

Supplementary Material

Table S1 and Table S2 show the grid search results obtained by initializing time constants to the same values of standard training and incorporating them in the training process. the results show that performance is still sensitive to initial tuning of time constants.

Table S1. Heterogeneous training accuracy in FSNN for different initial values of time constants.

Table 1a. SHD

(ms)	LIF	CUBA-LIF				
	$\tau_{syn} = 0$ ($\alpha \approx 0$)	$\tau_{syn} = 14$ ($\alpha \approx 0.368$)	$\tau_{syn} = 28$ ($\alpha \approx 0.606$)	$\tau_{syn} = 70$ ($\alpha \approx 0.818$)	$\tau_{syn} = 140$ ($\alpha \approx 0.905$)	
$\tau_{mem} = 420$ ($\beta \approx 0.967$)	75.67%	76.07%	74.80%	71.52%	66.23%	
$\tau_{mem} = 700$ ($\beta \approx 0.980$)	78.09%	76.78%	75.44%	72.62%	67.40%	
$\tau_{mem} = 1120$ ($\beta \approx 0.987$)	78.02%	76.23%	75.52%	71.94%	67.89%	
$\tau_{mem} = 1680$ ($\beta \approx 0.992$)	79.84%	78.69%	76.78%	72.79%	66.79%	

Table 1b. N-MNIST

(ms)	LIF	CUBA-LIF				
	$\tau_{syn} = 0$ ($\alpha \approx 0$)	$\tau_{syn} = 14$ ($\alpha \approx 0.368$)	$\tau_{syn} = 28$ ($\alpha \approx 0.606$)	$\tau_{syn} = 70$ ($\alpha \approx 0.818$)	$\tau_{syn} = 140$ ($\alpha \approx 0.905$)	
$\tau_{mem} = 420$ ($\beta \approx 0.967$)	97.41%	97.08%	96.75%	95.86%	95.68%	
$\tau_{mem} = 700$ ($\beta \approx 0.980$)	97.24%	97.24%	96.74%	95.91%	95.65%	
$\tau_{mem} = 1120$ ($\beta \approx 0.987$)	97.37%	97.15%	96.65%	96.14%	95.51%	
$\tau_{mem} = 1680$ ($\beta \approx 0.992$)	97.34%	97.08%	96.86%	96.20%	95.50%	

Table S2. Heterogeneous training accuracy in RSNN for different initial values of time constants.

Table 2a. SHD

(ms)	LIF	CUBA-LIF				
	$\tau_{syn} = 0$ ($\alpha \approx 0$)	$\tau_{syn} = 14$ ($\alpha \approx 0.368$)	$\tau_{syn} = 28$ ($\alpha \approx 0.606$)	$\tau_{syn} = 70$ ($\alpha \approx 0.818$)	$\tau_{syn} = 140$ ($\alpha \approx 0.905$)	
$\tau_{mem} = 420$ ($\beta \approx 0.967$)	83.27%	81.48%	81.48%	79.00%	75.58%	
$\tau_{mem} = 700$ ($\beta \approx 0.980$)	83.47%	82.84%	81.75%	76.90%	75.52%	
$\tau_{mem} = 1120$ ($\beta \approx 0.987$)	83.10%	82.21%	81.07%	78.05%	77.04%	
$\tau_{mem} = 1680$ ($\beta \approx 0.992$)	83.10%	82.35%	80.90%	79.29%	76.47%	

Table 2b. N-MNIST

(ms)	LIF	CUBA-LIF				
	$\tau_{syn} = 0$ ($\alpha \approx 0$)	$\tau_{syn} = 14$ ($\alpha \approx 0.368$)	$\tau_{syn} = 28$ ($\alpha \approx 0.606$)	$\tau_{syn} = 70$ ($\alpha \approx 0.818$)	$\tau_{syn} = 140$ ($\alpha \approx 0.905$)	
$\tau_{mem} = 420$ ($\beta \approx 0.967$)	97.25%	97.07%	96.74%	96.08%	95.64%	
$\tau_{mem} = 700$ ($\beta \approx 0.980$)	97.24%	96.92%	96.79%	96.17%	95.59%	
$\tau_{mem} = 1120$ ($\beta \approx 0.987$)	97.38%	97.14%	96.55%	96.00%	95.76%	
$\tau_{mem} = 1680$ ($\beta \approx 0.992$)	97.23%	97.02%	96.49%	96.00%	95.41%	