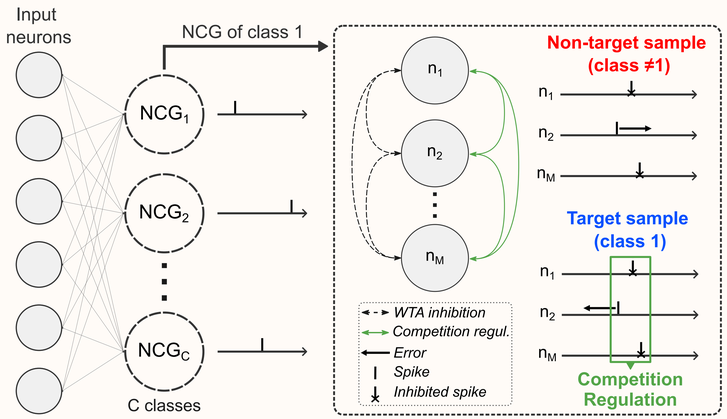
Intra-class winner-takes-all can improve classification in spiking neural networks by helping learn various class-specific patterns

Full paper

Scaling a spiking classification layer with NCGs: an architecture using intra-class WTA & competition regulation

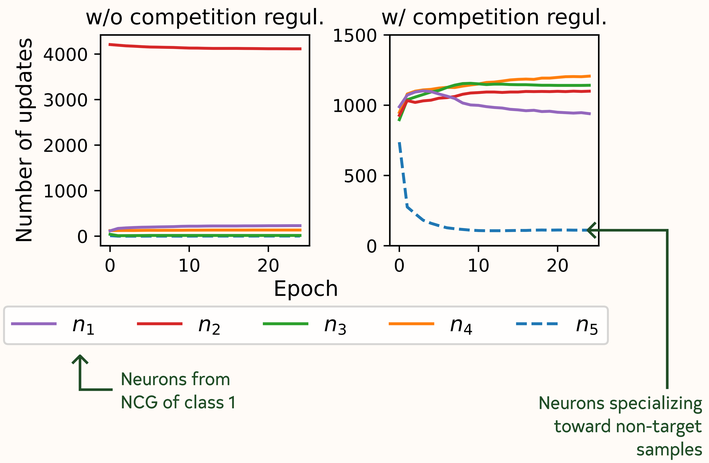


NCGs significantly improve the accuracy of spiking classification layers trained with SOTA supervised STDP rules

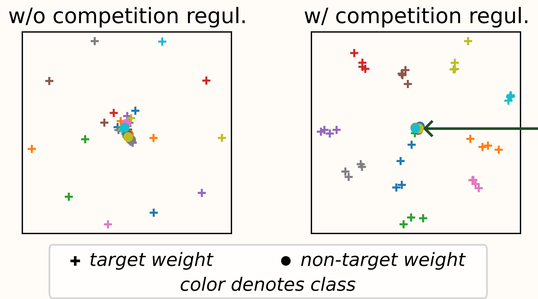
Dataset	Method	Neurons per class	Accuracy (Mean±Std %) STDP-CSNN*	SoftHebb-CNN*
Fashion-MNIST	SSTDP	1	85.26 ± 0.17	89.36 ± 0.24
	SSTDP+NCG (ours)	5	**87.59 ± 0.11**	**91.06 ± 0.10**
	S2-STDP	1	85.89 ± 0.27	90.61 ± 0.19
	S2-STDP+NCG (ours)	5	**88.72 ± 0.23**	**91.86 ± 0.14**
CIFAR-10	SSTDP	1	60.87 ± 0.53	76.57 ± 0.58
	SSTDP+NCG (ours)	5	**64.05 ± 0.48**	**78.53 ± 0.32**
	S2-STDP	1	61.08 ± 0.17	76.90 ± 0.27
	S2-STDP+NCG (ours)	5	**66.41 ± 0.17**	**79.55 ± 0.23**
CIFAR-100	SSTDP	1	28.49 ± 0.49	48.73 ± 0.39
	SSTDP+NCG (ours)	5	**31.19 ± 0.27**	**49.81 ± 0.23**
	S2-STDP	1	29.39 ± 0.19	49.17 ± 0.29
	S2-STDP+NCG (ours)	5	**35.90 ± 0.42**	**53.49 ± 0.18**

* Hebbian-based unsupervised feature extractors

Competition regulation is crucial for ensuring balanced competition within NCGs



Competition regulation enables the learning of various class-specific patterns



Neuronal Competition Groups with Supervised STDP for Spike-Based Classification

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