Auto3DSG

Autoencoding for 3D Scene Graph Learning via Object-Level Scene Reconstruction

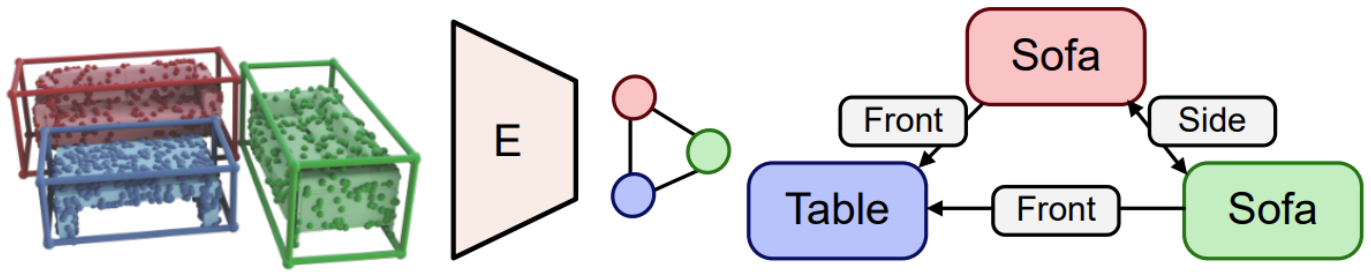
Sebastian Koch[1,2,3], Pedro Hermosilla[4], Narunas Vaskevicius[1,2], Mirco Colosi[2], Timo Ropinski[4]

Bosch Center for Artificial Intelligence[1], Bosch Cooperate Research[2], University of Ulm[3], TU Wien[4]

ICCV2023 – SG2RL Workshop

Current Challenges in 3D Scene Graph Prediction

3D Scene Graph Prediction

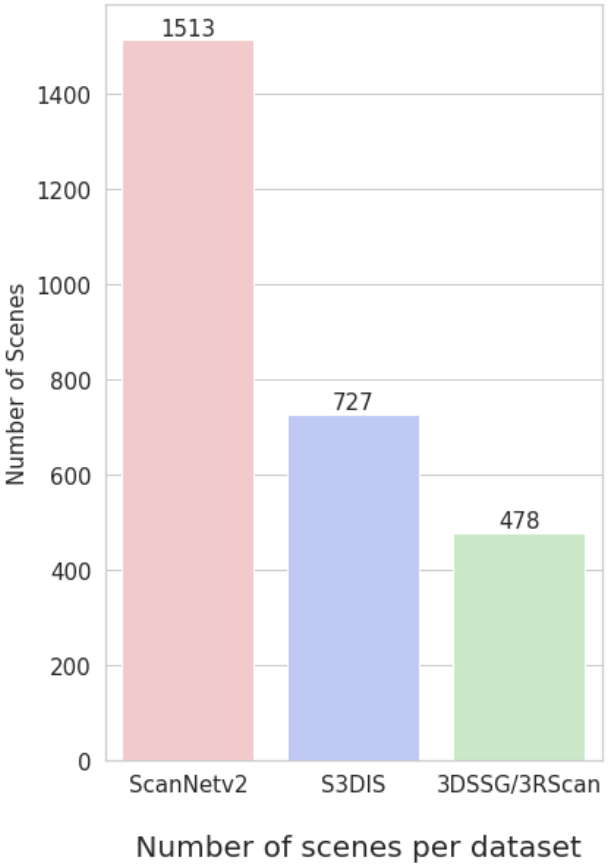


Problem:

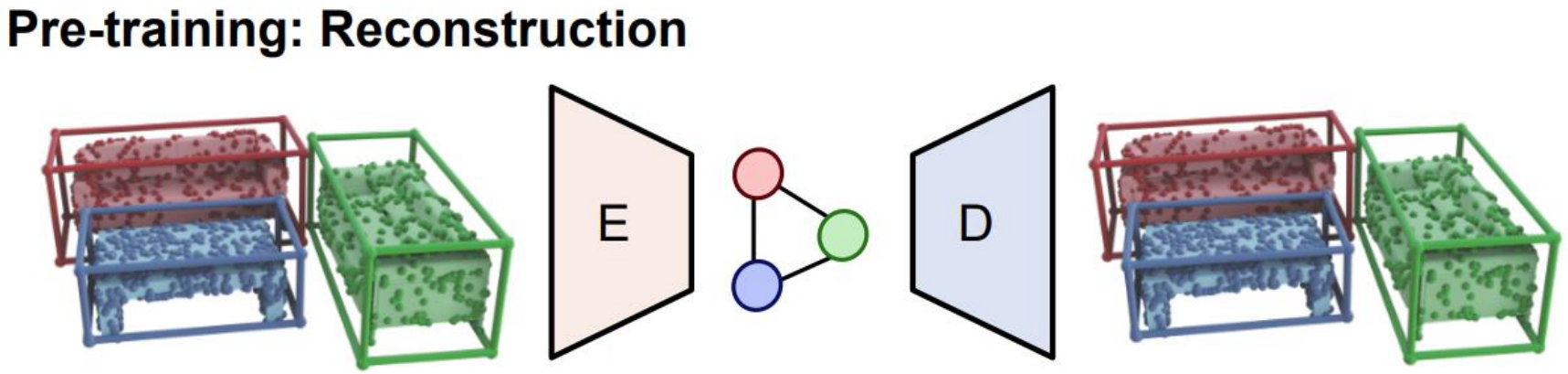
- Lack of large-scale relationship labels for 3D scene graph learning

Goal:

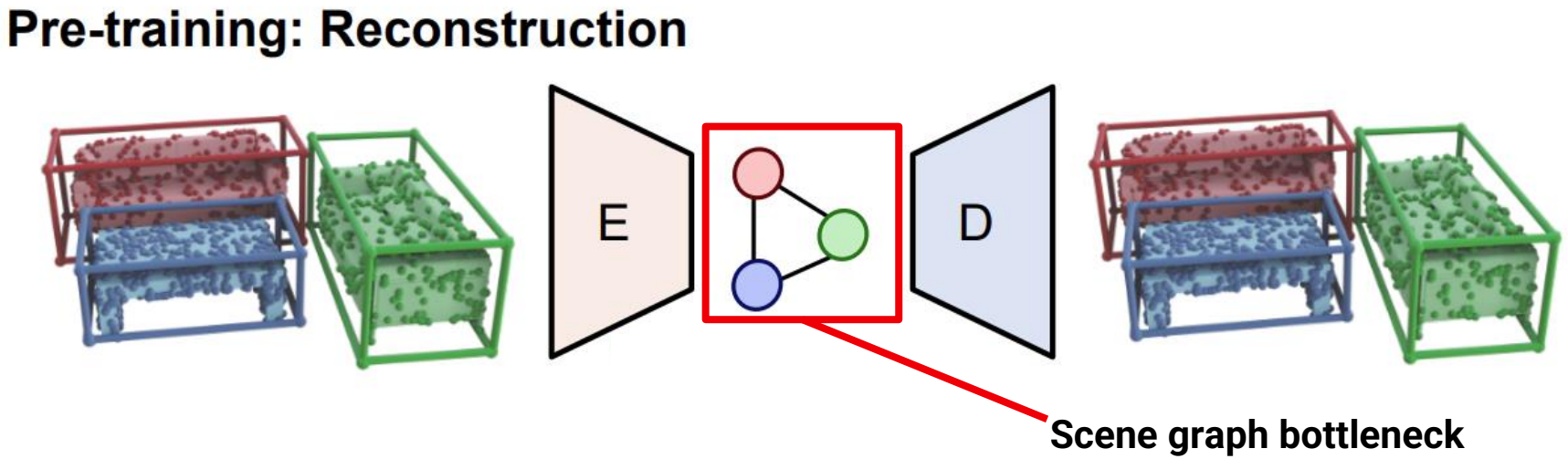
- Can we add self-supervision for more efficient learning?
- How can we use large-scale 3D datasets for scene graph learning?



Autoencoder-based approach

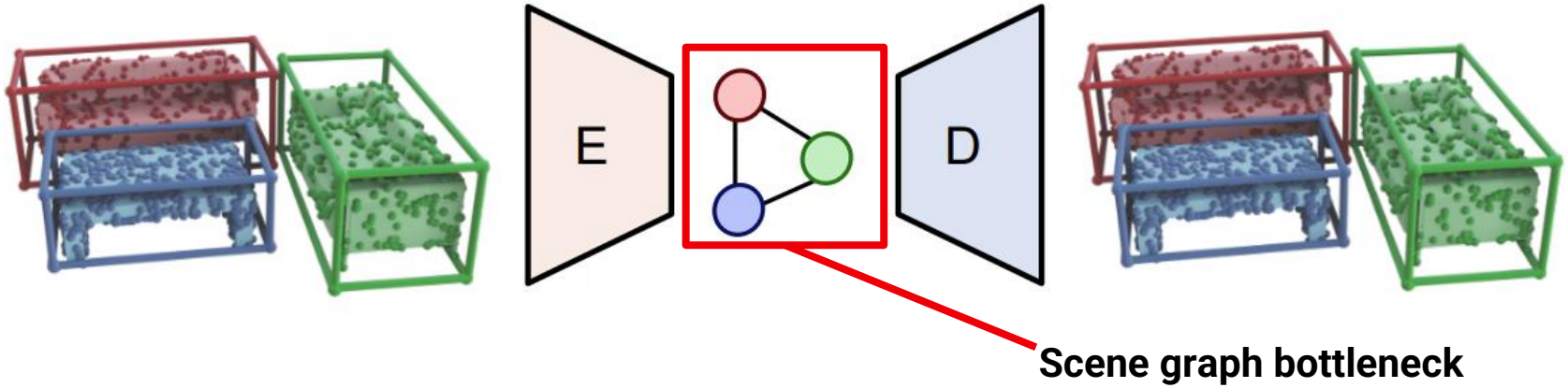


Autoencoder-based approach



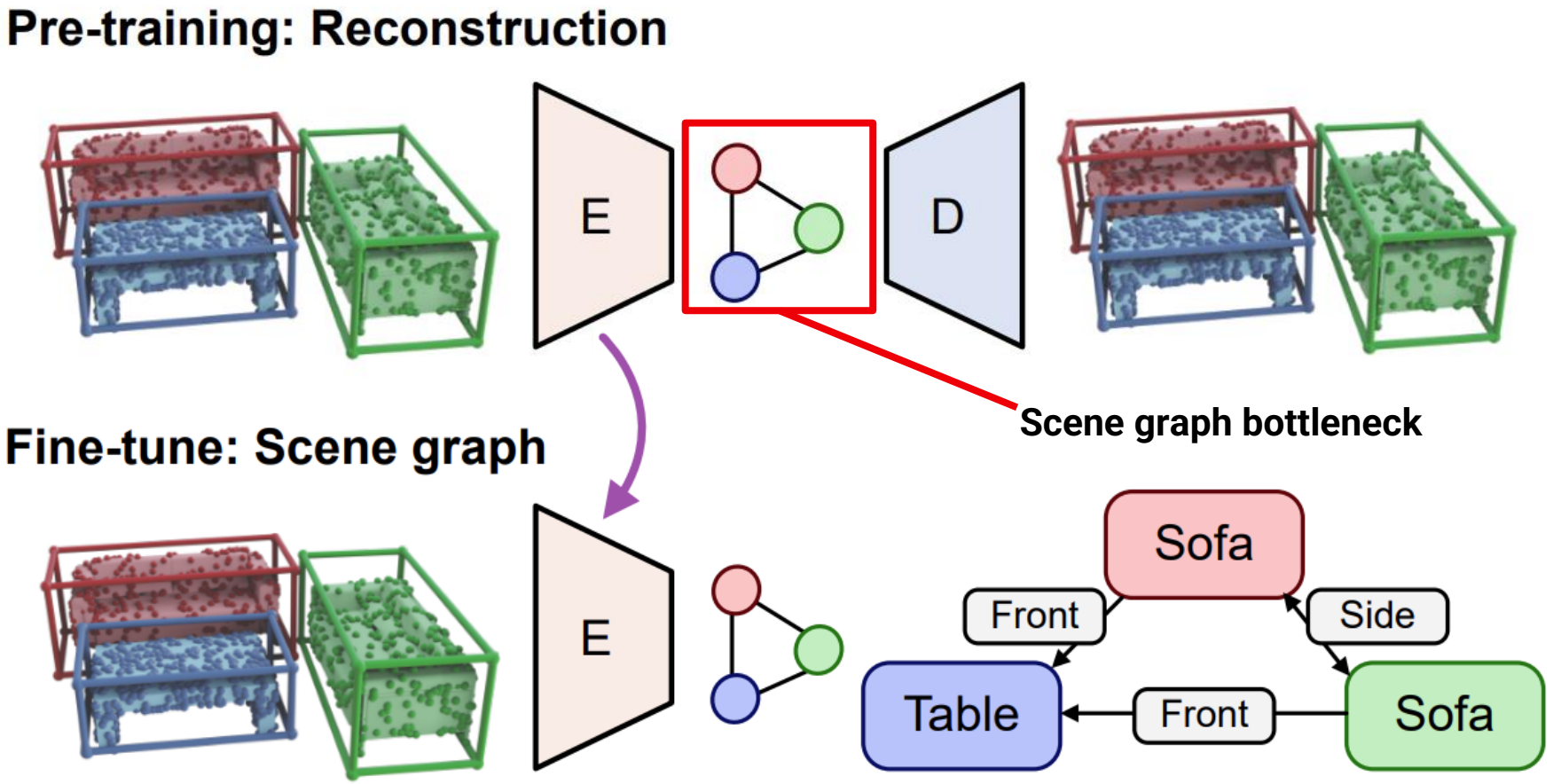
Autoencoder-based approach

Pre-training: Reconstruction

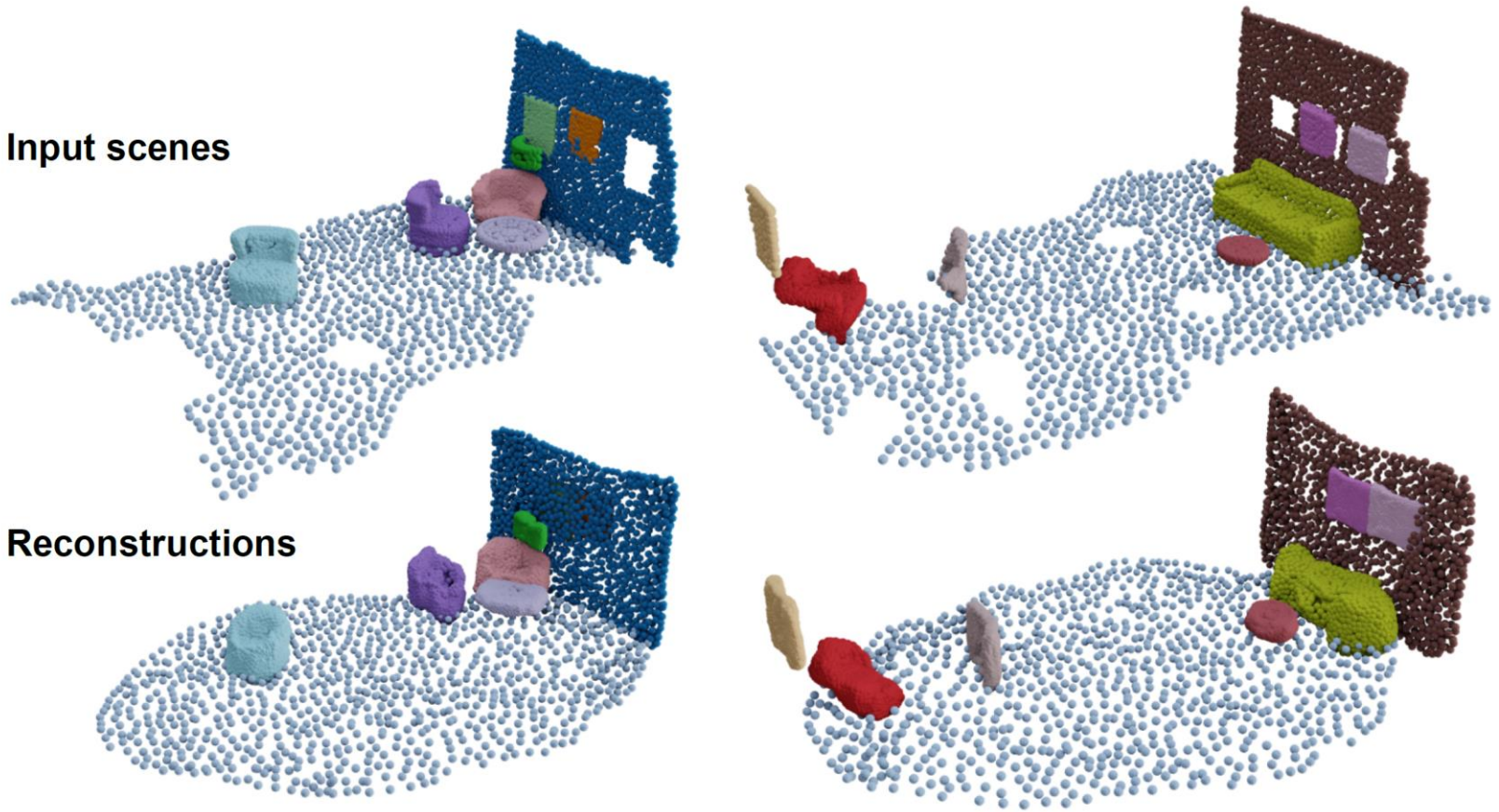


- ✔ No explicit scene graph labels required
- ✔ Trainable on large scale 3D datasets such as ScanNet

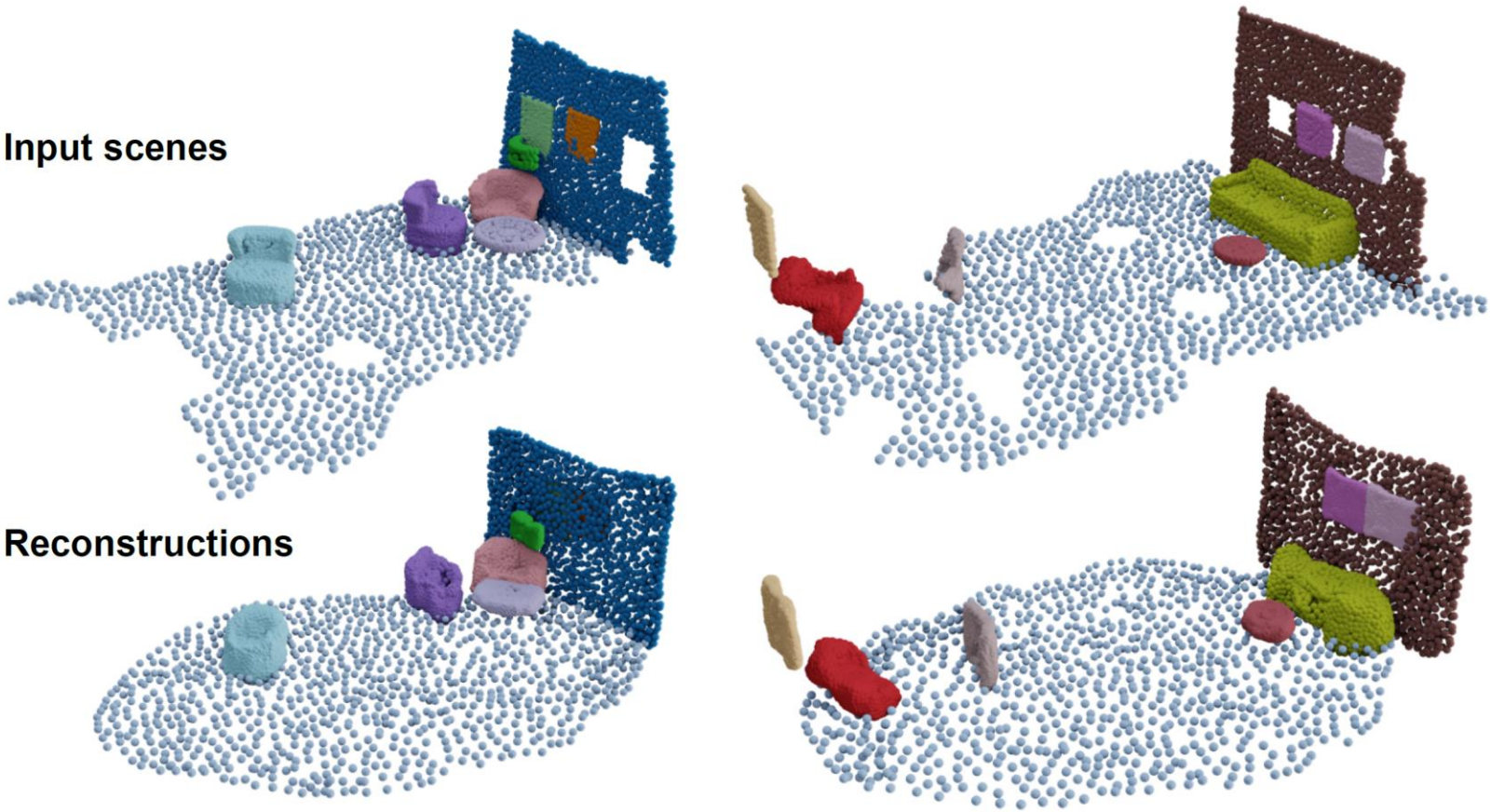
Autoencoder-based approach



3D scene reconstructions

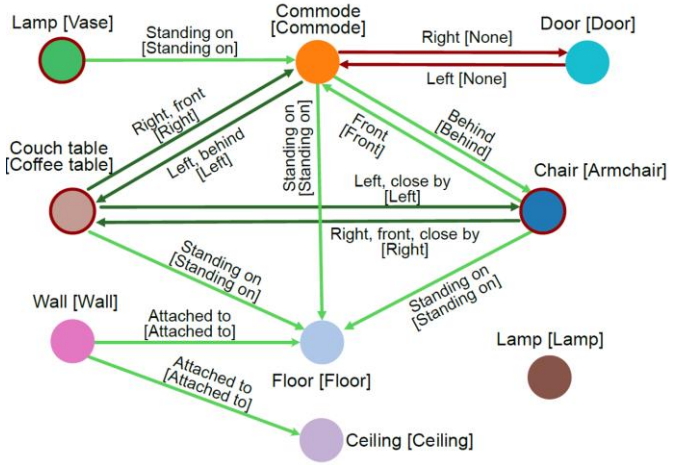


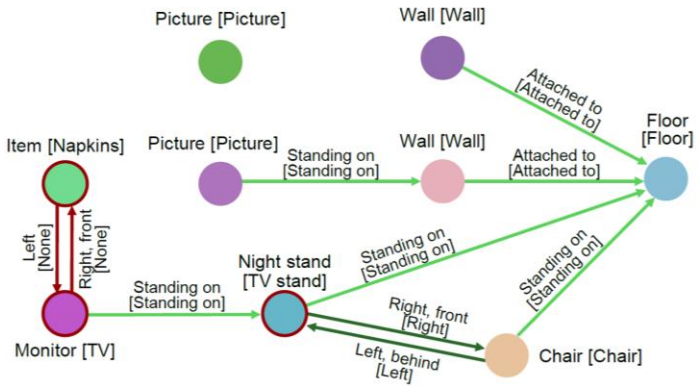
3D scene reconstructions



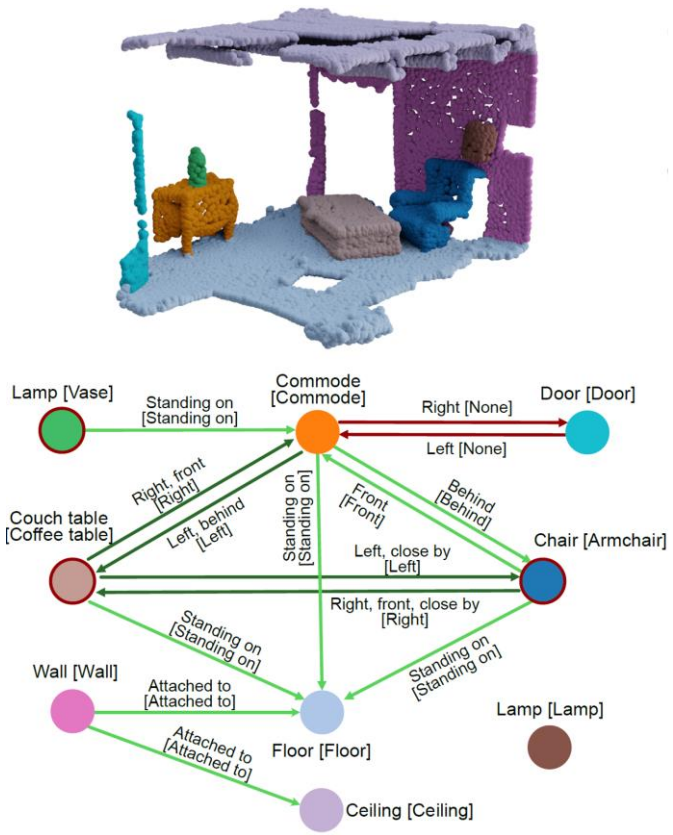
Relationship	Accuracy
left of	0.92
right of	0.92
front of	0.90
behind of	0.90
higher than	0.96
lower than	0.96
smaller than	0.98
bigger than	0.98
same as	1.00
average	0.92

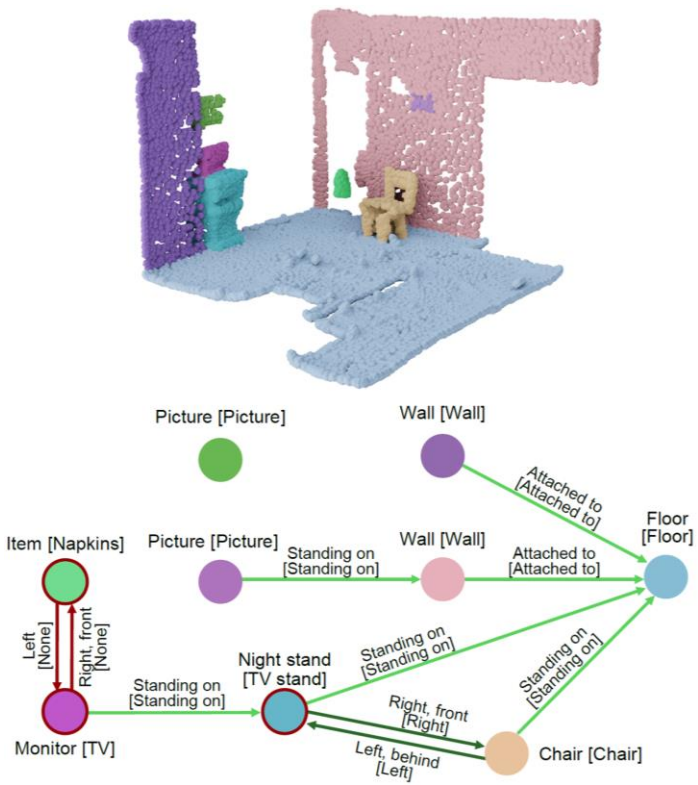
3D Scene graph prediction performance





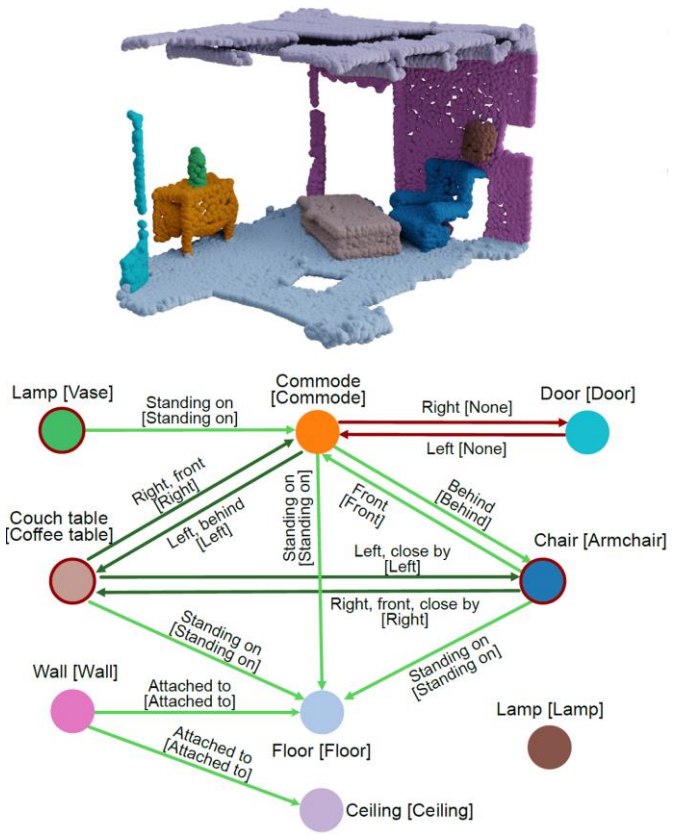
3D Scene graph prediction performance

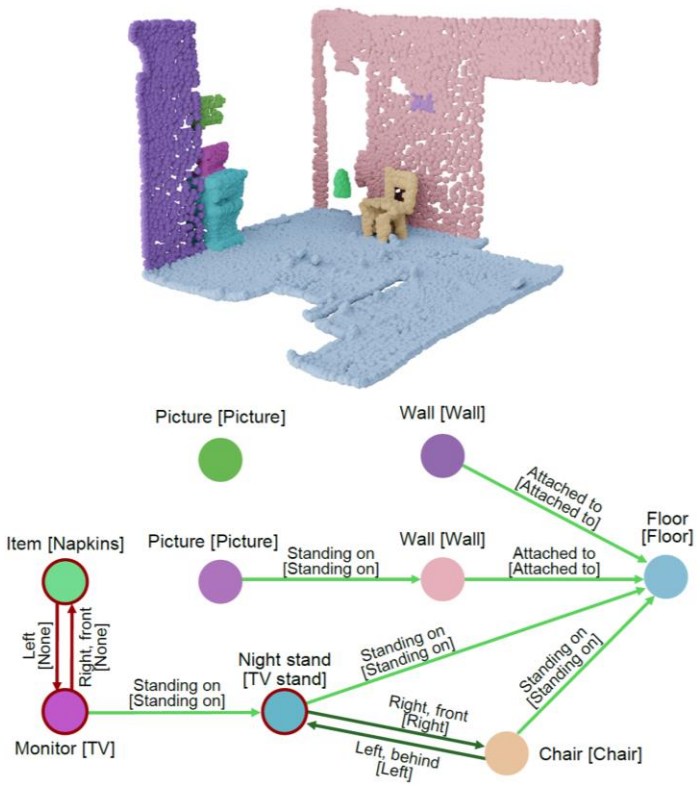




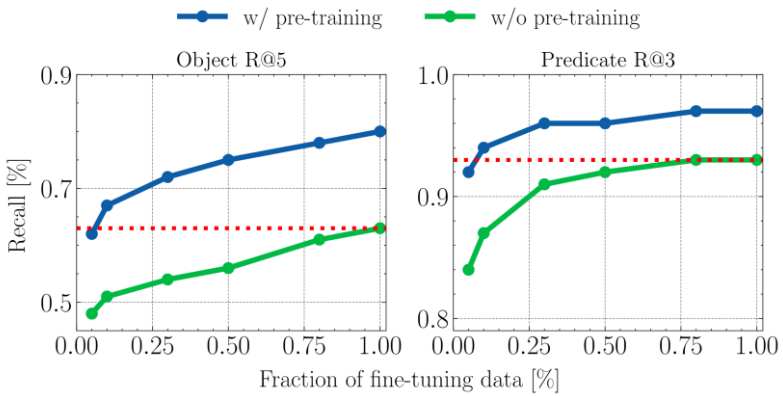
Method	Object		Predicate		Relationship	
	R@5	R@10	R@3	R@5	R@50	R@100
SGGPoint [31]	0.28	0.36	0.68	0.87	0.08	0.10
3D+MSDN [18]	0.61	0.72	0.86	0.94	0.47	0.53
3D+KERN [5]	0.67	0.77	0.83	0.96	0.51	0.58
3D+BGNN [17]	0.71	0.82	0.87	0.94	0.55	0.60
3DSSG [25]	0.68	0.78	0.89	0.93	0.40	0.66
Liu *et al.* [19]	0.74	0.83	0.90	0.96	0.62	0.68
SGFN [27]	0.70	0.80	**0.97**	**0.99**	0.85	0.87
Auto3DSG	**0.80**	**0.87**	**0.97**	**0.99**	**0.89**	**0.91**

3D Scene graph prediction performance





Method	Object		Predicate		Relationship	
	R@5	R@10	R@3	R@5	R@50	R@100
SGGPoint [31]	0.28	0.36	0.68	0.87	0.08	0.10
3D+MSDN [18]	0.61	0.72	0.86	0.94	0.47	0.53
3D+KERN [5]	0.67	0.77	0.83	0.96	0.51	0.58
3D+BGNN [17]	0.71	0.82	0.87	0.94	0.55	0.60
3DSSG [25]	0.68	0.78	0.89	0.93	0.40	0.66
Liu *et al.* [19]	0.74	0.83	0.90	0.96	0.62	0.68
SGFN [27]	0.70	0.80	**0.97**	**0.99**	0.85	0.87
Auto3DSG	**0.80**	**0.87**	**0.97**	**0.99**	**0.89**	**0.91**



Auto3DSG

kochsebastian.com/auto3dsg

Check out our full paper recently published on Arxiv