

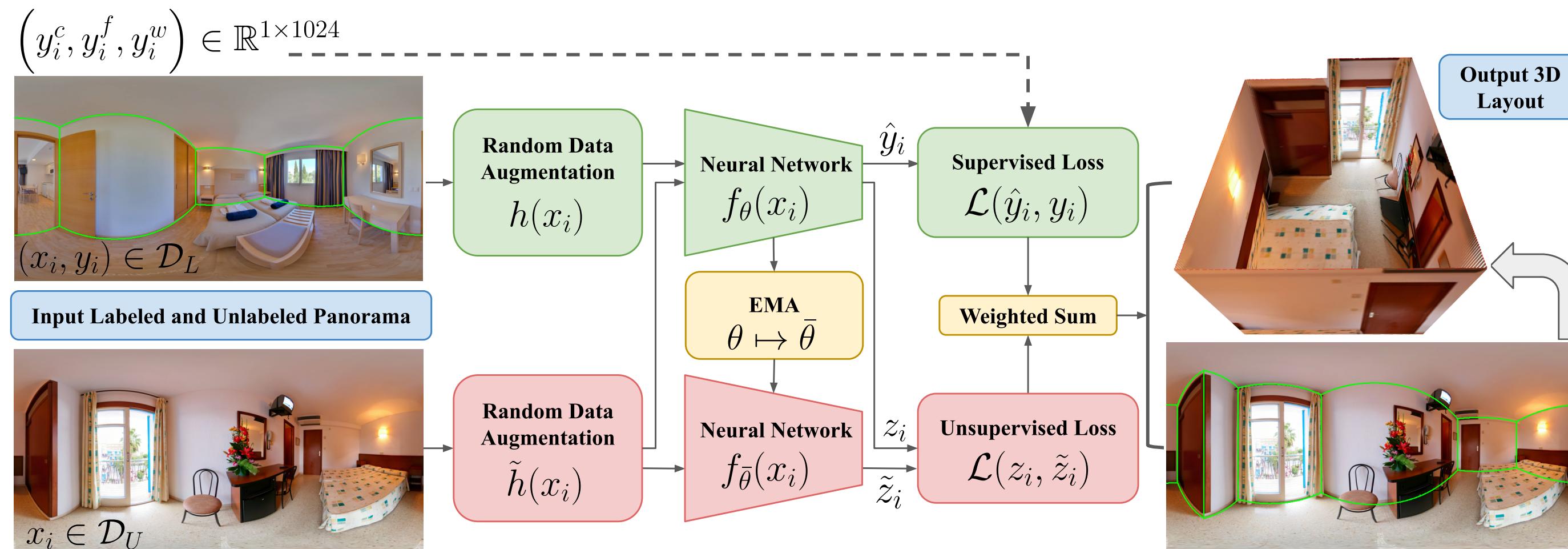
SSLayout360: Semi-Supervised Indoor Layout Estimation From 360-Degree Panorama

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What Is It?

We present **SSLayout360**, first neural architecture for semi-supervised indoor layout estimation from a single view 360-degree panorama.

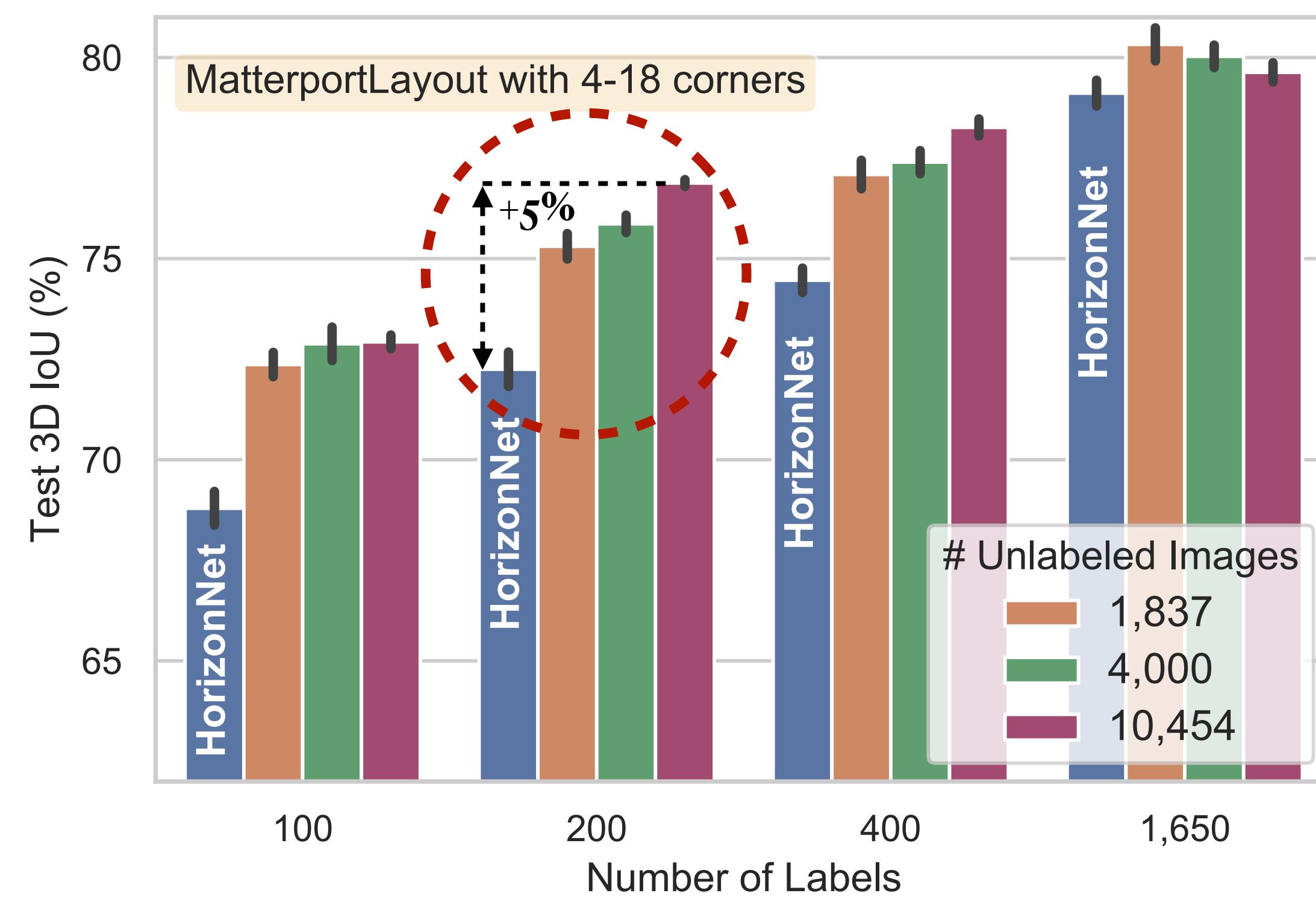


Why Do We Care?

The effective use of unlabeled data improves complex 3D layout estimation in the limited labeled data setting. We compare predicted layout boundary lines from state-of-the-art fully supervised HorizonNet trained on 1,650 labels (cyan) with semi-supervised **SSLayout360** (magenta) and show that our model's predictions follow more closely to the ground truth (green lines) using just 100 labels.

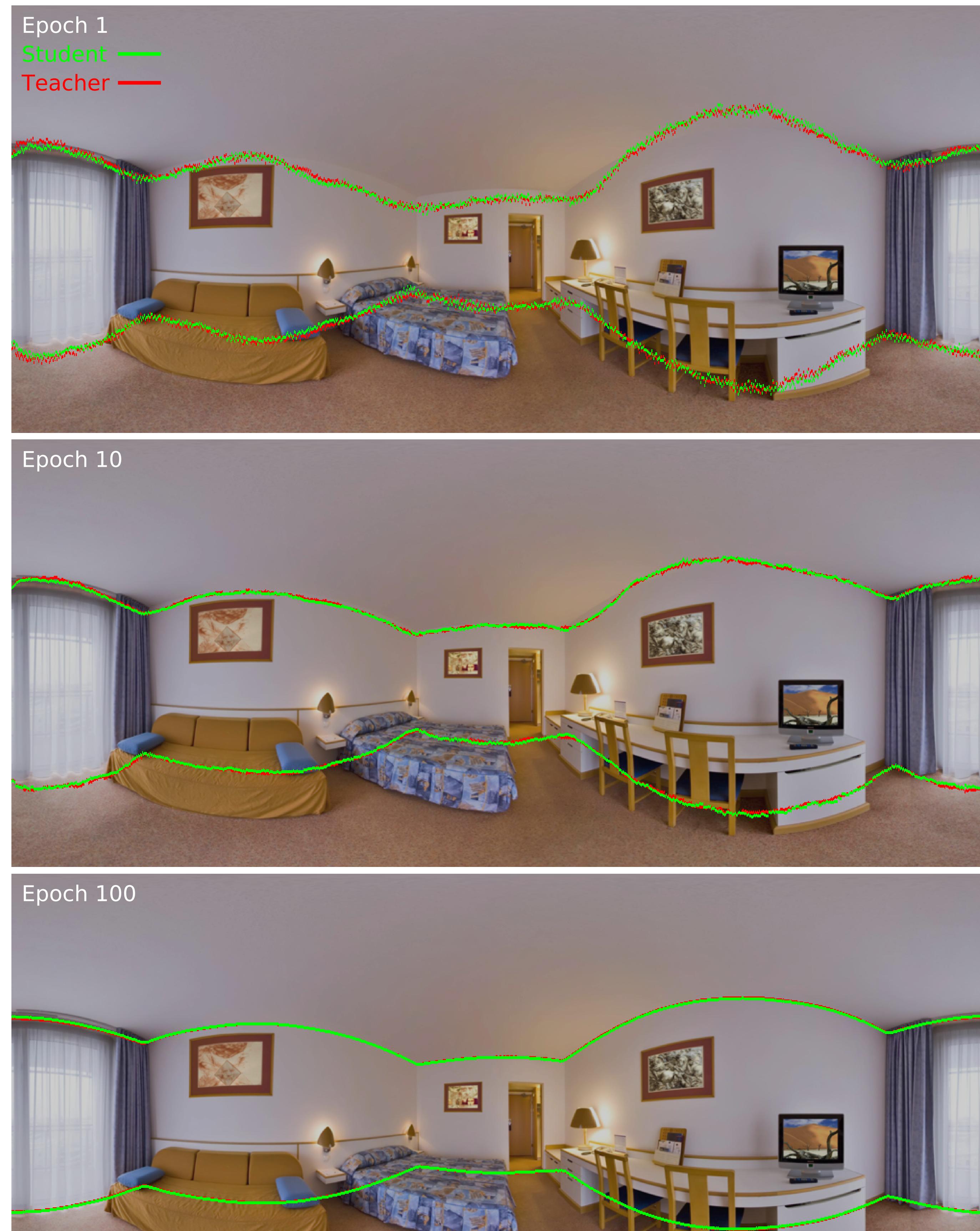


In scenarios with additional unlabeled data, **SSLayout360** provides a significant boost in accuracy over the fully supervised counterparts.



How Does It Work?

SSLayout360 follows the student-teacher framework to learn layout representations of floor, ceiling, and wall boundaries from unlabeled data by enforcing consistency (or minimizing discrepancy) between student and teacher predictions perturbed by random model and data noise.



Results: Cuboid Layout Estimation

PanoContext	3D IoU (%) ↑				
	20 labels 1,009 images	50 labels 1,009 images	100 labels 1,009 images	200 labels 1,009 images	963 labels 1,009 images
HorizonNet	61.48 ± 2.07	63.84 ± 2.87	65.43 ± 1.30	75.76 ± 0.62	83.55 ± 0.31
SSLayout360	63.05 ± 0.65	68.41 ± 1.02	72.86 ± 1.07	78.64 ± 0.72	83.30 ± 0.53
Stanford 2D-3D					
Method	20 labels 949 images	50 labels 949 images	100 labels 949 images	200 labels 949 images	916 labels 949 images
HorizonNet	62.20 ± 3.98	68.27 ± 1.45	69.94 ± 3.64	74.95 ± 3.69	82.79 ± 0.90
SSLayout360	71.60 ± 2.04	73.86 ± 1.65	76.96 ± 1.20	79.78 ± 0.83	84.66 ± 0.57

Results: Non-Cuboid Layout Estimation

Method	MatterportLayout (4-18 Corners)		3D IoU (%) ↑			
	50 labels 1,837 images	100 labels 1,837 images	200 labels 1,837 images	400 labels 1,837 images	1,650 labels 1,837 images	
HorizonNet	63.44 ± 0.56	68.79 ± 0.49	72.25 ± 0.50	74.46 ± 0.35	79.12 ± 0.37	
SSLayout360	67.42 ± 0.24	72.37 ± 0.35	75.31 ± 0.37	77.09 ± 0.41	80.33 ± 0.48	

Method	2D IoU (%) ↑	
	50 labels 1,837 images	100 labels 1,837 images
HorizonNet	67.17 ± 0.65	72.06 ± 0.49
SSLayout360	71.03 ± 0.28	75.46 ± 0.36

Complex 3D Layout Reconstruction with 100 Labels

