Rebuttal Responses

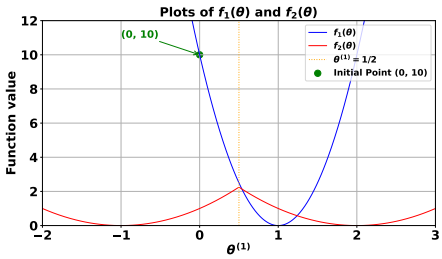
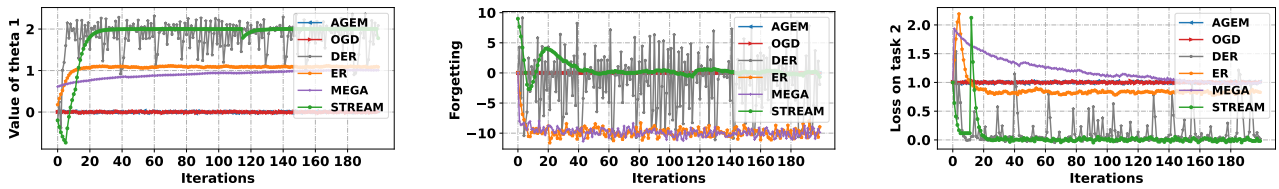


Figure 1: Loss function of two tasks. $f_1(\theta)$ and $f_2(\theta)$ have different minimums and $f_2(\theta)$ is dominant across most values of θ_1.

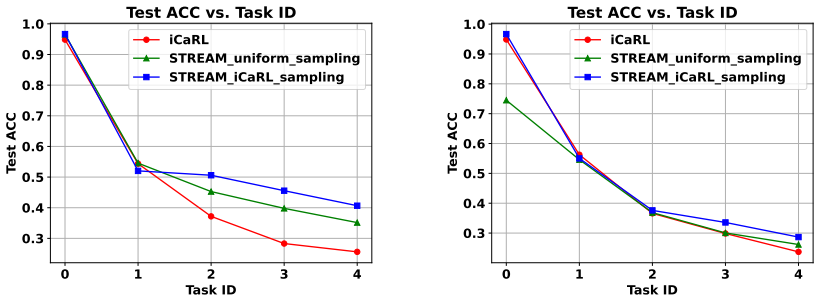


(a) $\theta^{(1)}$ value vs. iterations. (b) The forgetting vs. iterations. (c) Loss on task 2 vs. iterations.

Figure 2: Synthetic experiment for the counterexample. We add Gaussian random noise to simulate the stochastic gradient descent. STREAM can find the optimal $\theta^{(1)}$ and achieve minimal forgetting and loss on the new task.

Table 1: Results on Multiple Dataset, Split CIFAR100, and Split Tiny Imagenet.

Methods	Multiple Dataset		Split CIFAR100		Split Tiny-Imagenet	
	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)
NCL	46.64±2.32	0.334±0.035	44.42±1.35	0.325±0.024	20.43±0.64	0.301±0.009
SGP	55.68±1.23	0.305±0.153	56.55±1.64	**0.100±0.001**	26.86±0.90	0.122±0.008
STREAM	**72.08±1.40**	**0.152±0.035**	**64.06±0.86**	0.132±0.010	**31.36±0.71**	**0.121±0.008**

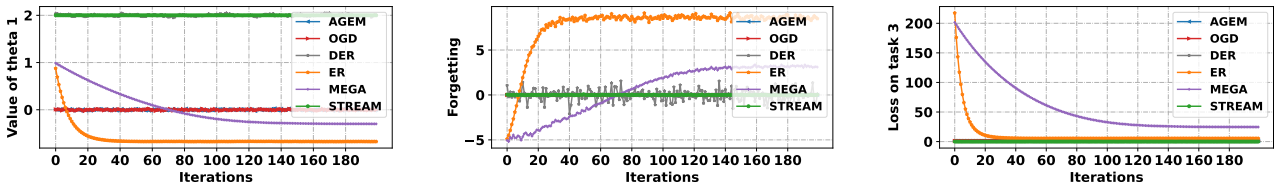


(a) Average testing ACC on CIFAR10. (b) Average testing ACC on CIFAR10 with label noise $p = 0.2$.

Figure 3: Class-incremental learning comparison with different sampling methods.

Table 2: Continual learning process (retain two decimal places for the numerical values).

Task	$\theta^{(1)}$		$\theta^{(2)}$		FGT↓		Loss↓	
	ER	STREAM	ER	STREAM	ER	STREAM	ER	STREAM
f_1	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
f_2	1.09	2.00	0.00	0.00	-9.20	0.00	0.83	0.00
f_3	-0.67	2.00	0.00	0.00	8.62	0.00	0.00	0.00



(a) $\theta^{(1)}$ value vs. iterations.

(b) The forgetting on task 1 and task 2 vs. iterations.

(c) Loss on task 3 vs. iterations.

Figure 4: Synthetic experiment on task 3 for the counterexample. Each algorithm starts from their points at the end of the task2.

Table 3: Results on Multiple Dataset, Split CIFAR100, and Split Tiny Imagenet.

Methods	Multiple Dataset		Split CIFAR100		Split Tiny-Imagenet	
	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)
ER	59.03±0.90	0.244±0.024	48.56±1.74	0.342±0.025	17.54±0.83	0.230±0.019
"vanilla" ER	61.33± 0.94	0.329±0.043	60.92±0.93	0.142±0.009	23.38±0.56	0.170±0.011
STREAM	**72.08±1.40**	**0.152±0.035**	**64.06±0.86**	**0.132±0.010**	**31.36±0.71**	**0.121±0.008**

Table 4: Running time/memory on Multiple Dataset and Split CIFAR-100.

Methods	Multiple Dataset (hours/MB)	Split CIFAR-100 (hours/MB)
EWC	0.16/552	1.31/930
MAS	0.17/562	1.31/963
AGEM	0.16/570	1.30/1102
OGD	0.47/558	3.01/926
DER	0.18/778	1.27/1146
GDumb	0.13/572	0.92/1034
MEGA	0.15/560	1.05/1032
STREAM	0.11/572	0.79/1046

Table 5: Results on Multiple Dataset (p denotes the noise rate).

Methods	$p = 0.0$		$p = 0.3$	
	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)
DER	51.70±2.04	0.224±0.024	**42.09±3.32**	0.164±0.019
STREAM	**72.08±1.40**	**0.152±0.035**	41.32±0.41	**0.100±0.005**

Table 6: Results on Split CIFAR100 (p denotes the noise rate).

Methods	$p = 0.0$		$p = 0.3$	
	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)
DER	63.14±0.99	**0.100±0.051**	35.78±1.54	0.237±0.053
STREAM	**64.06±0.86**	0.132±0.010	**52.39±1.51**	**0.234±0.013**

Table 7: Results on Split Tiny-ImageNet (p denotes the noise rate).

Methods	$p = 0.0$		$p = 0.3$	
	ACC (↑)	FGT (↓)	ACC (↑)	FGT (↓)
DER	30.85±0.79	**0.078±0.015**	16.73±1.04	**0.053±0.023**
STREAM	**31.36±0.71**	0.121±0.008	**28.89±0.41**	0.202±0.004