

Motivation

Dataset Distillation (DD)

- **Input:** An original real dataset
- **Output:** A much smaller synthetic dataset with performance to the original one

Previous Methods on DD

- Format of synthetic samples is the same as that of original ones
- **Poor Data Efficiency**

DD via Factorization

- Decompose a dataset into **bases** and **hallucinators**
- **Bases:** Storing sample-specific information
- **Hallucinators:** Storing shared information

Method

Pair-wise Reconstruction

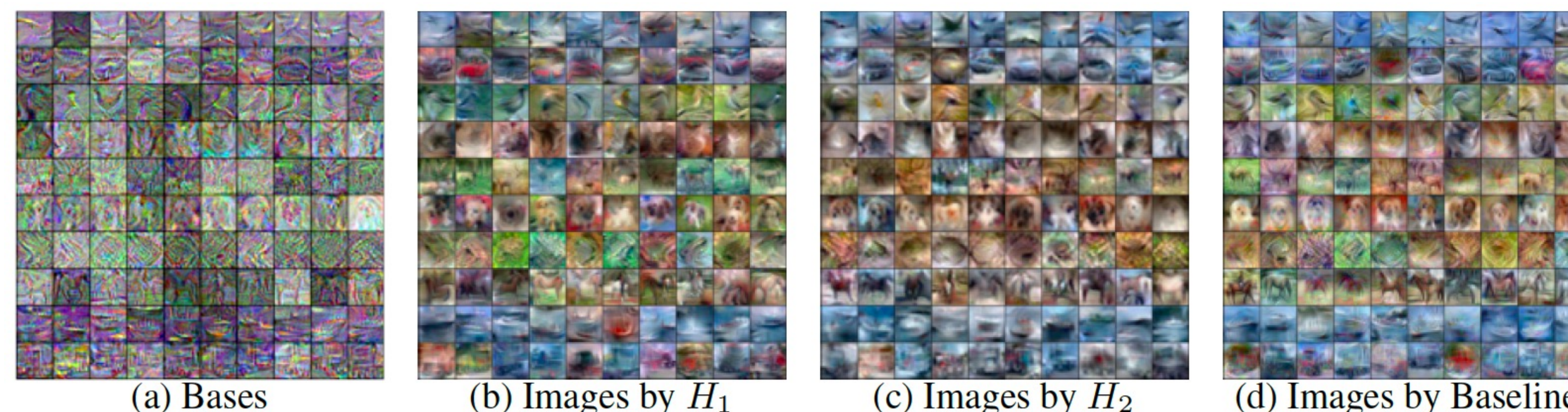
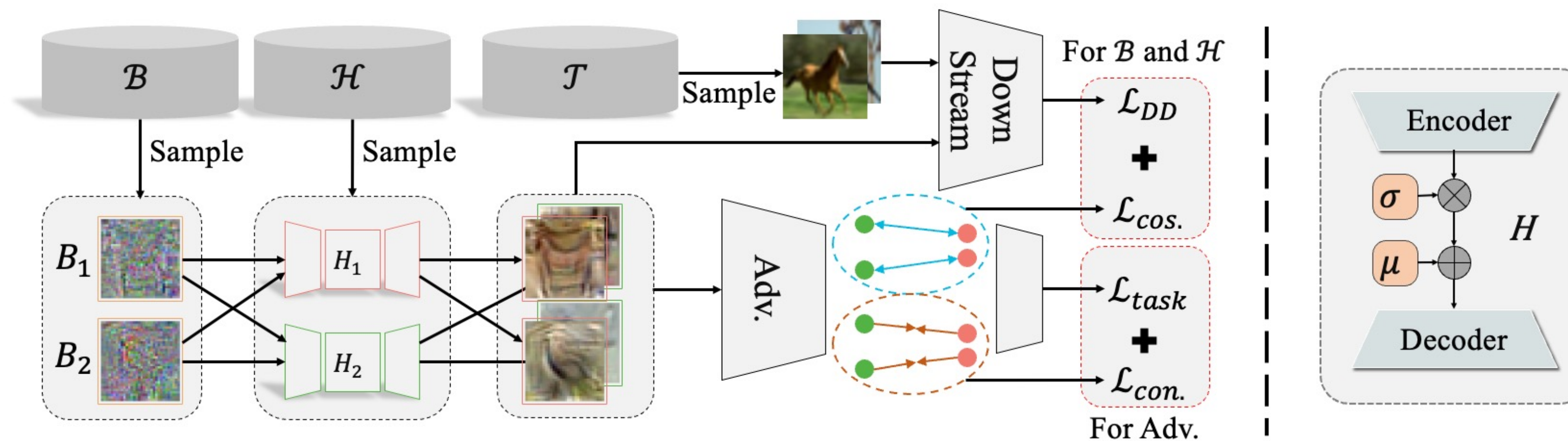
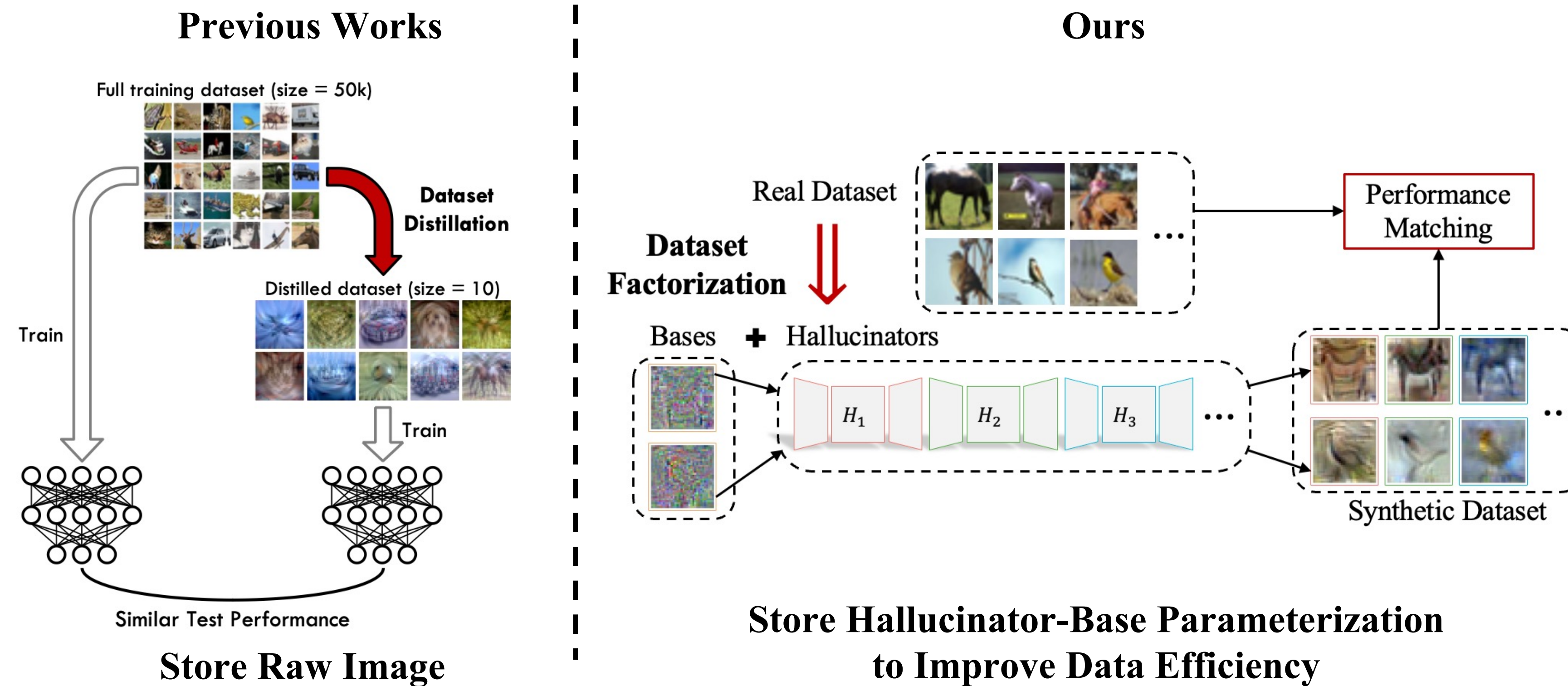
- Samples are generated by feeding **arbitrary** bases into **arbitrary** hallucinators
- **Exponential informativeness gain**

Adversarial Contrastive Loss

- Dataset distillation wants to **minimize** the similarity between samples generated by different hallucinators but the same basis
- An Adversary wants to **maximize** it
- **Increase sample-wise diversity**

A Plug-and-Play Parameterization

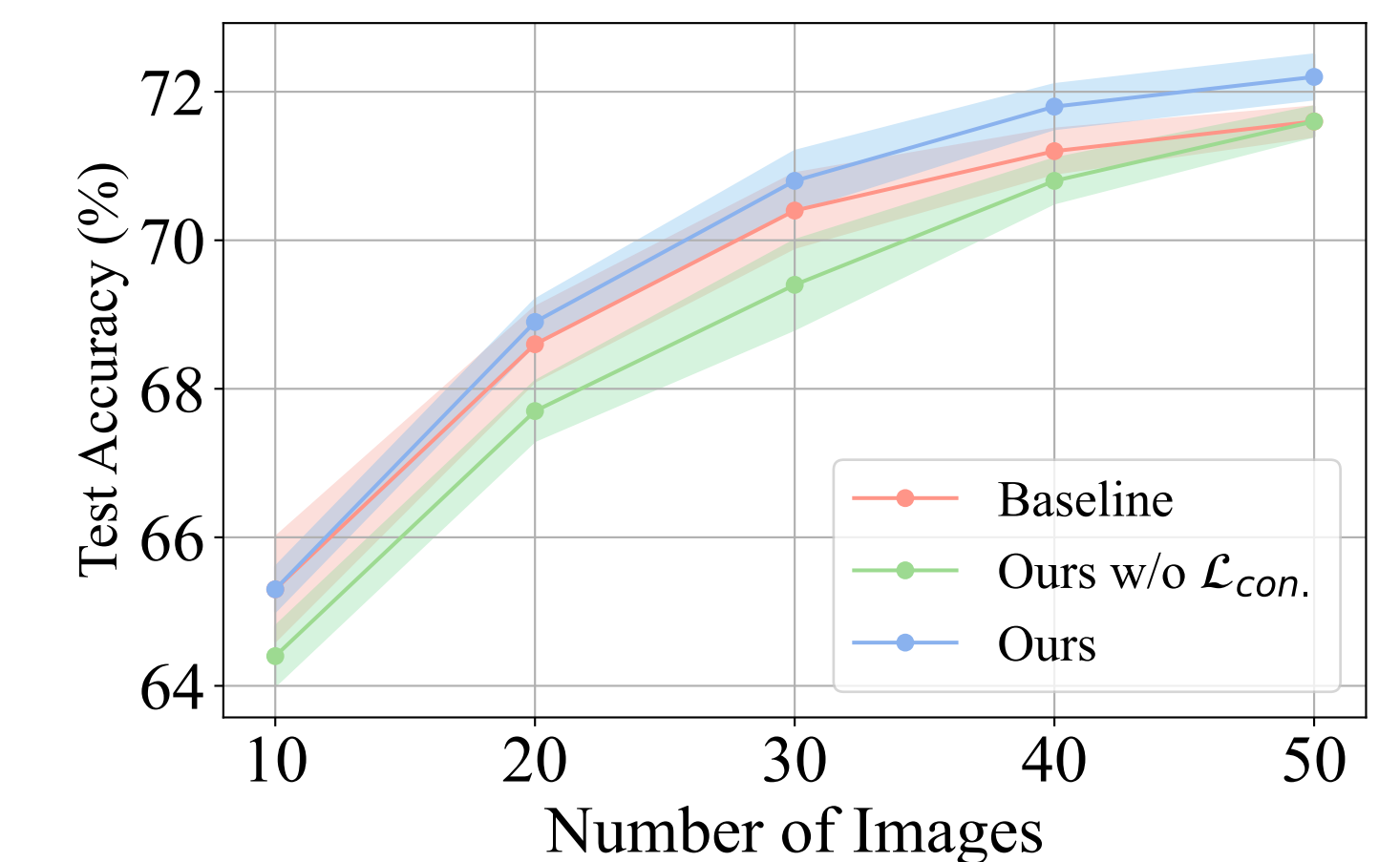
- Compatible with **all** existing DD methods
- **Yield consistent improvement**



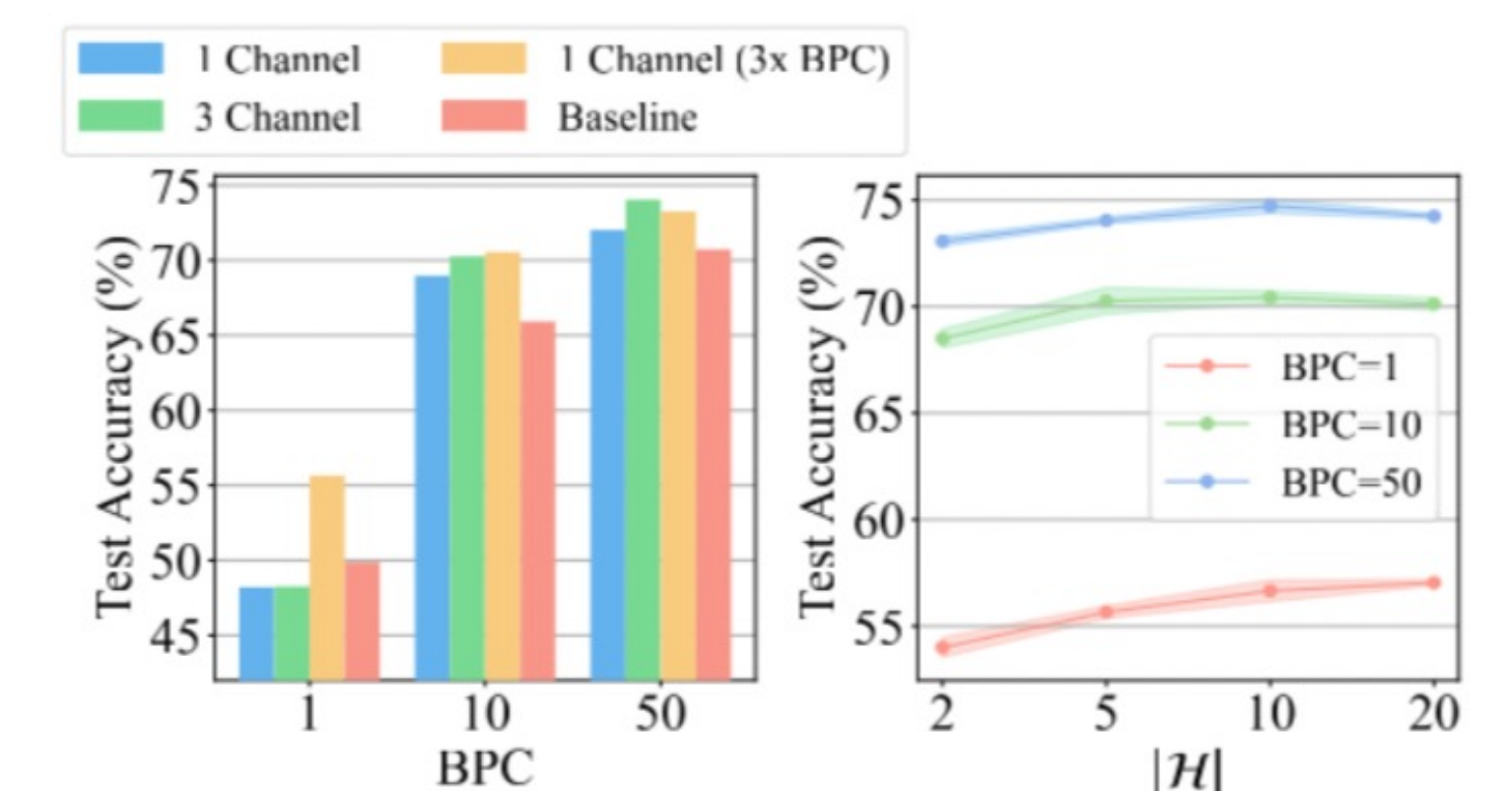
Qualitative comparisons with the baseline.

Dataset	SVHN			CIFAR10			CIFAR100			
IPC	1	10	50	1	10	50	1	10	50	
Ratio %	0.014	0.14	0.7	0.02	0.2	1	0.2	2	10	
Coreset	Random	14.6	35.1	70.9	14.4	26.0	43.4	4.2	14.6	30.0
	Herding	20.9	50.5	72.6	21.5	31.6	40.4	8.4	17.3	33.7
	K-Center	21.0	14.0	20.1	21.5	14.7	27.0	8.3	7.1	30.5
	Forgetting	12.1	16.8	27.2	13.5	23.3	23.3	4.5	9.8	-
Distillation	DD [†]	-	-	-	-	36.8	-	-	-	-
	LD [†]	-	-	-	25.7	38.3	42.5	11.5	-	-
	DC	31.2	76.1	82.3	28.3	44.9	53.9	12.8	25.2	-
	DSA	27.5	79.2	84.4	28.8	52.1	60.6	13.9	32.3	42.8
	DM	-	-	-	26.0	48.9	63.0	11.4	29.7	43.6
	CAFE	42.6	75.9	81.3	30.3	46.3	55.5	12.9	27.8	37.9
Factorization	CAFE+DSA	42.9	77.9	82.3	31.6	50.9	62.3	14.0	31.5	42.9
	MTT	58.5	70.8	85.7	46.3	65.3	71.6	24.3	39.0	46.1
BPC	Ratio %	1	9	49	1	9	49	1	9	49
	HaBa	0.028	0.14	0.7	0.04	0.2	1	0.22	1.82	9.82
Whole Dataset		95.4		84.8		56.2				

Comparisons with State-of-the-Arts



Comparison under the Same Number of Images



Study on the Number of Channels used by Bases and the Number of Hallucinators