Layer-specific Image Augmentations in Local Learning ANNs

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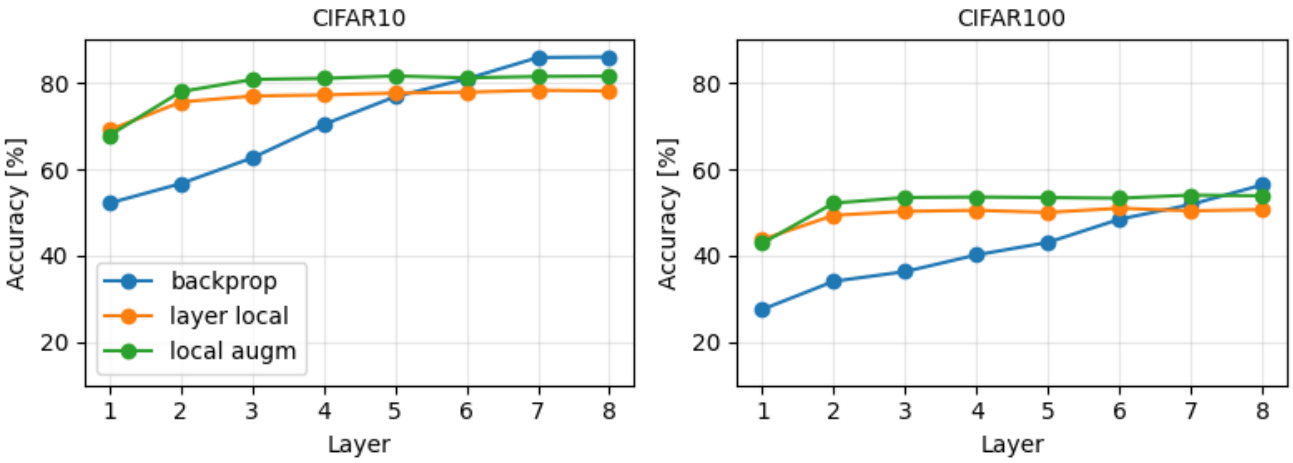
Even though backpropagation has proven its efficiency in machine learning setups, corresponding traits of such global and at the same time neuron-specific learning signals could not be identified in the brain so far. We hypothesize learning in the brain to follow a canonical predictive learning rule, but expect the underlying objective to differ along the processing hierarchy. More precisely, we posit that view-invariance increases with depth, which we implement in a machine learning model with layer-wise contrastive learning. We observed that increasing image augmentations strength with network depth improves the performance of the network in a layer-local learning setup, indicating that the data-driven variance is useful for creating more diverse representation spaces, and helps the network to reduce the gap between local learning and backpropagation.



	CIFAR10		**CIFAR100**	
	Final layer readout	Pooled cross-layer readout	Final layer readout	Pooled cross-layer readout
Backpropagation	86.0%	87.5%	56.4%	55.6%
Layer-local learning	78.2%	80.2%	50.7%	52.6%
Layer-local learning + Layer-specific augmentations	81.6%	82.6%	53.9%	54.8%

Figure 1: Comparison of ConViT performance trained with backpropagation (blue), default layer-local learning (orange) and layer-local learning + layer-specific augmentations on CIFAR10 and CIFAR100.