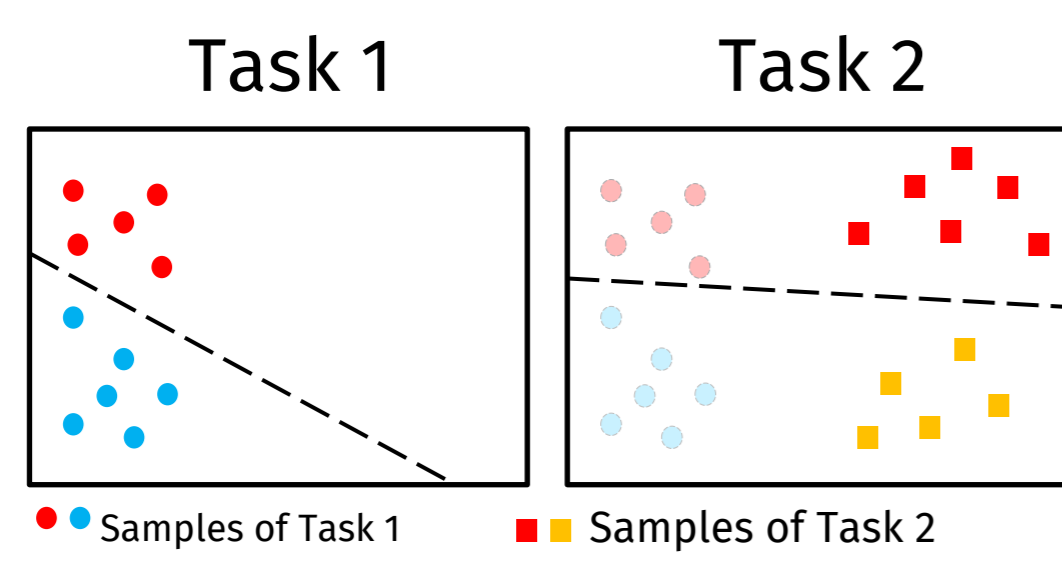


Introduction

Class-incremental learning for semantic segmentation (CiSS). Major challenge in CiSS is overcoming catastrophic forgetting. Despite latest advances in mitigating catastrophic forgetting, the underlying causes of forgetting specifically in CiSS are not well understood. We investigate different causes of forgetting such as the recency-bias, background bias and how these affect specific layers of the network.

Effects of Catastrophic Forgetting in CiSS

- Weight Drift
- Activation Drift
- Task-Recency Bias
- Inter-task Confusion

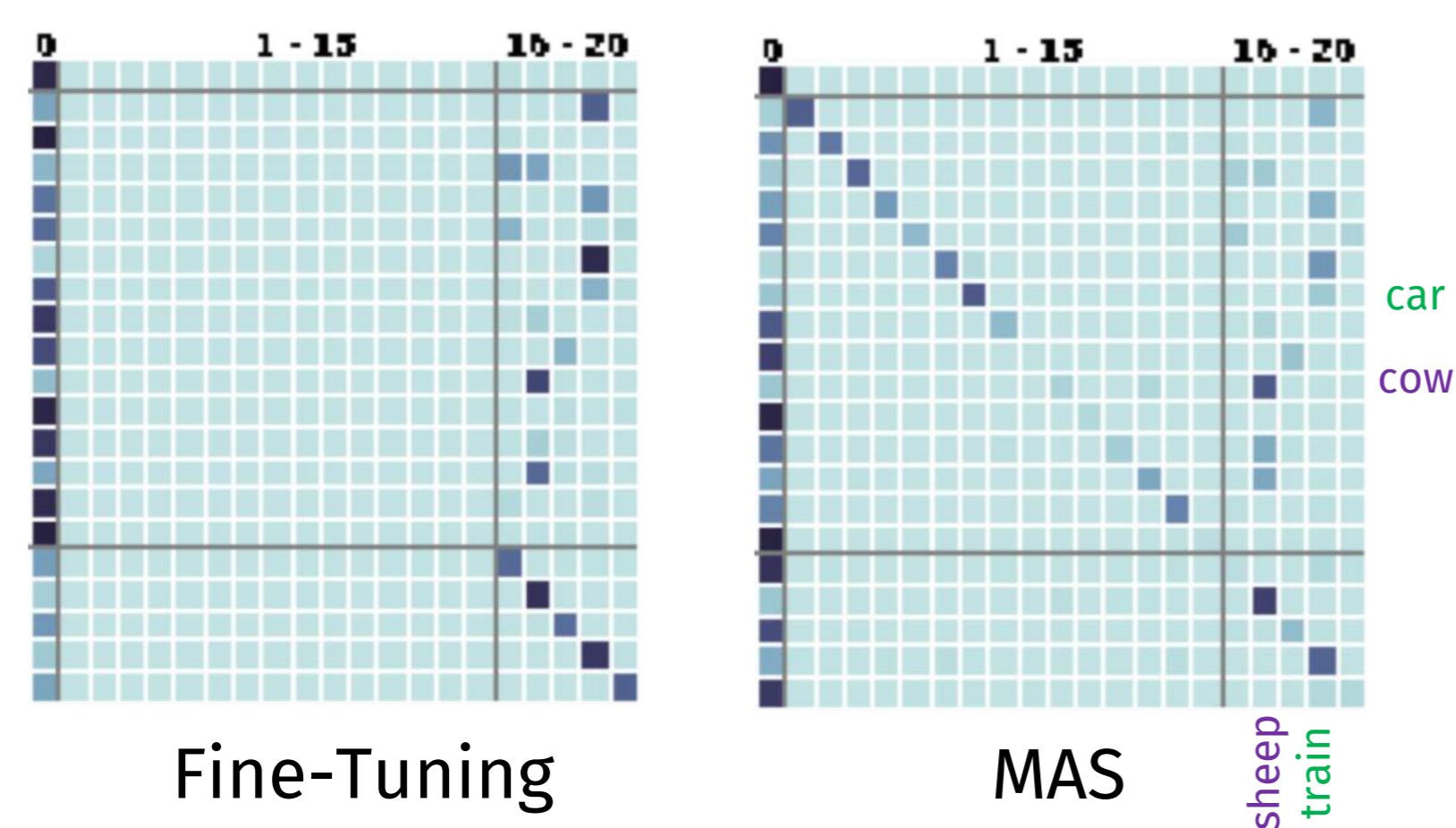


Experimental Results

PascalVoc 15-5

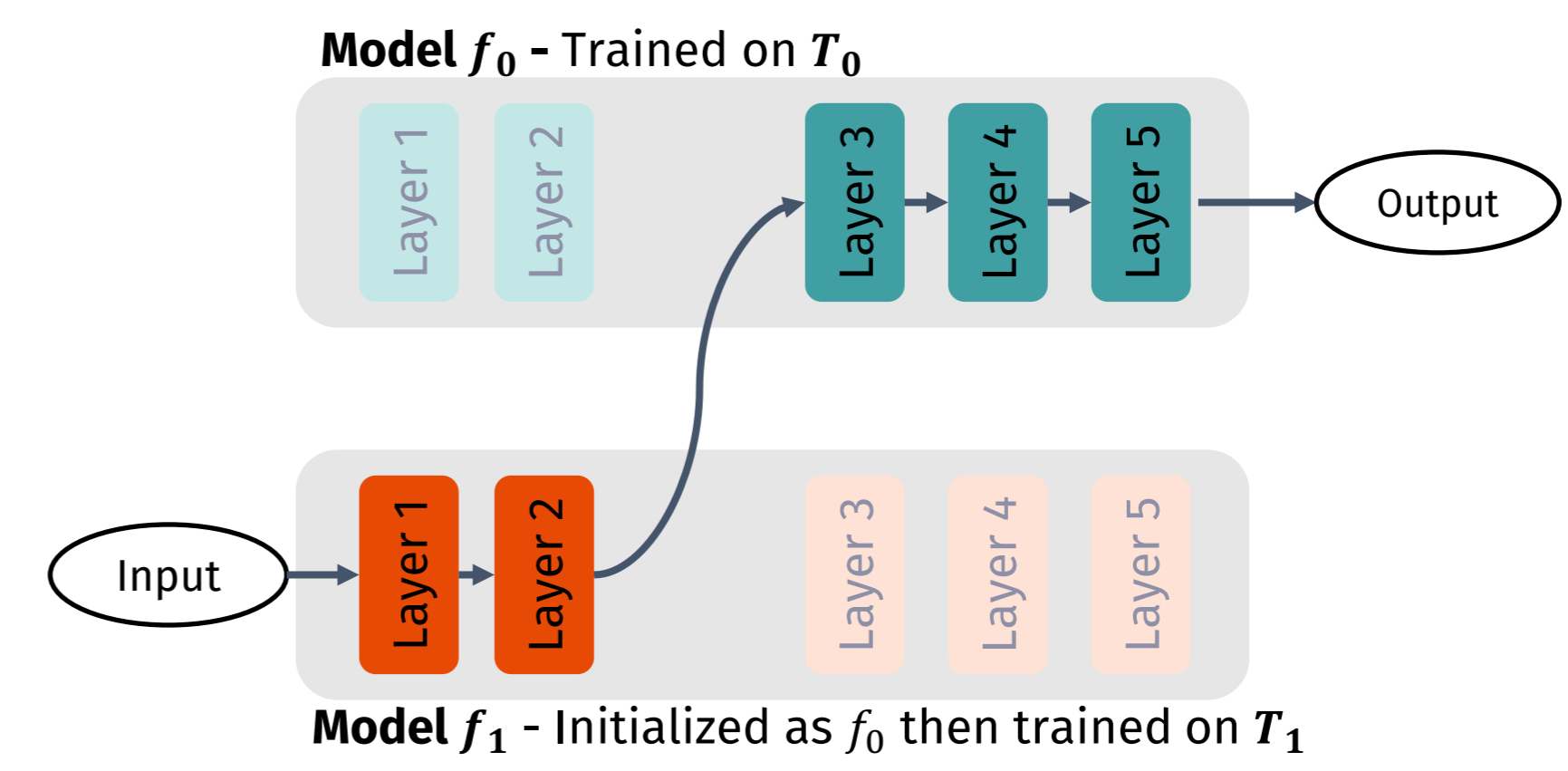
Method	Disjoint			Full Disjoint		
	0 - 15	16 - 20	all	0 - 15	16 - 20	all
Fine-Tuning	4.6	23.0	9.0	5.1	16.3	7.8
MAS [1]	30.6	12.9	26.4	35.6	12.9	30.2
EWC [2]	28.1	10.1	23.8	35.2	10.9	29.4
Replay	42.2	29.1	39.1	48.2	28.8	43.6
LwF [3]	44.4	25.4	39.9	35.9	12.6	30.4
Offline	55.7	47.6	53.8	55.7	47.6	53.8

Avoiding Semantic Background shift in full disjoint setting significantly improves mIoU for EWC, MAS and Replay, but decreases for LwF

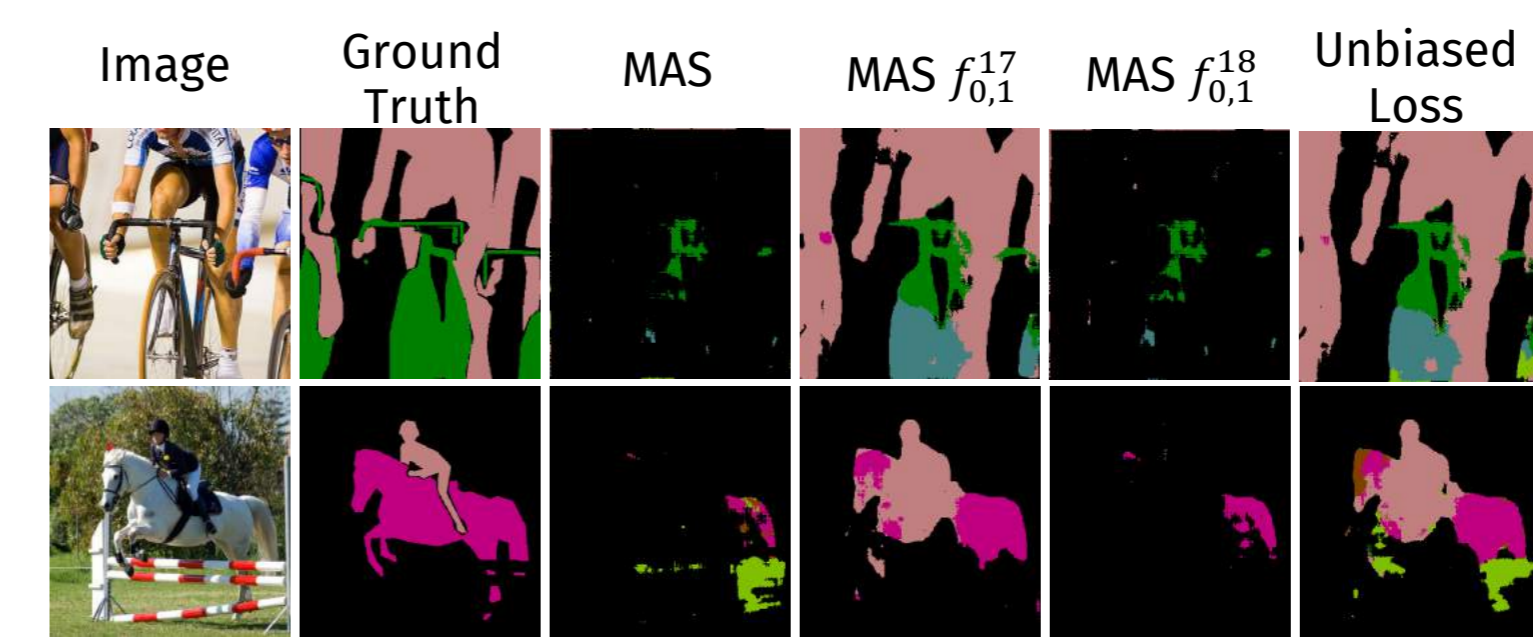
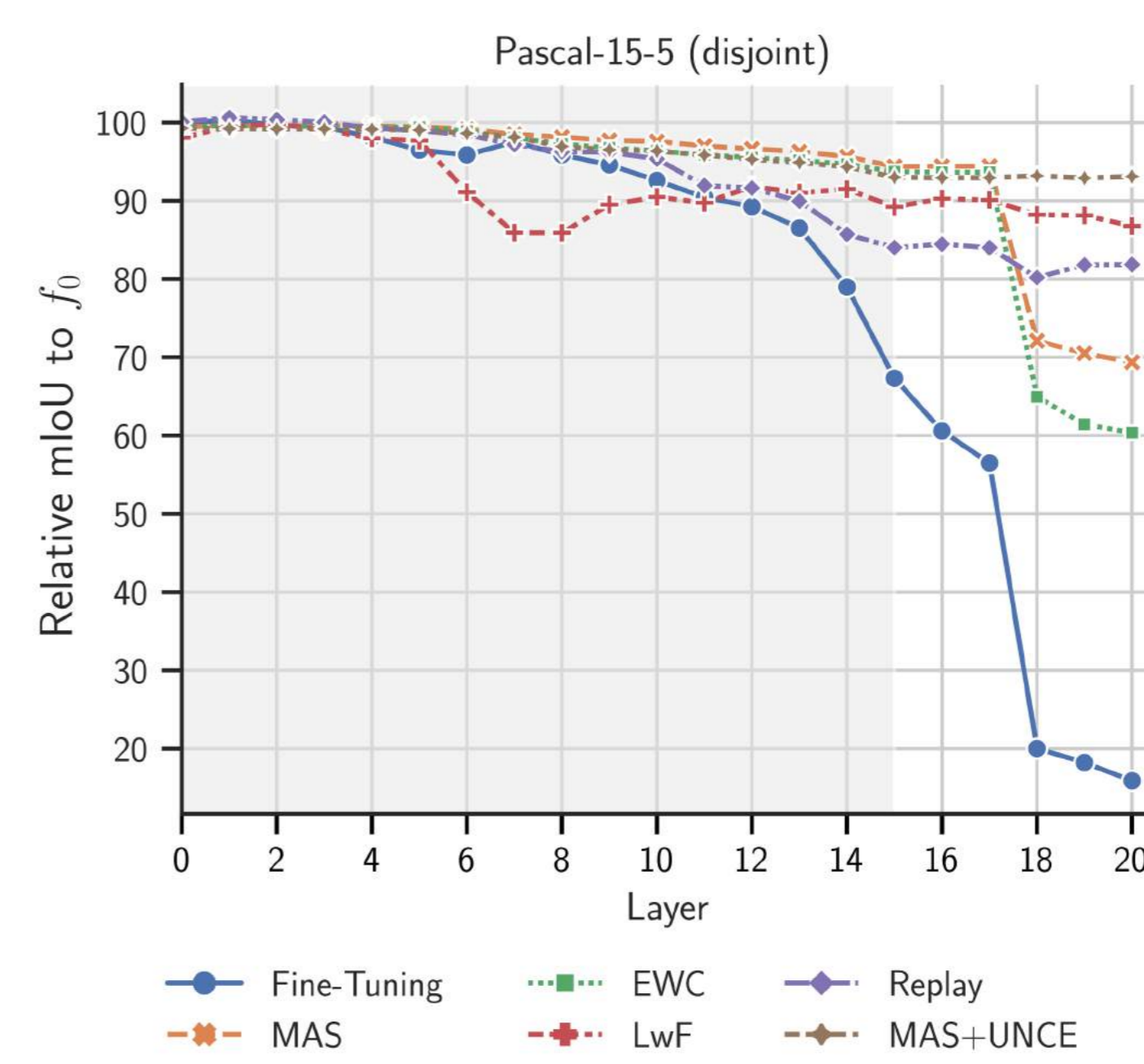


- [1] Aljundi, Rahaf, et al. "Memory aware synapses: Learning what (not) to forget." Proceedings of the European conference on computer vision (ECCV). 2018.
- [2] Kirkpatrick, James, et al. "Overcoming catastrophic forgetting in neural networks." Proceedings of the national academy of sciences 114.13 (2017): 3521-3526.
- [3] Aljundi, Rahaf, et al. "Memory aware synapses: Learning what (not) to forget." Proceedings of the European conference on computer vision (ECCV). 2018.

Representational Analysis



Activation Drift between Tasks



Conclusion

- Semantic shift of the background class is the main cause for forgetting in CiSS
- Forgetting is mainly affecting later decoder layers of the network
- Discriminating features for old classes are not forgotten, but are either assigned to visually similar classes or to the background class in the decoder
- Methods without any form of Replay do not reliably learn discriminating features for similar classes



Partners



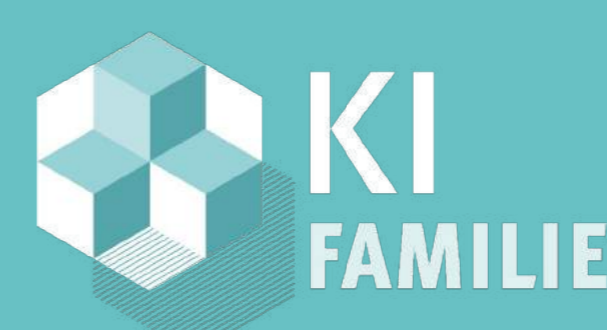
External partners



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KI Delta Learning is a project of the KI Familie. It was initiated and developed by the VDA Leitinitiative autonomous and connected driving and is funded by the Federal Ministry for Economic Affairs and Climate Action.



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