IWDSC 2021

INTERNATIONAL WORKSHOP

ON DISTRIBUTED SMART CAMERAS

11TH OCTOBER 2021

Where Did I See It?

Object Instance Re-Identification with Attention



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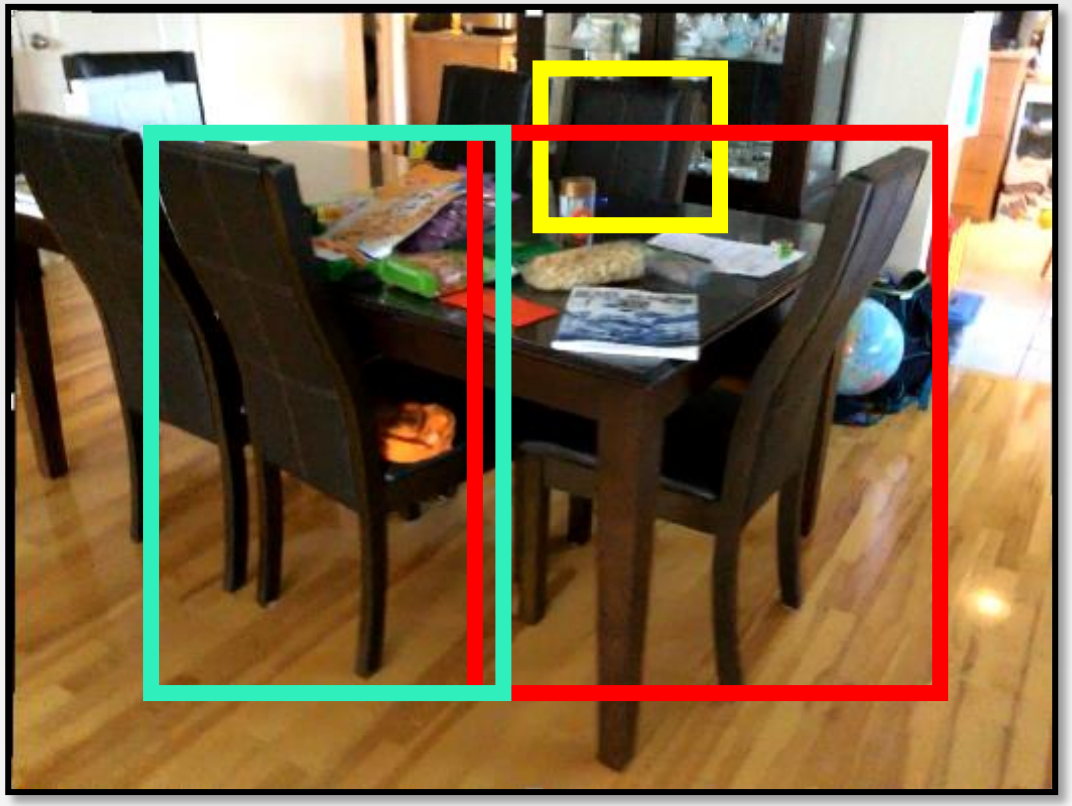
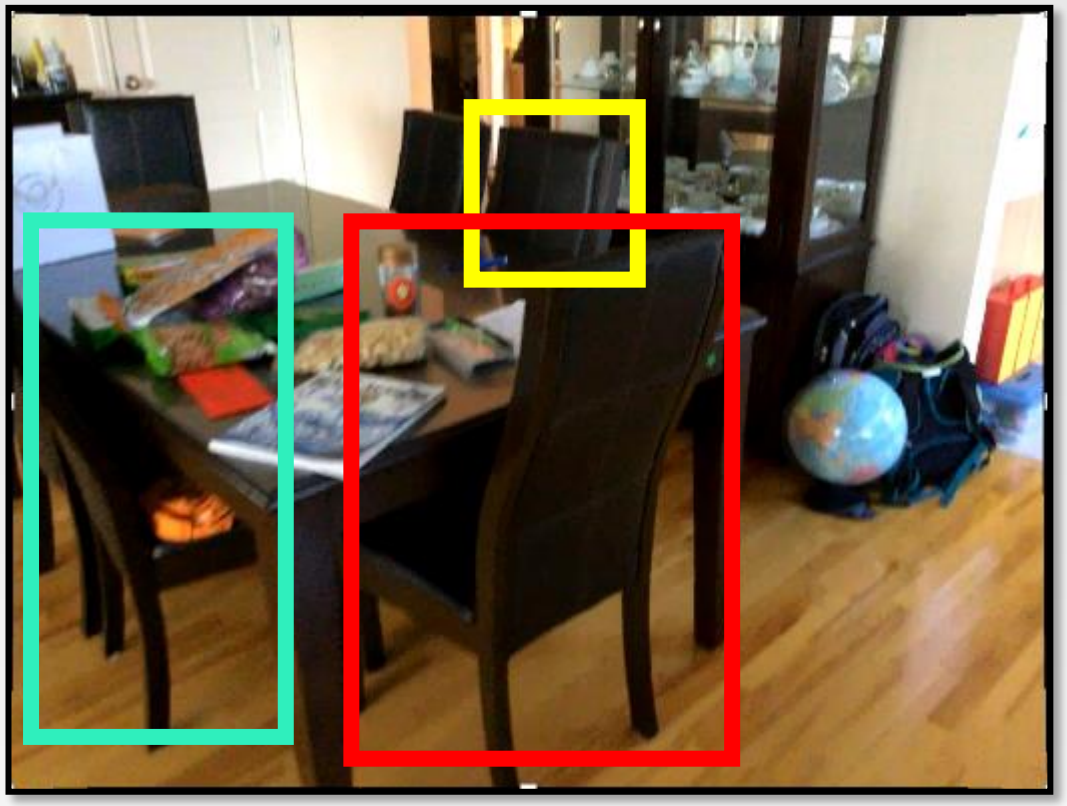
Problem





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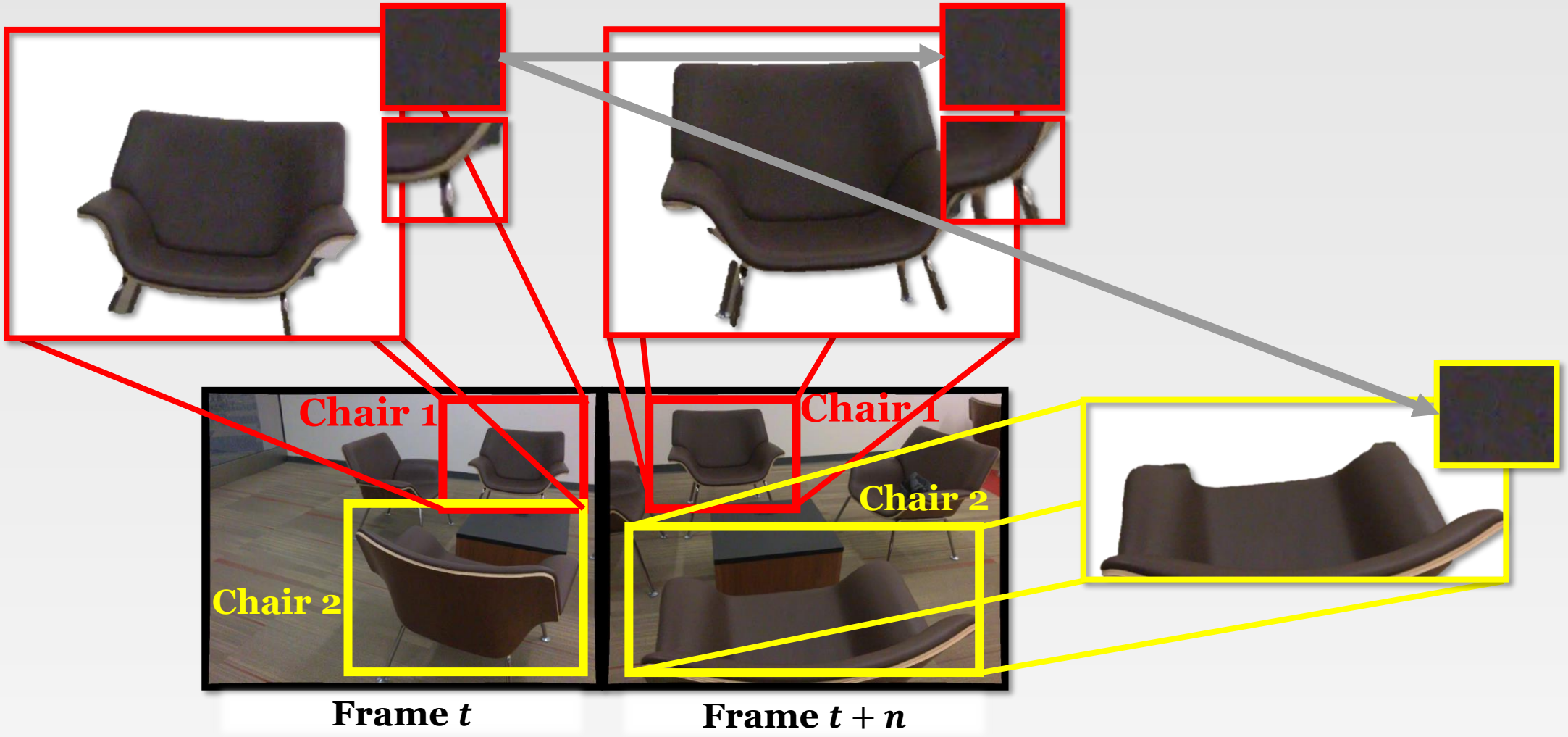
Appearance-based: Using Foreground



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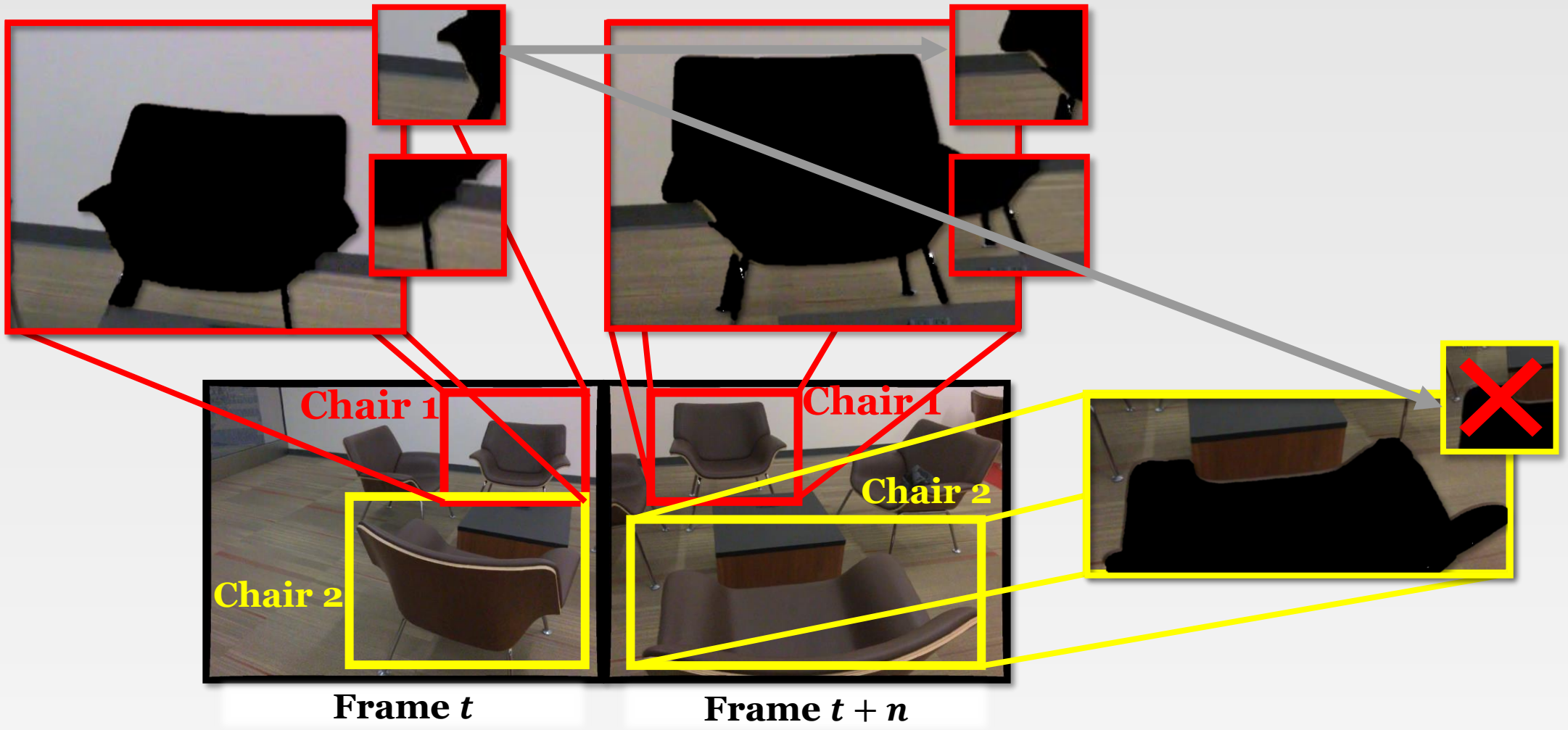
Appearance-based: Using Background



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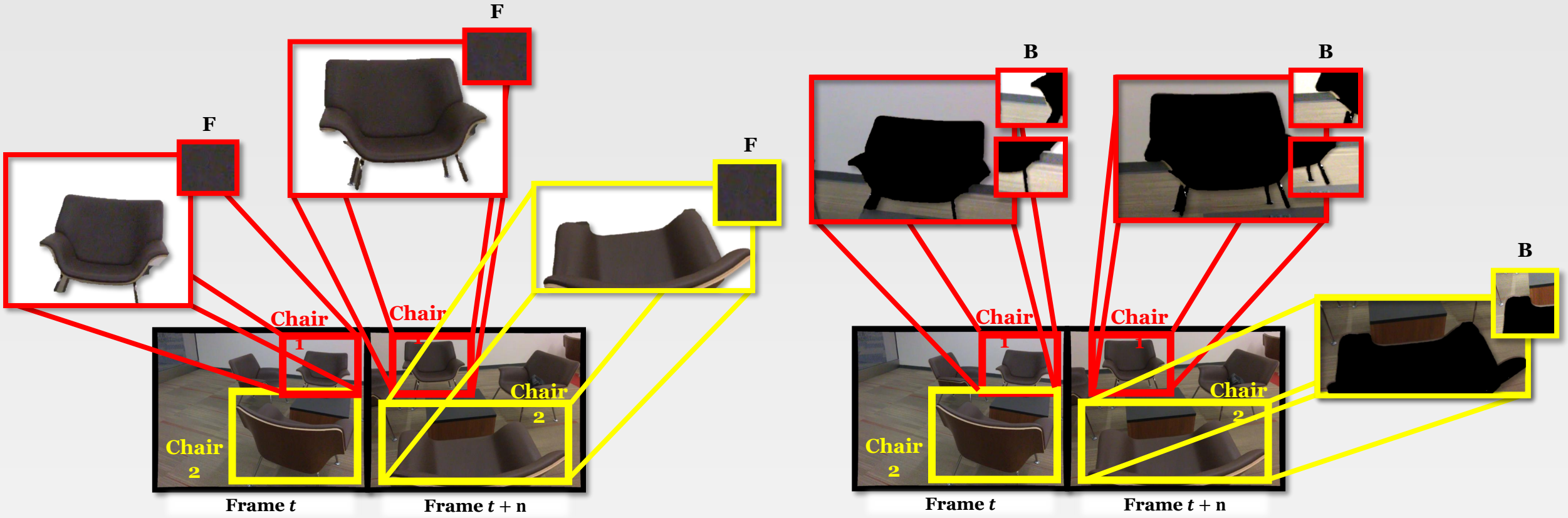
Better Approach: Foreground-Background



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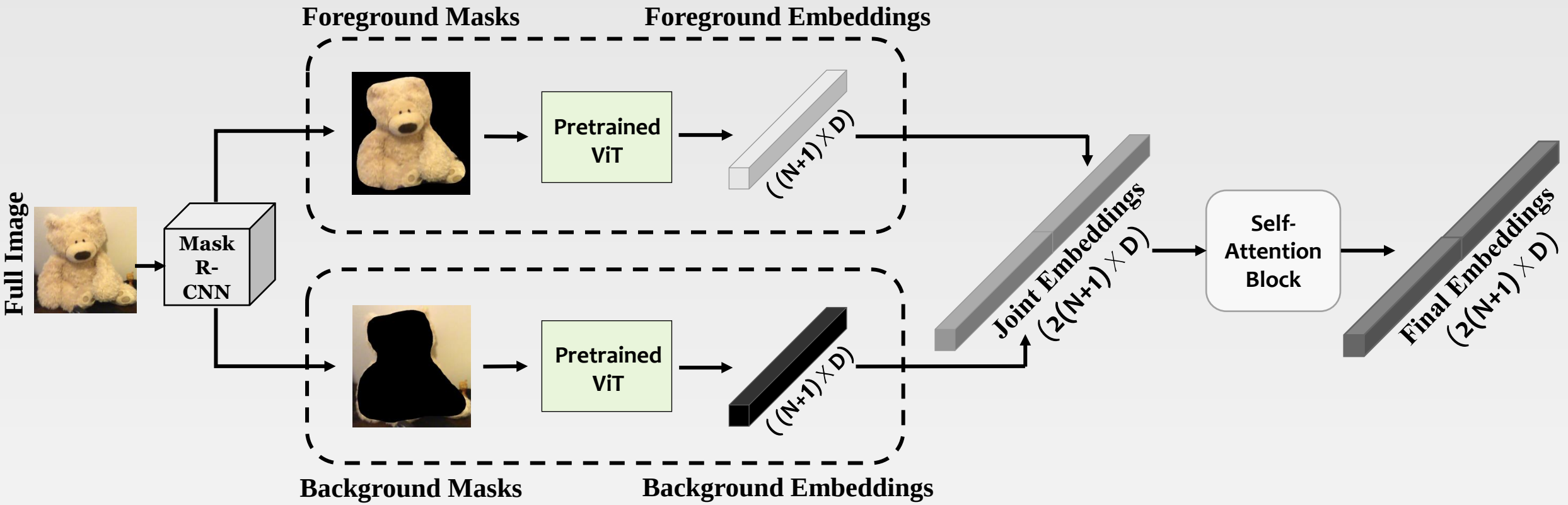
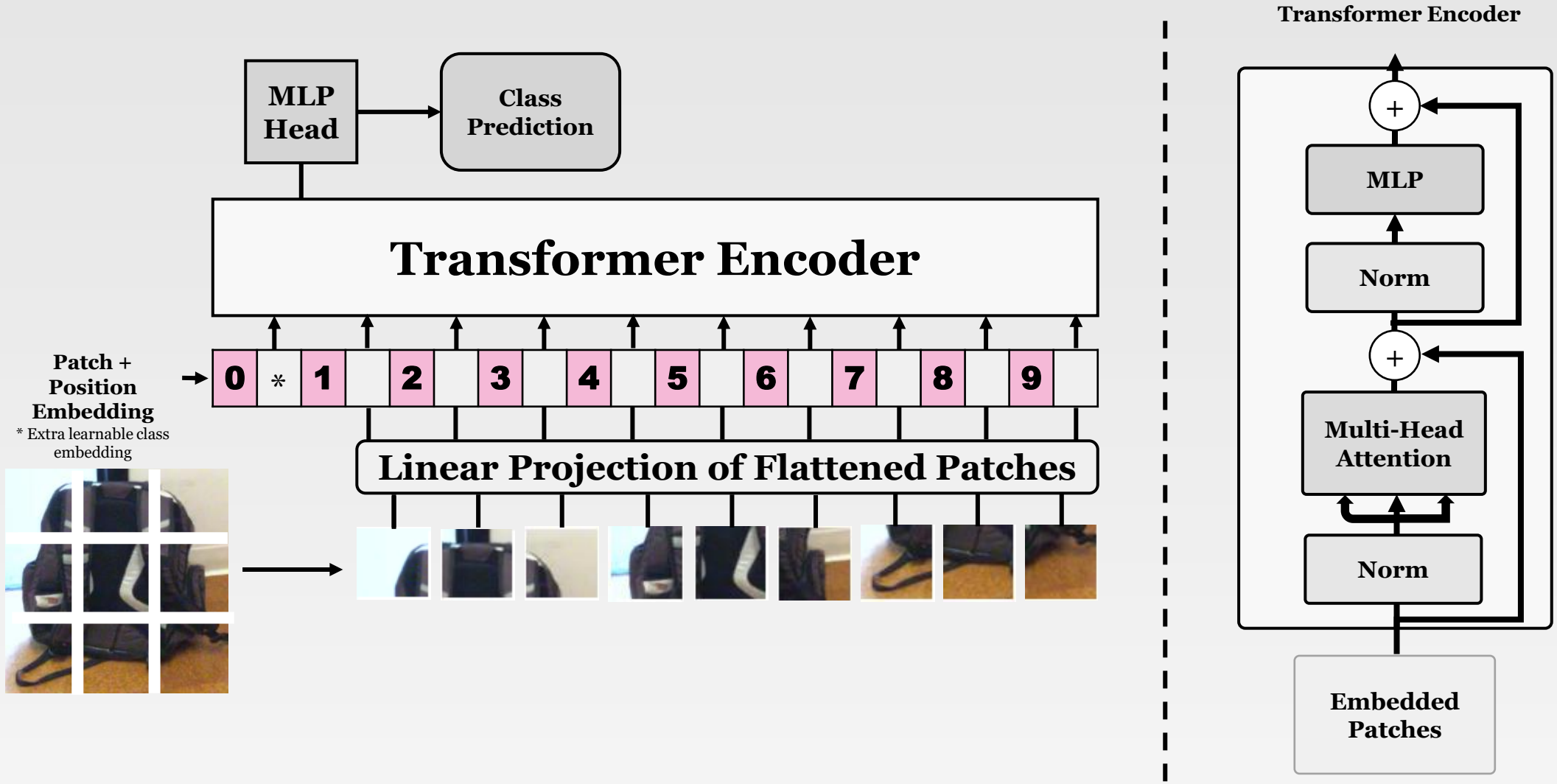
Approach – Stage 1



Alexey Dosovitskiy, Lucas Beyer, Alexander Kolesnikov, Dirk Weissenborn, Xiaohua Zhai, Thomas Unterthiner, Mostafa Dehghani, Matthias Minderer, Georg Heigold, Sylvain Gelly, et al. An image is worth 16x16 words: Transformers for image recognition at scale. arXiv preprint arXiv:2010.11929, 2020.

Approach – **Vision Transformer (ViT)**



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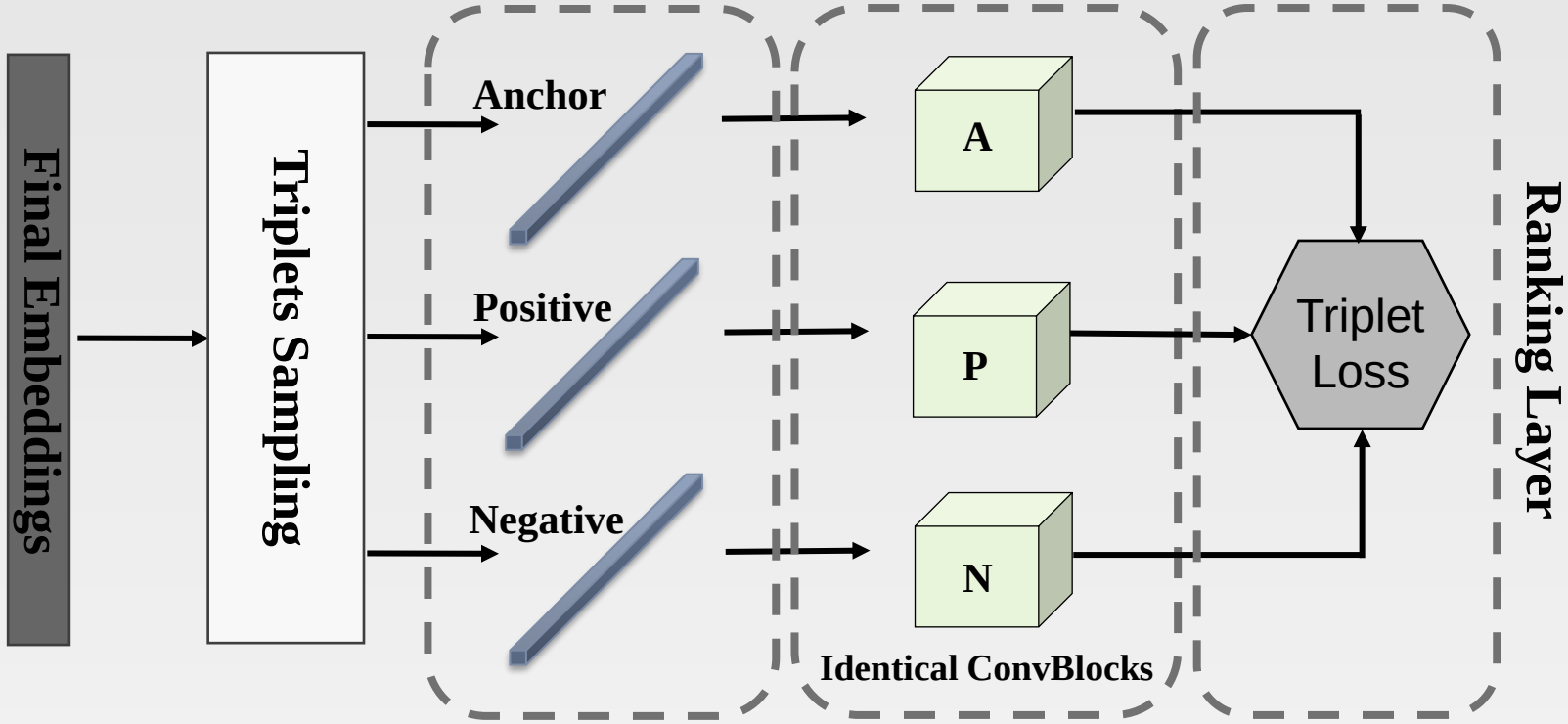
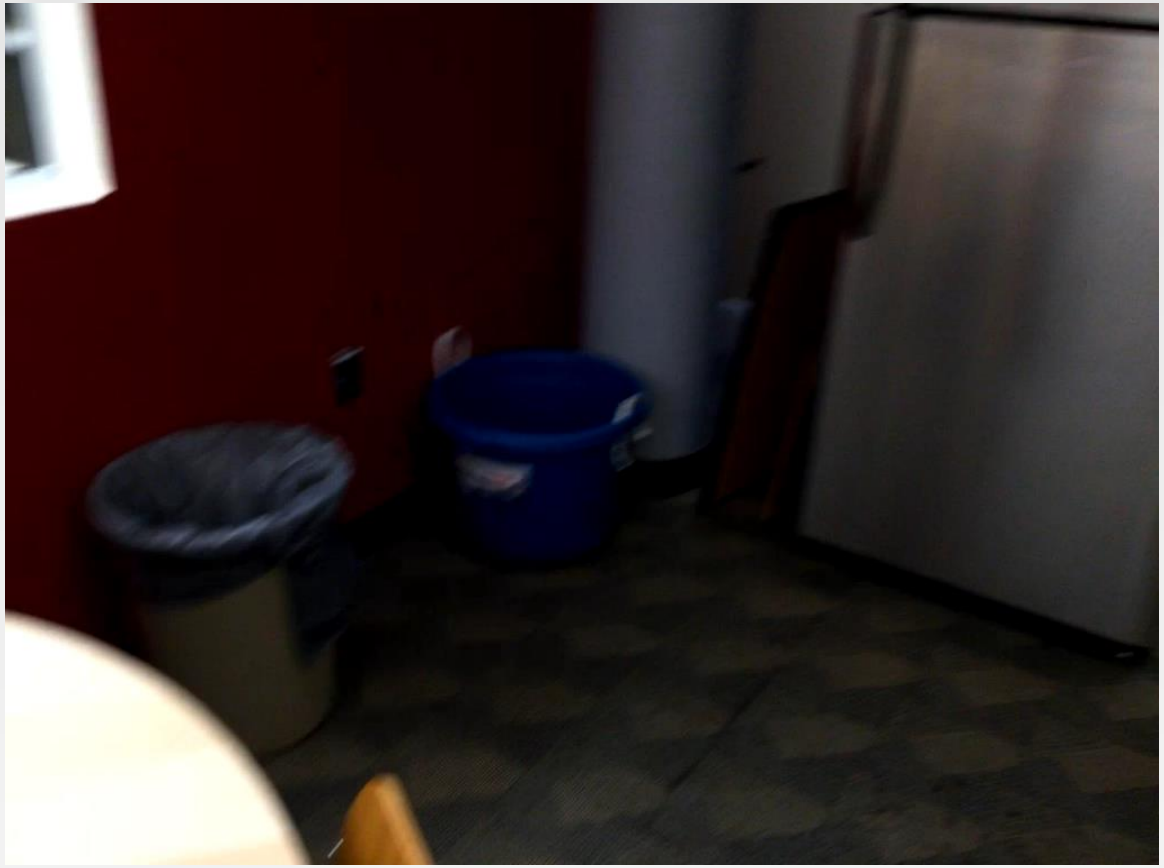
Approach – Stage 2

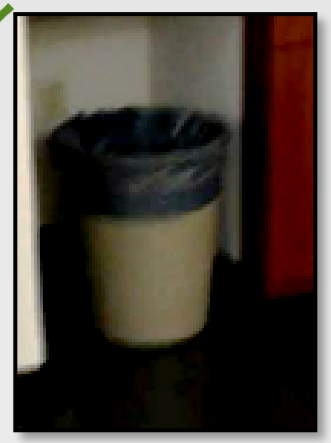


Triplets



Anchor or Probe

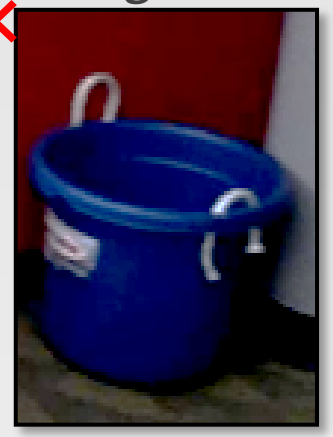
Positive



Different view

Different view

Negative



Different object

Different instance

Experimental setup

Type	Pre-trained ViT	Input images		Fine tuning	Feature concatenation
		Full	Mask		
no_train	✓	✓	✗	✗	✗
full	✓	✓	✗	✓	✗
concat	✓	✗	✓	✓	✓

Training data

- ScanNet: Over 800 scans of rigid indoor scenes
- Total number of objects detected by Mask-RCNN: 646,156
- Number of object classes: 29
- Number of *Valid* detections : 58876 or 9.11% of the total
- Criteria for *Valid* detections: Bounding box overlap ratio > 60% and matching labels

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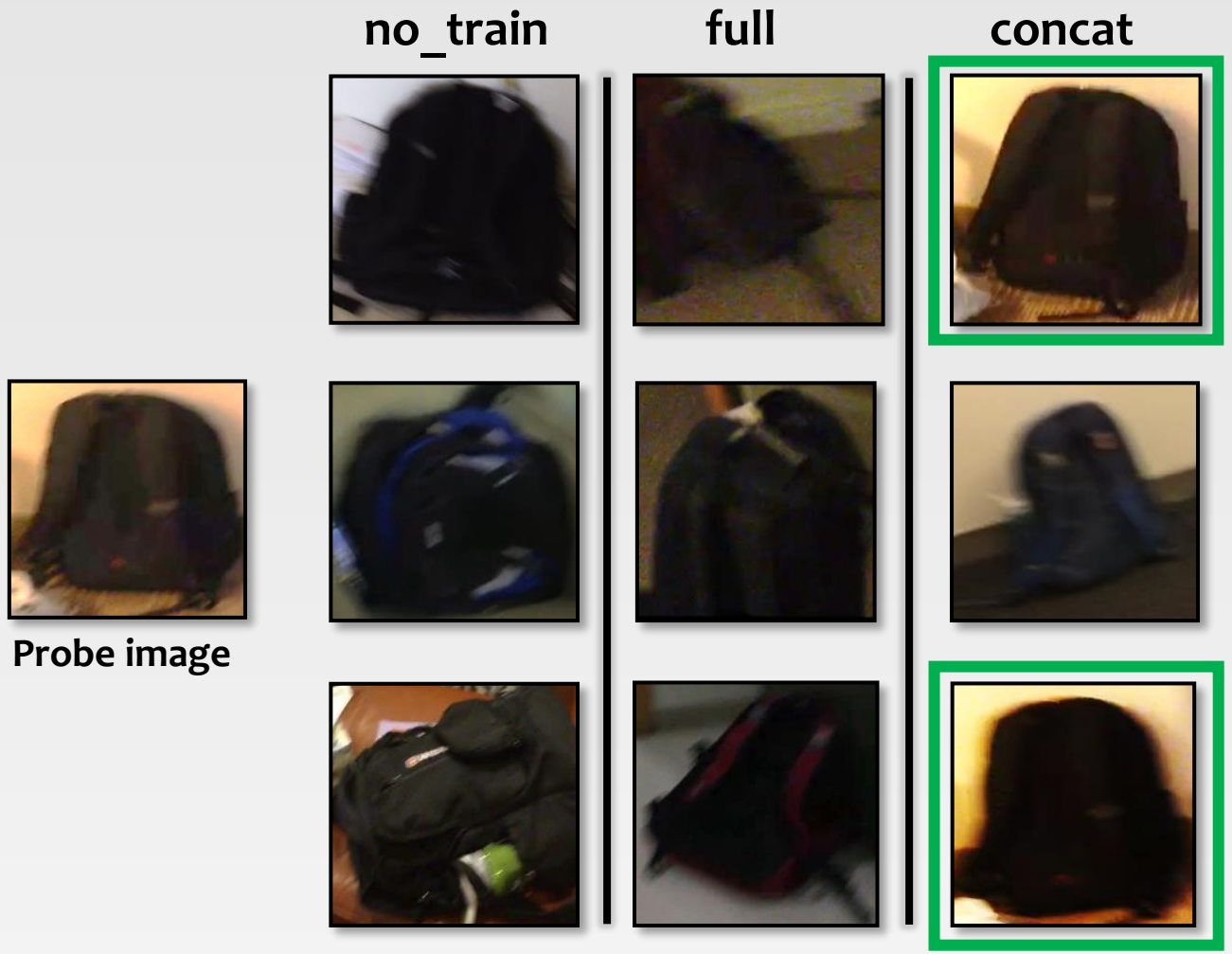
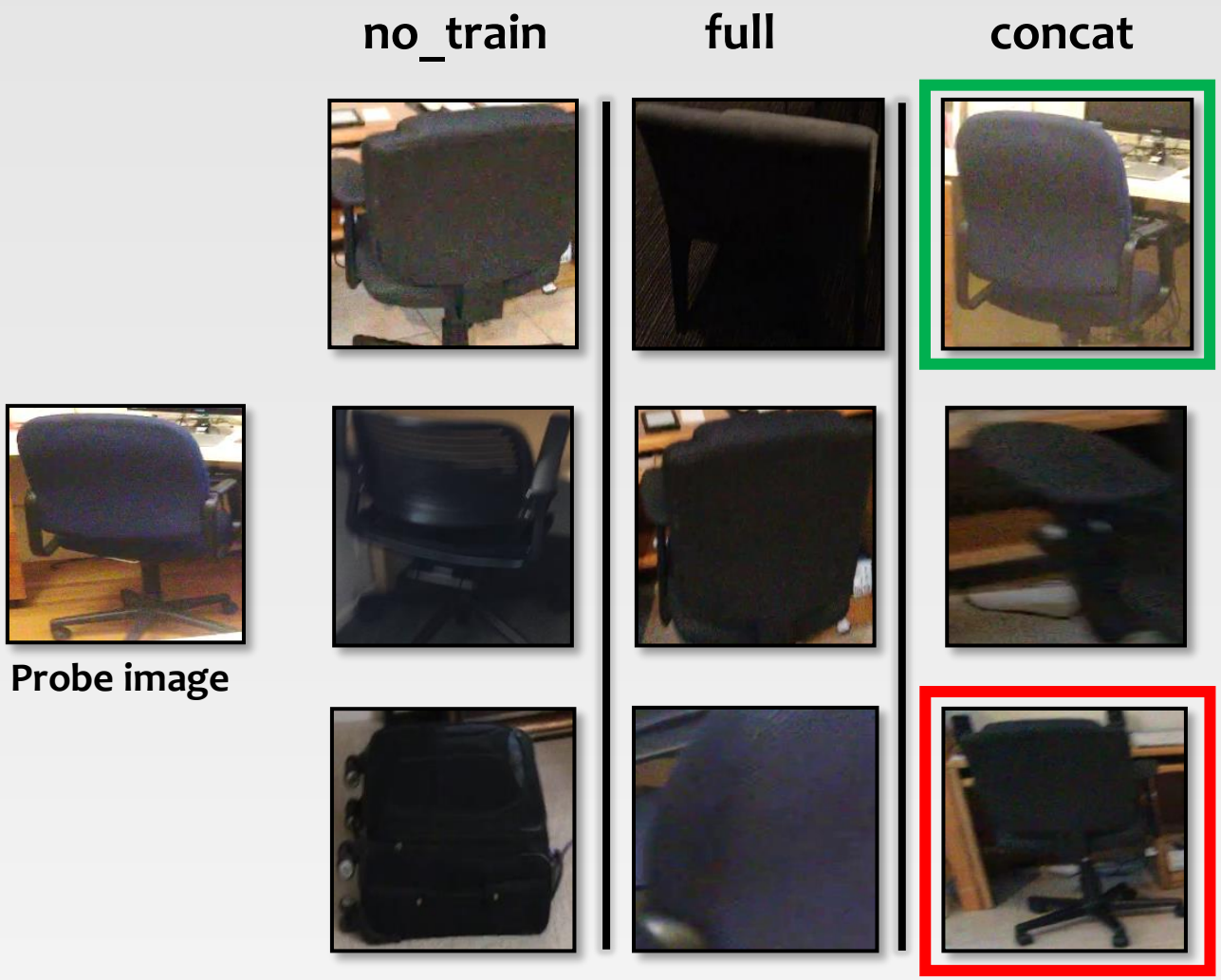
Results - Matching Accuracy

Type	Rank-1 (%)	Rank-5 (%)	Rank-20 (%)	Rank-50 (%)
no_train	68.7	77.06	81.78	92.71
full	75.79	88.0	91.22	96.25
concat	**83.89**	**94.61**	**99.42**	**100**

Visualization



Visualization



Results – Comparison with SOTA

Type	Rank-1 (%)	Rank-5 (%)	Rank-20 (%)
deepsort	49.60	-	-
re-OBJ	77.85	91.55	98.36
ours	**83.89**	**94.61**	**99.42**

- Wojke, N., Bewley, A. and Paulus, D., 2017, September. Simple online and realtime tracking with a deep association metric. In *2017 IEEE International Conference on Image Processing (ICIP)* (pp. 3645-3649). IEEE.
- Bansal, V., James, S. and Del Bue, A., 2019, September. re-OBJ: Jointly learning the foreground and background for object instance re-identification. In International Conference on Image Analysis and Processing (pp. 402-413). Springer, Cham.

Results – Comparison with Person ReID methods

Method	Rank-1 (%)	Rank-5 (%)	Rank-20 (%)
OSNet	69	85.7	91.3
DGNet	58.3	76	92.4
Ours	**83.89**	**94.61**	**99.42**

- Kaiyang Zhou, Yongxin Yang, Andrea Cavallaro, and Tao Xiang. Omni-scale feature learning for person reidentification. CoRR, abs/1905.00953, 2019.
- Zhedong Zheng, Xiaodong Yang, Zhiding Yu, Liang Zheng, Yi Yang, and Jan Kautz. Joint discriminative and generative learning for person re-identification. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, pages 2138–2147, 2019.

Thank You