

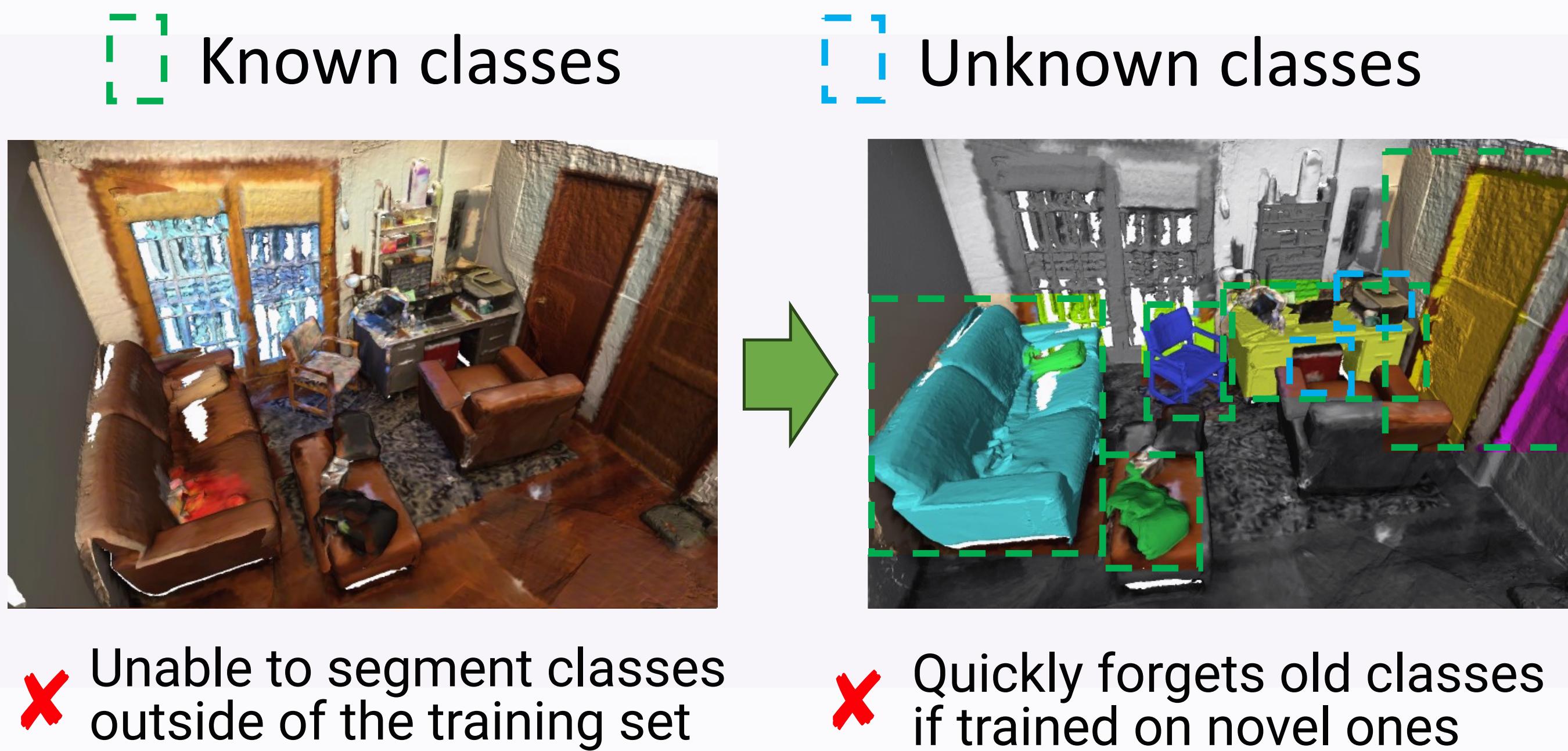
# 3D Indoor Instance Segmentation in an Open-World

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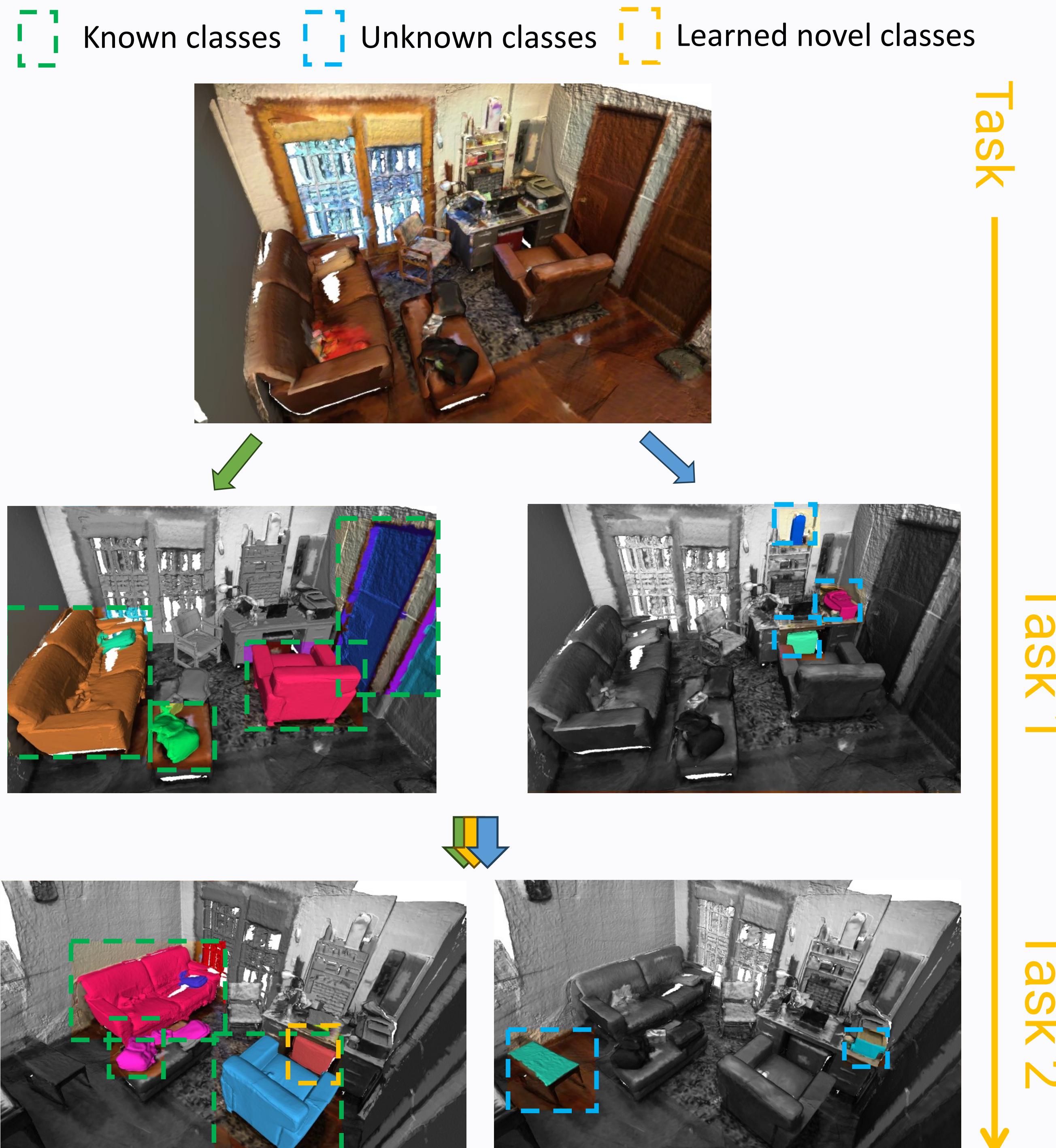
## Introduction

- ✓ First 3D instance segmentation model to
- ✓ Segment unknown classes
- ✓ Incrementally learn novel classes
- ✓ First evaluation protocol to evaluate the performance of open-world 3D instance segmentation models

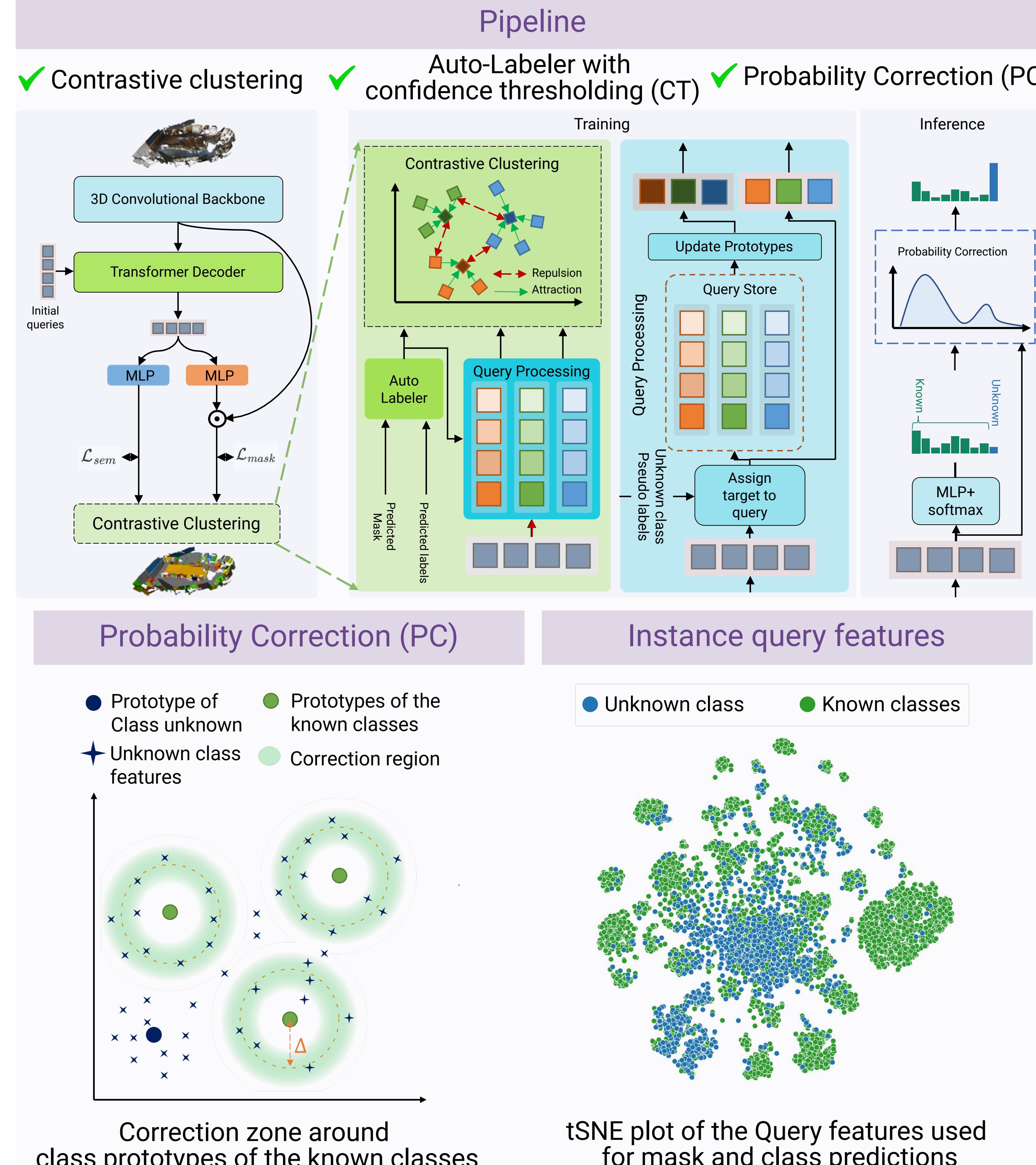
## Closed-set model (e.g. Mask3D)



## Open-World model (Ours)

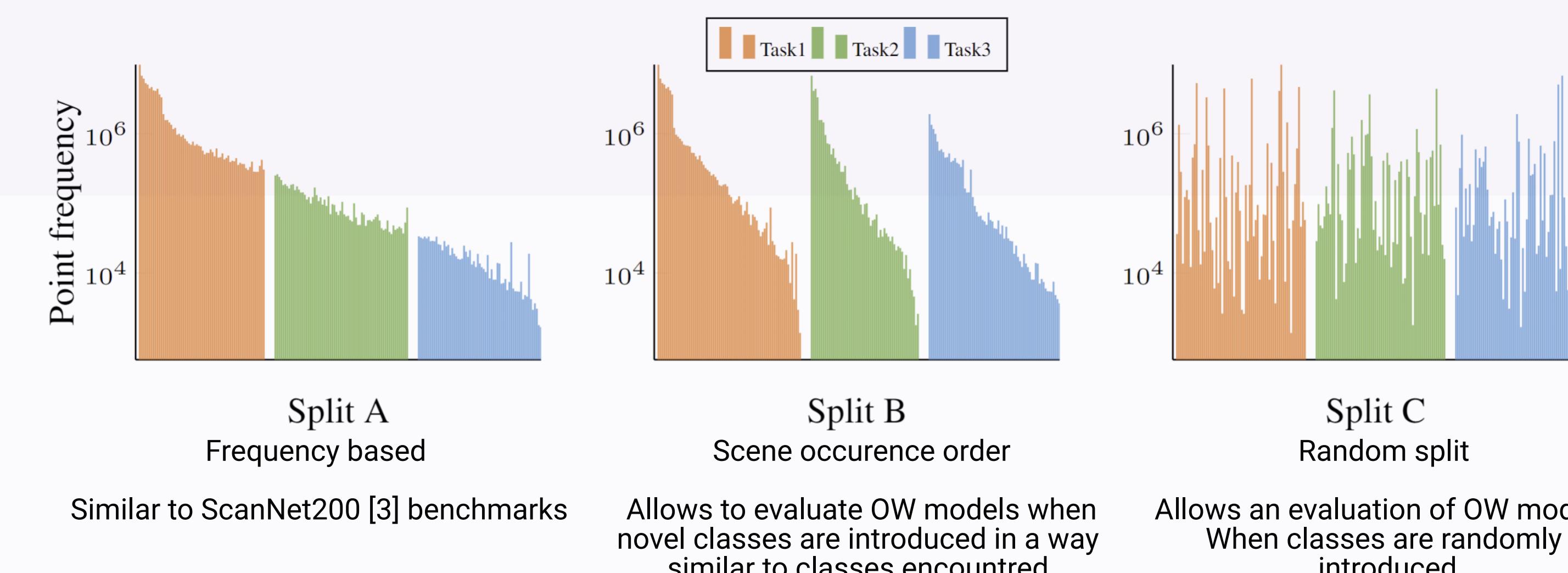


## Methodology



## Evaluation protocol & splits of classes in ScanNet200

	Split A			Split B			Split C		
	Task 1	Task 2	Task 3	Task 1	Task 2	Task 3	Task 1	Task 2	Task 3
Classes count	64	68	66	73	55	70	66	66	66
Train instances	24224	3791	1612	15327	8177	6123	13483	8239	7905
Validation instances	6539	1000	428	4177	2261	1529	3776	2102	2089
Train scenes	1201	924	627	1201	1002	895	1169	1089	1159
Validation scenes	312	242	165	312	264	236	307	273	300



## Quantitative results

### Split A

Task IDs (→)	Task 1			Task 2			Task 3										
	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Current known	All	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Previously known	All	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Previously known	All		
Oracle Mask3D [1]	0.129	227	55.94	38.75	38.60	0.03	112	45.40	38.25	20.91	29.40	29.58	17.78	26.10	28.61	18.33	25.58
3D-OW-DETR [2]	0.547	721	22.14	35.56	35.05	0.282	253	26.24	18.18	13.62	15.76	<b>21.56</b>	08.38	17.67	-	-	-
3D-OWIS – PC – CT	1.589	707	30.72	37.50	37.00	<b>0.000</b>	<b>4</b>	04.75	11.00	17.30	14.10	21.40	08.00	17.50	<b>17.30</b>	14.10	21.40
Ours: 3D-OWIS	<b>0.397</b>	<b>607</b>	<b>34.75</b>	<b>40.2</b>	<b>39.7</b>	0.007	126	27.03	<b>29.40</b>	16.40	<b>22.70</b>	20.20	<b>15.20</b>	<b>18.70</b>	20.20	<b>15.20</b>	<b>18.70</b>

34.75%  
In U-Recall

+8.6%  
In mAP

+1.2%  
In mAP

### Split B

Task IDs (→)	Task 1			Task 2			Task 3												
	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Current known	All	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Previously known	All	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Previously known	All				
Oracle Mask3D [1]	1.126	939	70.31	24.57	24.80	0.180	441	73.16	25.50	20.30	23.40	23.40	30.40	26.00	21.81	20.37	24.20	29.22	
3D-OW-DETR [2]	3.229	1935	17.18	20.00	19.73	2.053	1389	<b>33.31</b>	12.36	13.86	12.93	07.27	18.96	11.62	-	-	-	-	
3D-OWIS – PC – CT	<b>3.133</b>	1895	21.67	18.94	18.70	3.169	1081	26.63	18.00	19.70	16.40	16.40	17.30	17.50	13.50	17.70	17.70	24.60	20.90
Ours: 3D-OWIS	3.684	<b>1780</b>	<b>24.79</b>	<b>23.60</b>	<b>23.30</b>	<b>0.755</b>	<b>581</b>	24.21	<b>18.70</b>	<b>17.30</b>	<b>17.90</b>	<b>18.70</b>	<b>17.80</b>	<b>17.70</b>	15.80	<b>13.90</b>	<b>22.20</b>	<b>17.80</b>	

24.79%  
In U-Recall

+0.7%  
In mAP

+2.7%  
In mAP

### Split C

Task IDs (→)	Task 1			Task 2			Task 3										
	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Current known	All	WI (↓)	A-OSE (↓)	U-Recall (↑)	mAP (↑) Previously known	All							
Oracle Mask3D [1]	1.039	651	71.61	23.30	23.6	0.249	591	62.83	20.50	26.67	24.13	25.30	28.20	26.30	25.41	25.21	25.35
3D-OW-DETR [2]	1.463	1517	13.00	14.81	14.59	1.330	847	<b>16.04</b>	08.00	17.41	12.40	08.81	15.63	11.01	-	-	-
3D-OWIS – PC – CT	2.901	1752	<b>15.66</b>	15.00	14.80	3.169	666	16.04	13.50	17.30	16.40	17.70	17.70	17.50	-	-	-
Ours: 3D-OWIS	<b>0.419</b>	<b>1294</b>	<b>14.34</b>	<b>18.00</b>	<b>17.60</b>	<b>0.152</b>	<b>303</b>	15.80	<b>13.90</b>	<b>22.20</b>	<b>17.80</b>	<b>17.80</b>	<b>17.70</b>	<b>17.70</b>	-	-	-

14.34%  
In U-Recall

+1.4%  
In mAP

+0.3%  
In mAP

## Qualitative results

