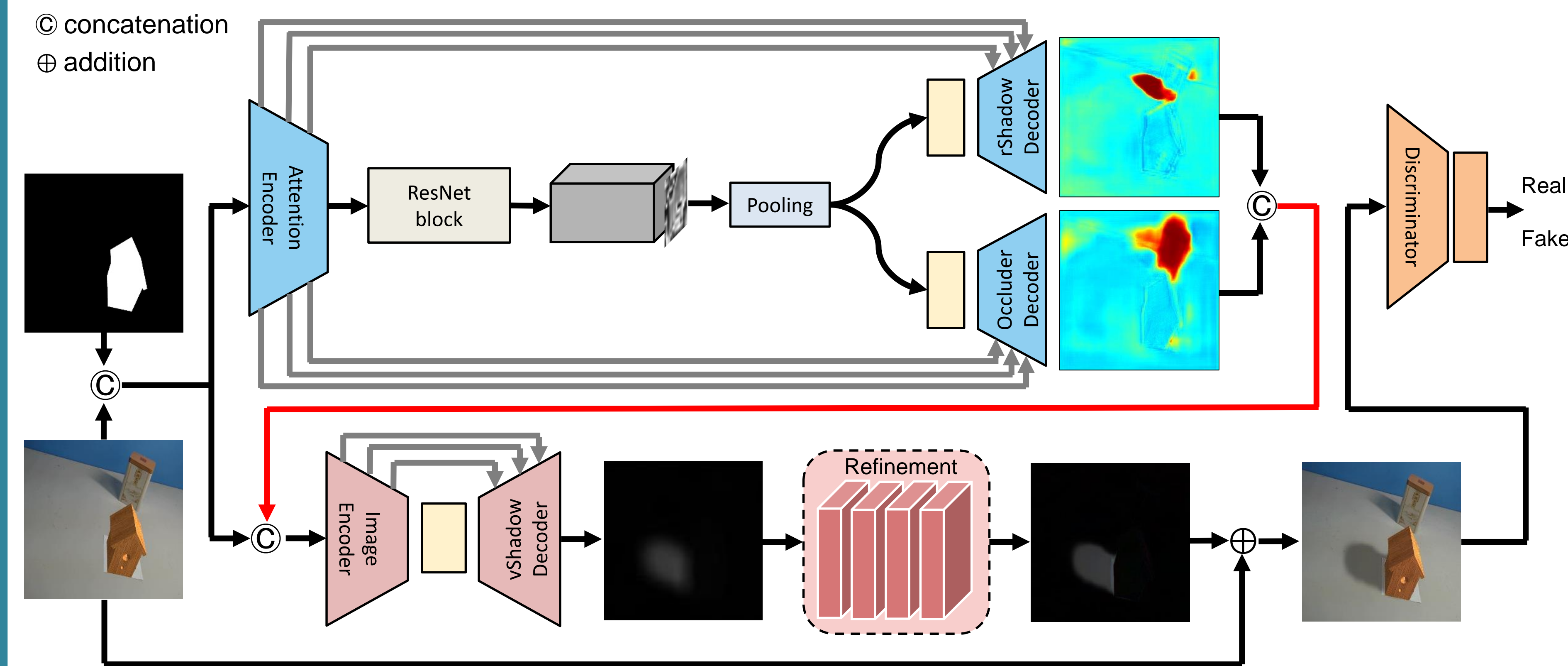


- The mask of real-world shadows and the corresponding occluders are used as clues to shadow inference.

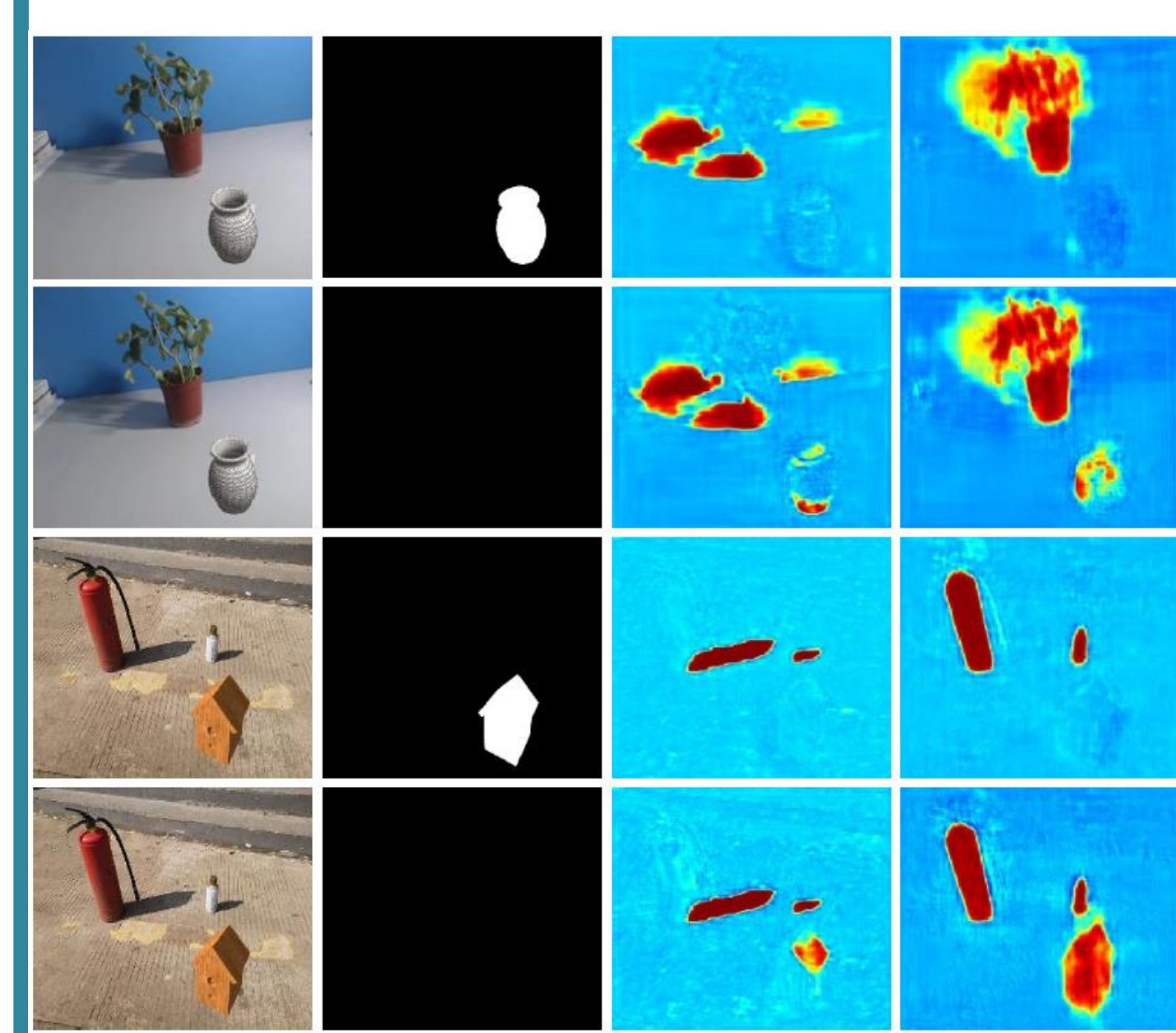
## Key References

- [Pix2Pix] Isola P., Zhu J.-Y., et al.: Image-to-image translation with conditional adversarial networks, IEEE CVPR 2017.
- [ShadowGAN] Zhang S., Liang R., et al.: Shadowgan: Shadow synthesis for virtual objects with conditional adversarial networks, CVM 2019.
- [Mask-ShadowGAN] Hu X., Jiang Y., et al.: Mask-ShadowGAN: Learning to remove shadows from unpaired data, IEEE ICCV 2019.

## Proposed ARShadowGAN



## Attention Visualization

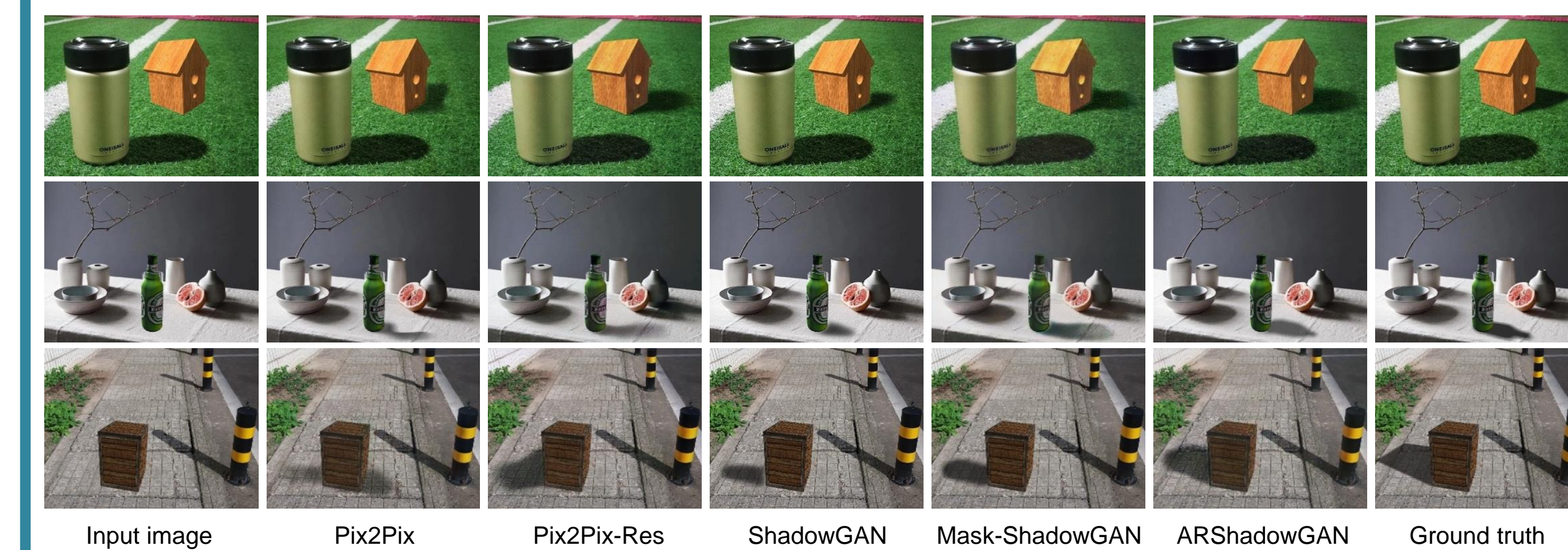


## Quantitative Comparisons

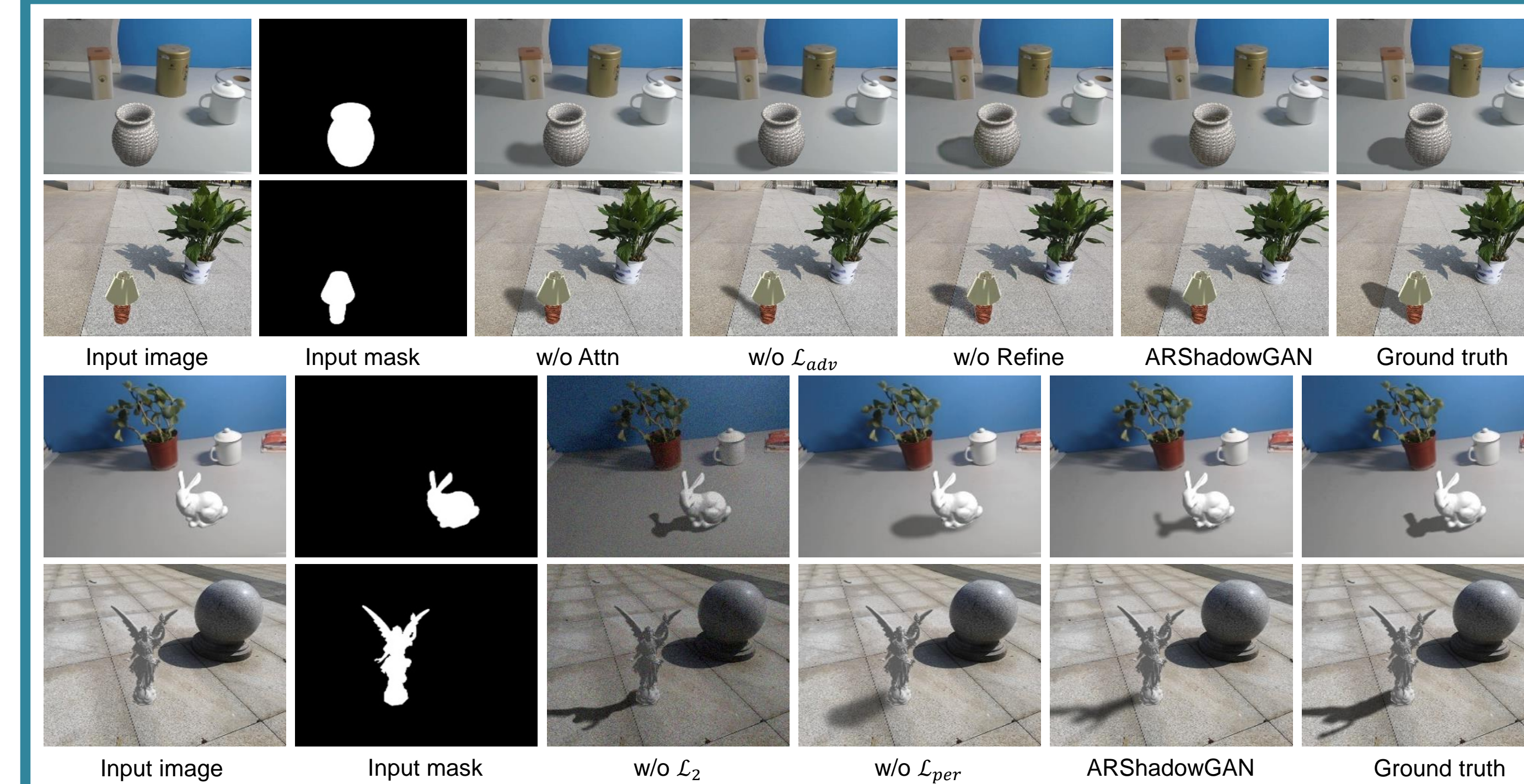
- Metrics: **RMSE**, **SSIM**, **BER**, **ACC**

Models	RMSE	SSIM	S (%)	A (%)	ACC (%)
Pix2Pix	9.514	0.938	41.468	27.358	90.631
Pix2Pix-Res	8.043	0.959	29.597	26.476	96.689
ShadowGAN	8.041	0.961	28.347	24.547	97.122
Mask-ShadowGAN	7.493	0.959	23.261	21.131	98.443
<b>ARShadowGAN</b>	<b>6.520</b>	<b>0.965</b>	<b>22.278</b>	<b>19.267</b>	<b>98.453</b>
w/o Attn	7.175	0.962	23.162	21.079	98.446
w/o Refine	7.050	0.961	23.087	21.024	98.450
w/o $\mathcal{L}_{adv}$	7.781	0.959	29.093	26.354	97.487
w/o $\mathcal{L}_{per}$	8.001	0.963	29.576	26.399	97.152
w/o $\mathcal{L}_2$	9.696	0.924	50.748	30.829	88.548

## Qualitative Comparisons



## Ablation Studies



## Results outside Dataset

