



香港中文大學(深圳)
The Chinese University of Hong Kong



S CoDA: Domain Adaptive Shape Completion for Real Scans

CVPR 2023

Yushuang Wu^{1,2,3} Zizheng Yan^{1,2,3} Ce Chen^{1,2} Lai Wei⁴ Xiao Li⁵

Guanbin Li^{6,7} Yihao Li^{1,2} Shuguang Cui^{2,1} Xiaoguang Han^{2,1#}

¹FNii, CUHKSZ ²SSE, CUHKSZ ³SRIBD ⁴SDS, CUHKSZ ⁵Microsoft Research Asia

⁶Sun Yat-sen University ⁷Research Institute, Sun Yat-sen University, Shenzhen



香港中文大學(深圳)
The Chinese University of Hong Kong, Shenzhen

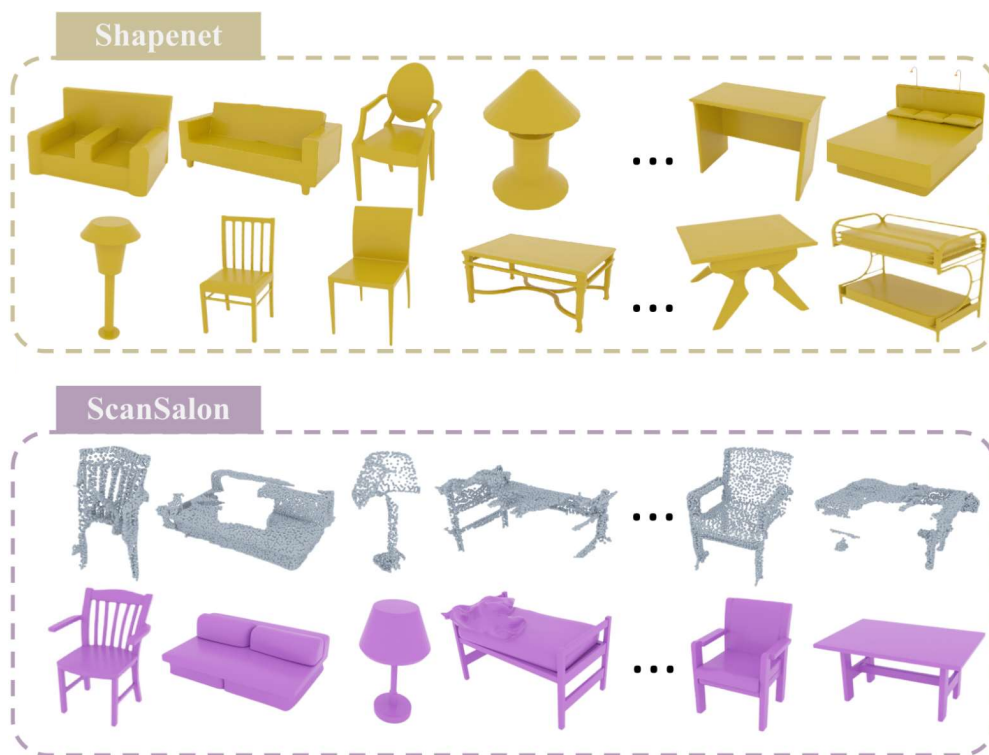




香港中文大學 (深圳)

The Chinese University of Hong Kong

Domain Gap



Synthetic v.s. Real

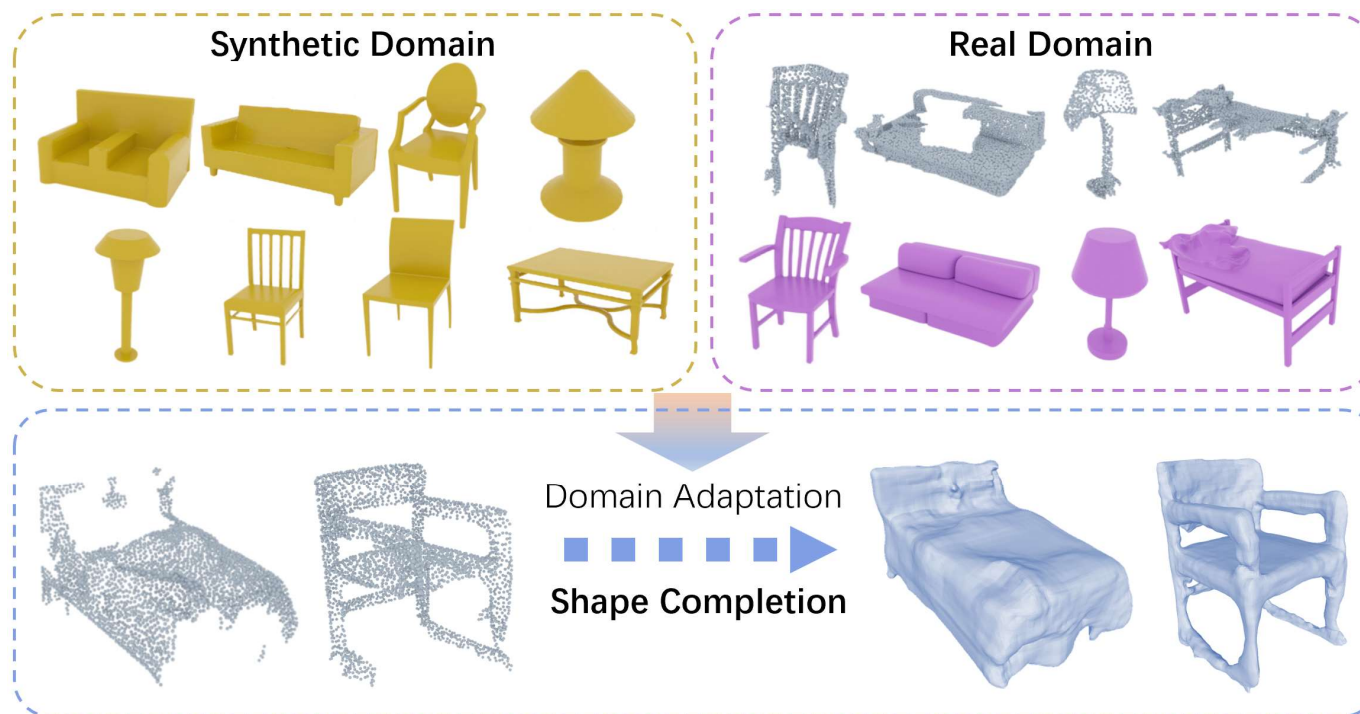
- Noise
- Incompleteness
- Sparsity



香港中文大學 (深圳)

The Chinese University of Hong Kong

Task: Domain Adaptive Shape Completion

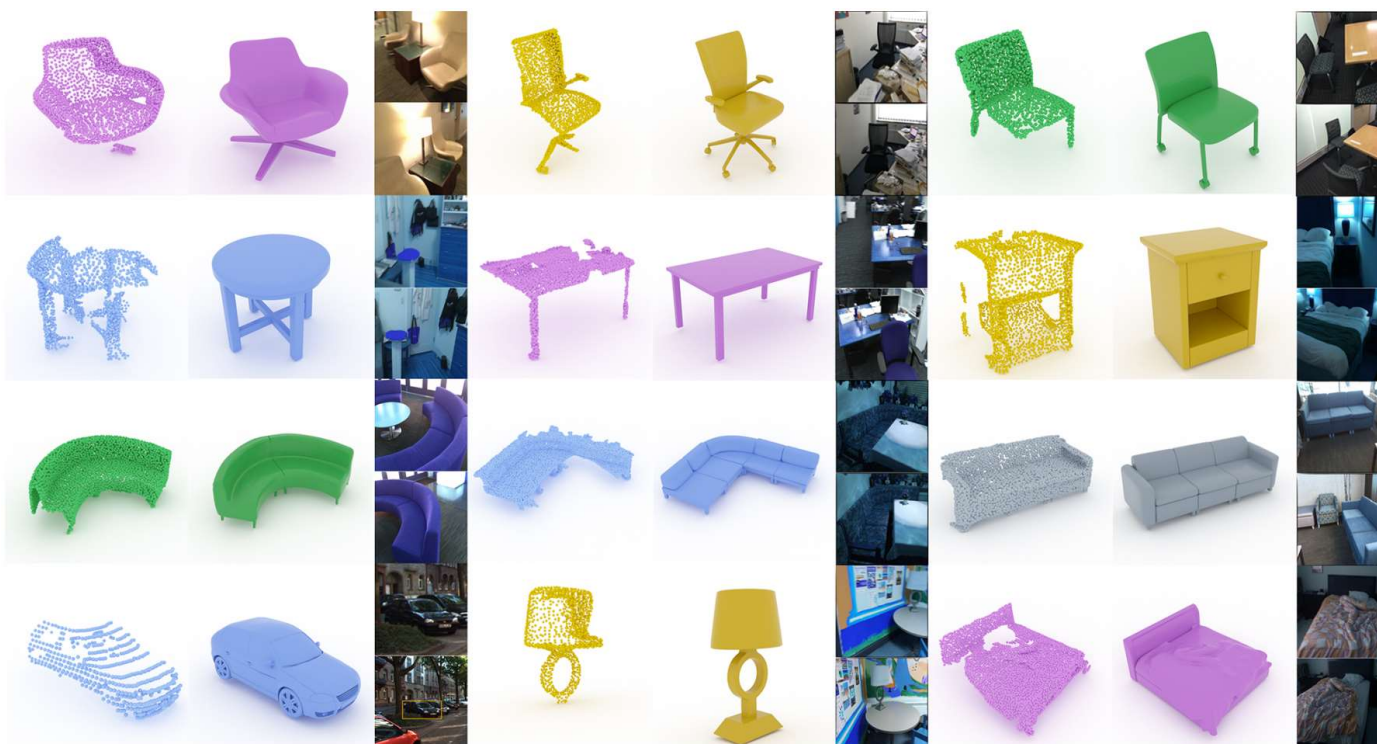




香港中文大學 (深圳)

The Chinese University of Hong Kong

Dataset: ScanSalon



	Syn.	Real	Mesh
Chair	6,579	4,651	497
Desk	8,071	1,630	161
Sofa	3,091	428	43
Bed	233	365	36
Lamp	2,318	133	20
Car	3,514	437	43
Total	23,806	7,644	800

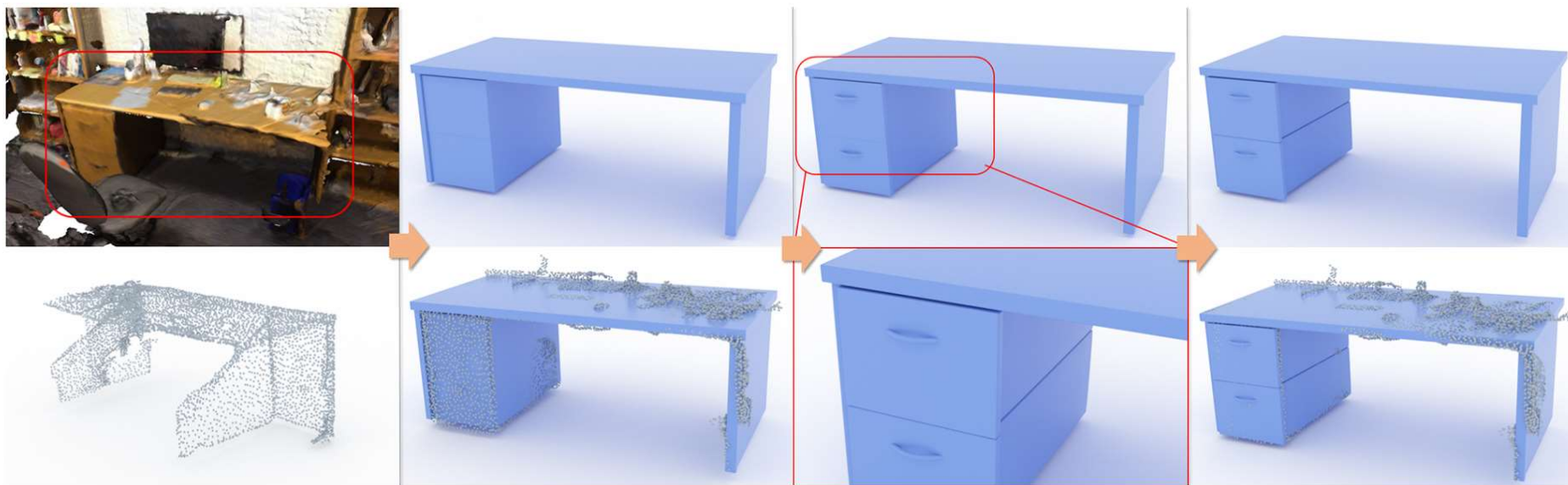


香港中文大學 (深圳)

The Chinese University of Hong Kong

Dataset: ScanSalon

- 3D data creation



Extract the instance

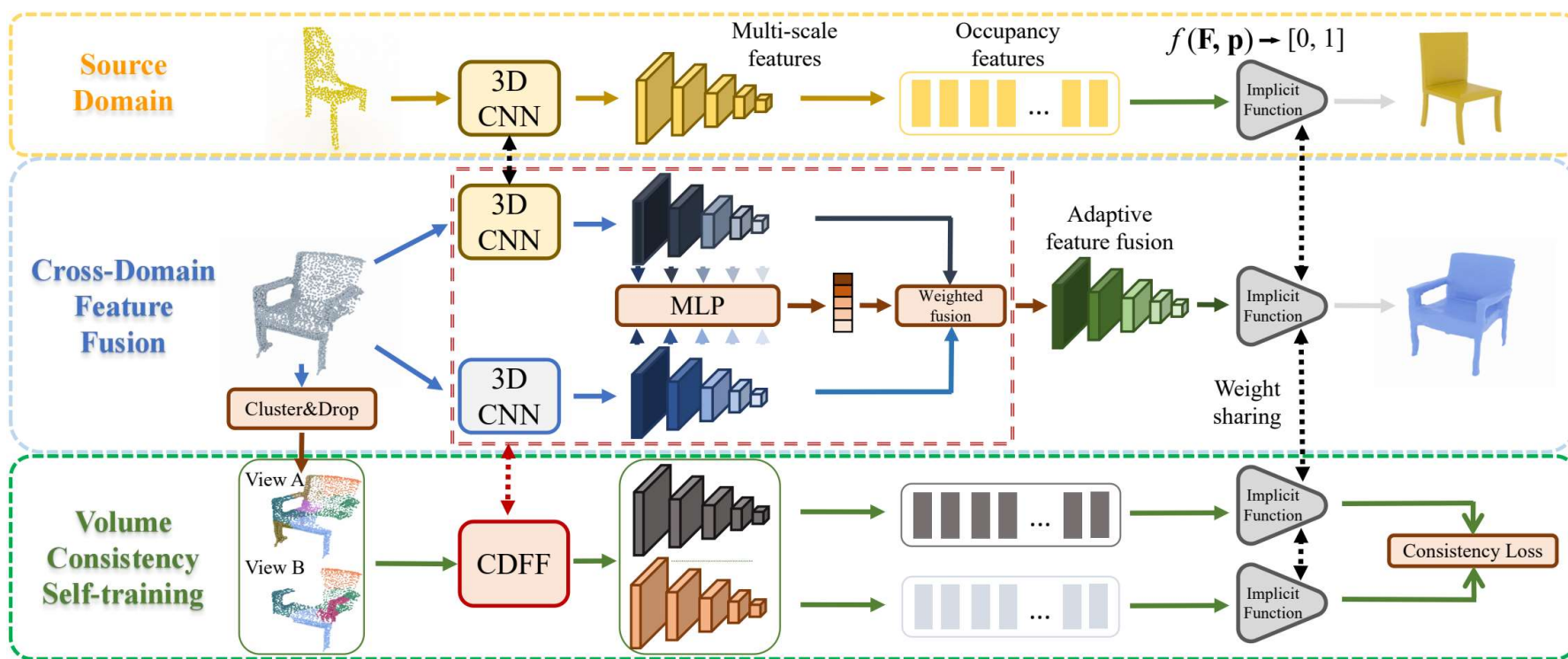
Coarse mesh

Add details

Fine adjust



Methods

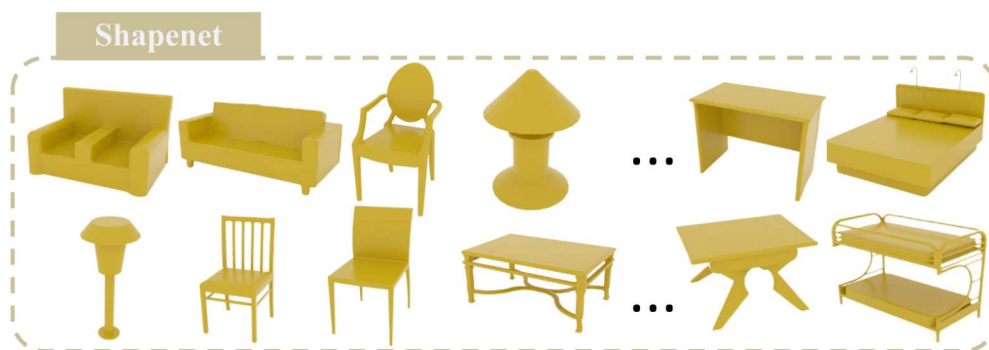




香港中文大學 (深圳)

The Chinese University of Hong Kong

Method: Key Observation



→ Global Topology

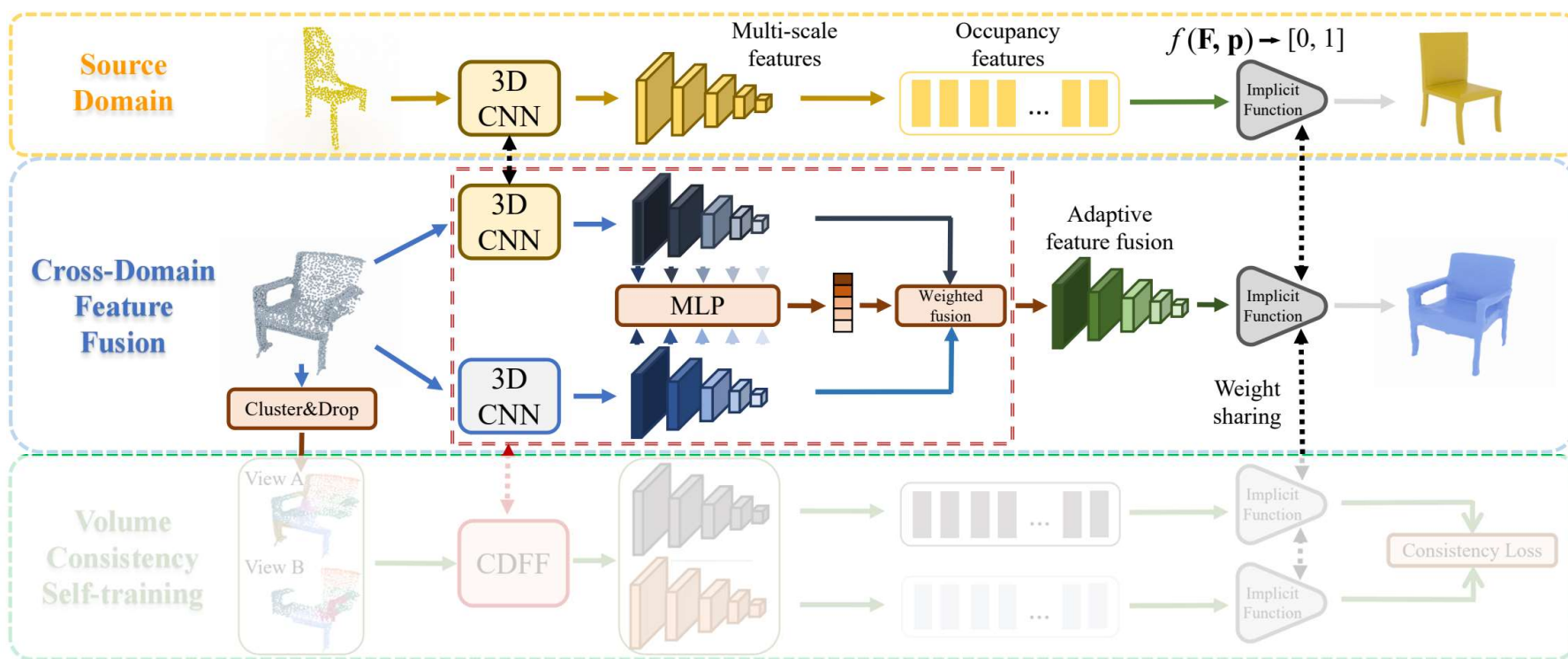


→ Local Patterns



香港中文大學 (深圳)
The Chinese University of Hong Kong

Methods: CDFF

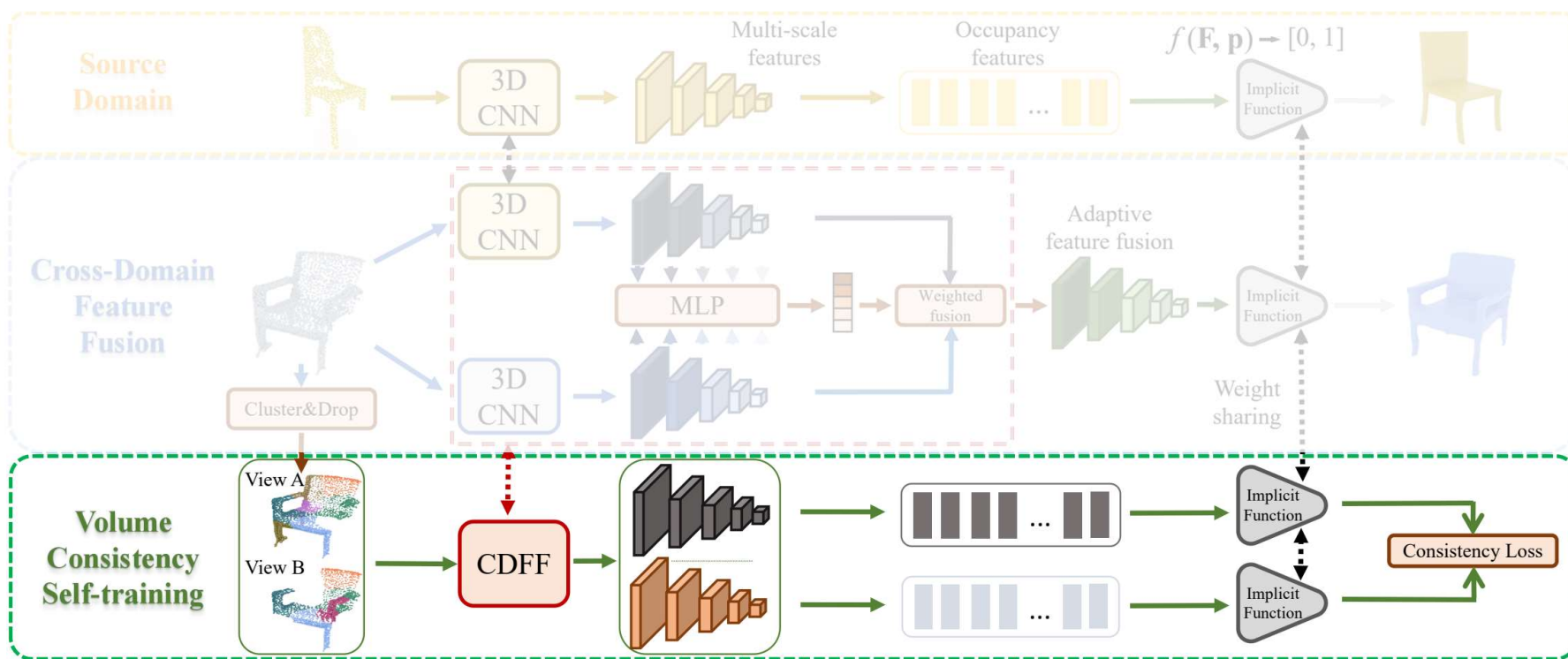




香港中文大學 (深圳)

The Chinese University of Hong Kong

Methods: VCST

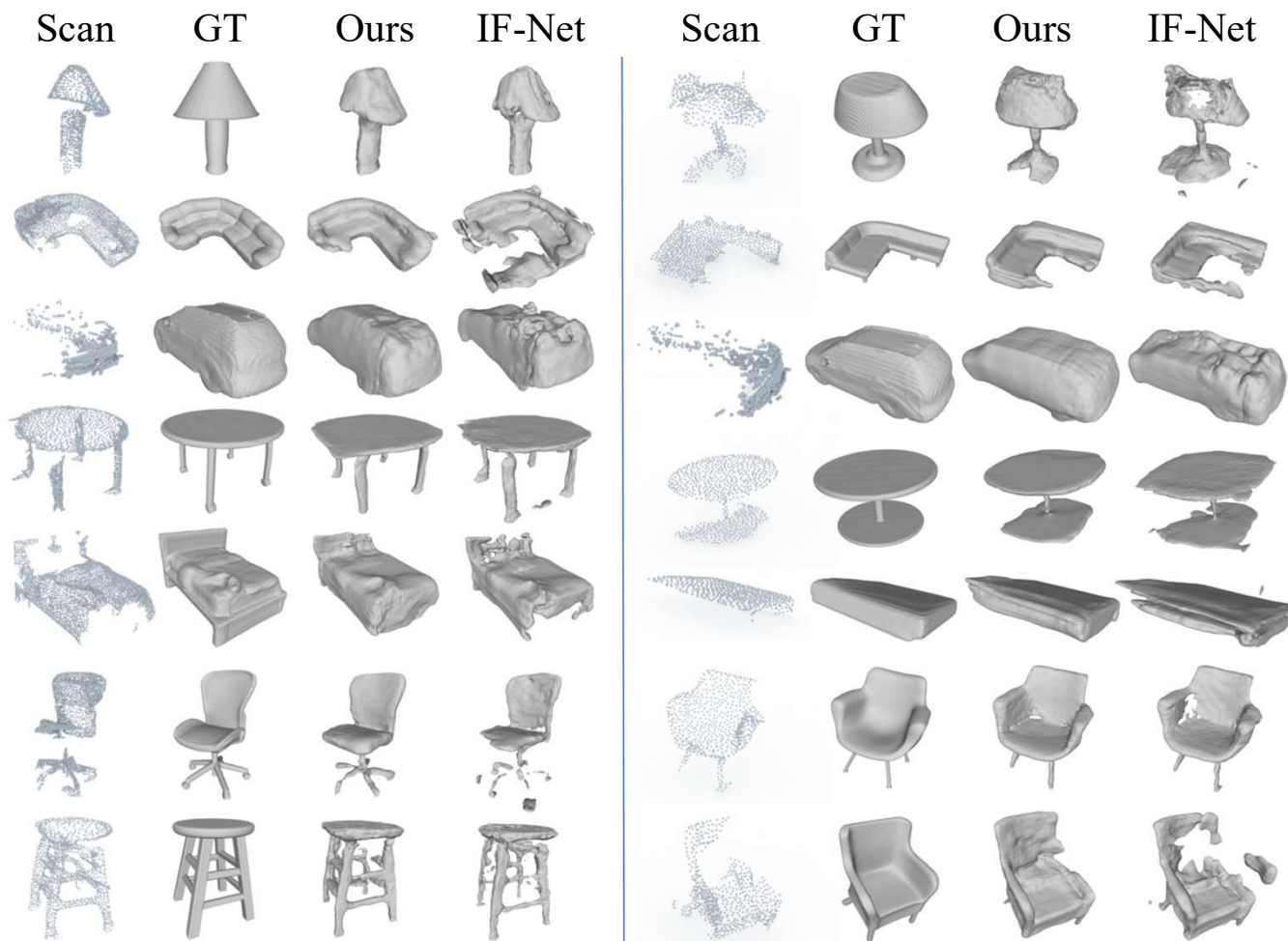




香港中文大學 (深圳)

The Chinese University of Hong Kong

Results





Results

(a) Results on the 3% labels setting.

Method	Chair		Desk		Sofa		Bed		Lamp		Car		Average	
	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑
IF-Net	1.57	56.10	2.44	43.04	0.65	79.03	1.64	67.30	1.67	39.89	0.74	74.77	1.45	60.02
SelfSup	1.49	58.55	3.49	42.97	0.55	81.16	1.59	68.58	2.41	51.42	0.62	78.75	1.69	63.57
PtComp	1.61	57.33	2.16	44.26	0.51	79.90	1.52	68.23	1.95	46.97	0.59	80.35	1.39	62.84
Adversarial	1.74	58.54	2.99	46.02	0.46	81.42	1.37	71.32	2.43	56.39	0.67	78.91	1.61	65.43
Ours	1.58	60.77	2.36	48.62	0.42	82.00	1.57	73.05	1.62	58.57	0.41	80.96	1.32	67.32

(b) Results on the 5% labels setting.

Method	Chair		Desk		Sofa		Bed		Lamp		Car		Average	
	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑	CD↓	mIoU↑
IF-Net	1.88	56.98	2.14	44.87	0.50	82.04	0.66	76.05	1.72	51.33	0.52	80.13	1.24	65.23
SelfSup	2.08	59.42	2.73	46.39	0.51	82.25	0.61	77.22	1.46	62.02	0.43	81.89	1.09	68.06
PtComp	1.34	57.98	1.83	46.20	0.32	82.66	0.61	79.07	1.44	61.61	0.43	81.89	1.00	68.24
Adversarial	1.71	60.58	2.13	48.46	0.41	83.54	0.51	80.81	1.33	64.22	0.41	81.86	1.08	69.91
Ours	1.37	61.48	2.09	50.93	0.31	82.71	0.41	82.27	1.57	67.80	0.46	83.12	1.04	71.39

(c) Ablation results.

CDFD only	1.49	58.55	2.84	48.20	0.53	79.42	1.91	71.19	1.73	53.18	0.57	79.17	1.51	64.95
VCST only	2.08	59.42	2.89	46.86	0.43	81.60	1.63	72.62	1.85	50.18	0.62	78.62	1.58	64.88



香港中文大學 (深圳)
The Chinese University of Hong Kong



Conclusion

- Contributions:
 - 1. A new task, SCoDA, is proposed, with a small dataset, ScanSalon, contributed.
 - 2. A novel cross-domain feature fusion module is designed to combine the knowledge of global shapes and local patterns learned in the synthetic and real domain.
 - 3. A volume-consistent self-training framework is proposed to improve the robustness of shape completion to the complex incompleteness of real scans.
 - 4. Extensive experiments also demonstrate the superiority of the proposed method.



香港中文大學 (深圳)

The Chinese University of Hong Kong



The End.

- Yushuang Wu:
- <https://scholar.google.com/citations?user=x5gpN0sAAAAJ>
- GAP Lab: (Generation and Analysis of Pixels, Points and Polygons)
- <https://gaplab.cuhk.edu.cn>

