Matching Feature Sets for Few-Shot Image Classification

Arman Afrasiyabi[⋆•], Hugo Larochelle[◇†•], Jean-François Lalonde[⋆], Christian Gagné[⋆†•]
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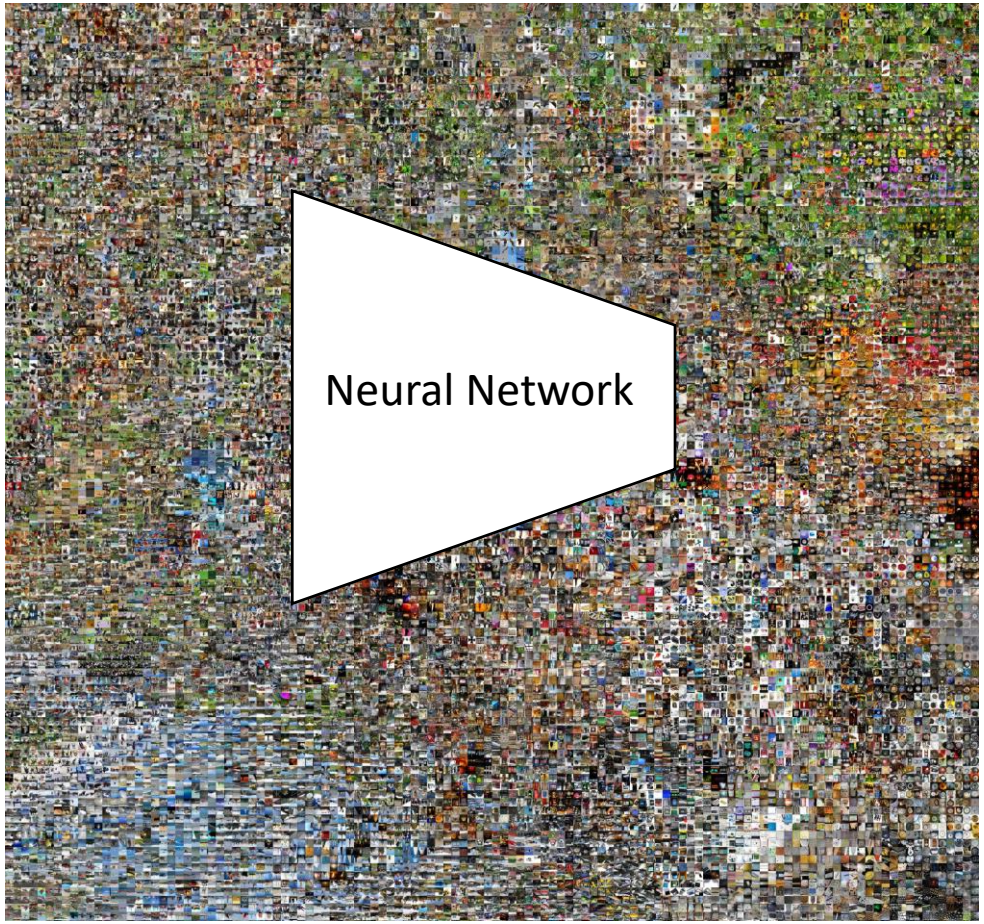
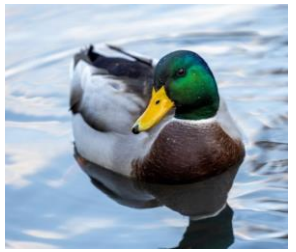
Few-shot image classification

Base classes



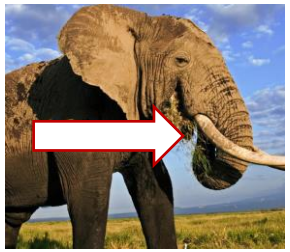
Novel classes

elephant



duck

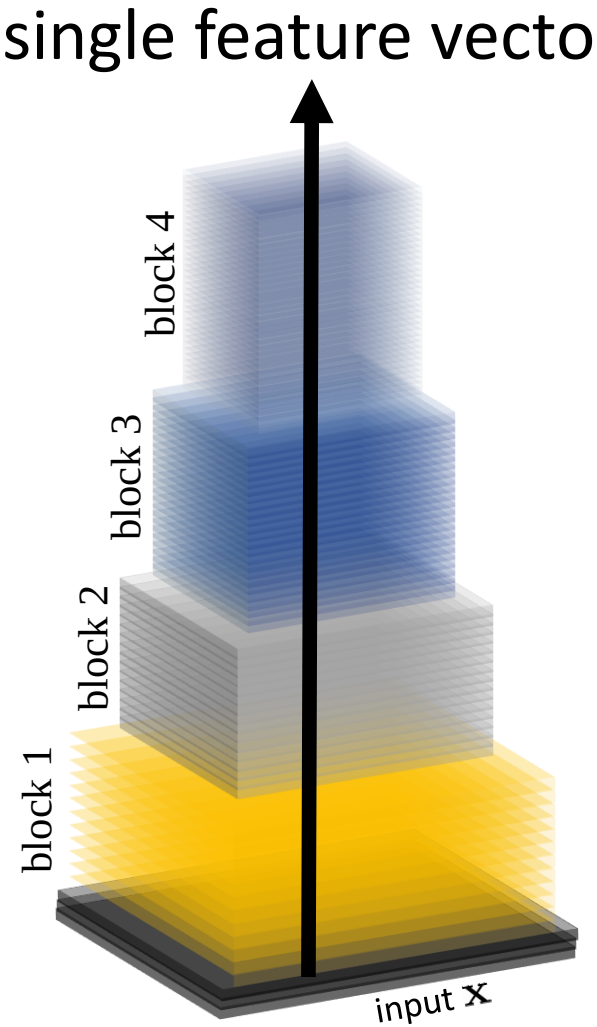
wolf



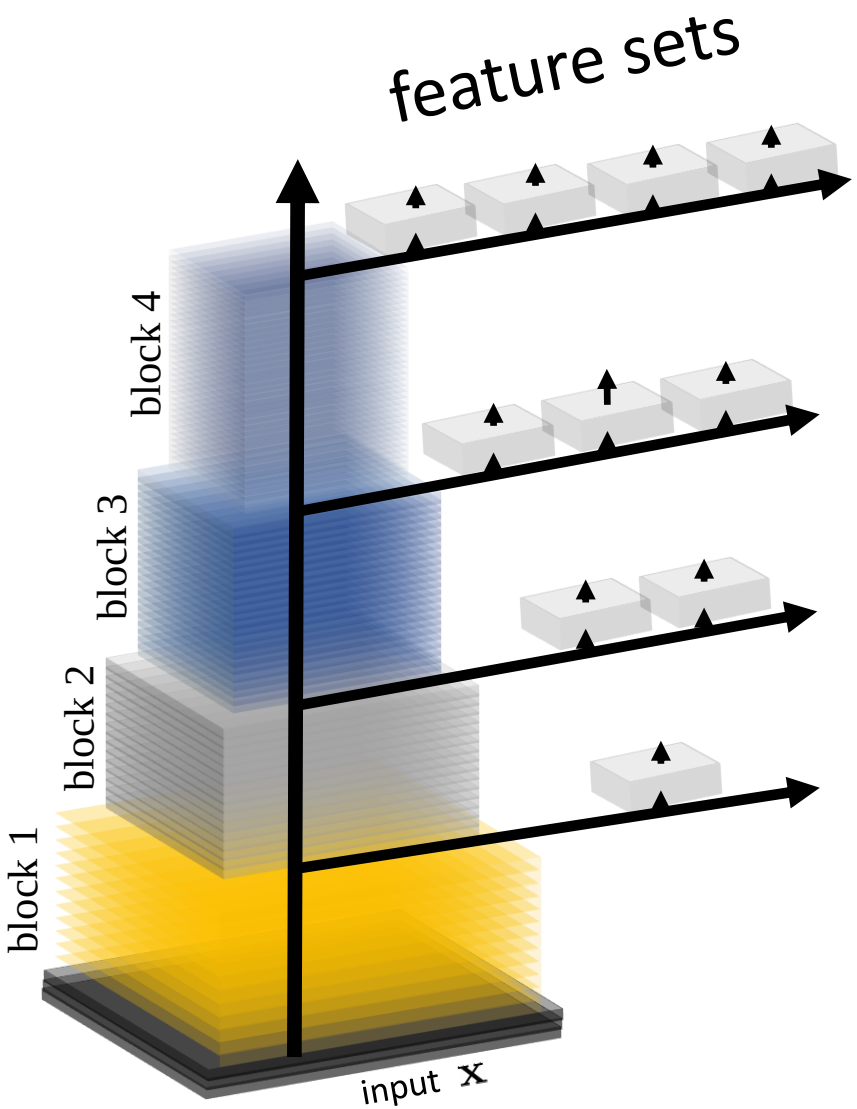
?

Query

Feature sets



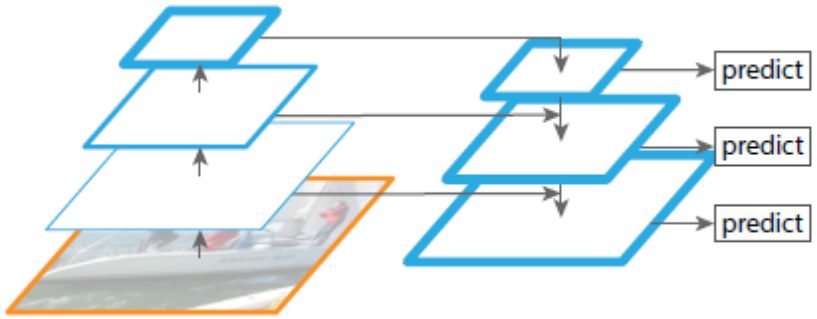
common practice



this work (ours)

Inspiration

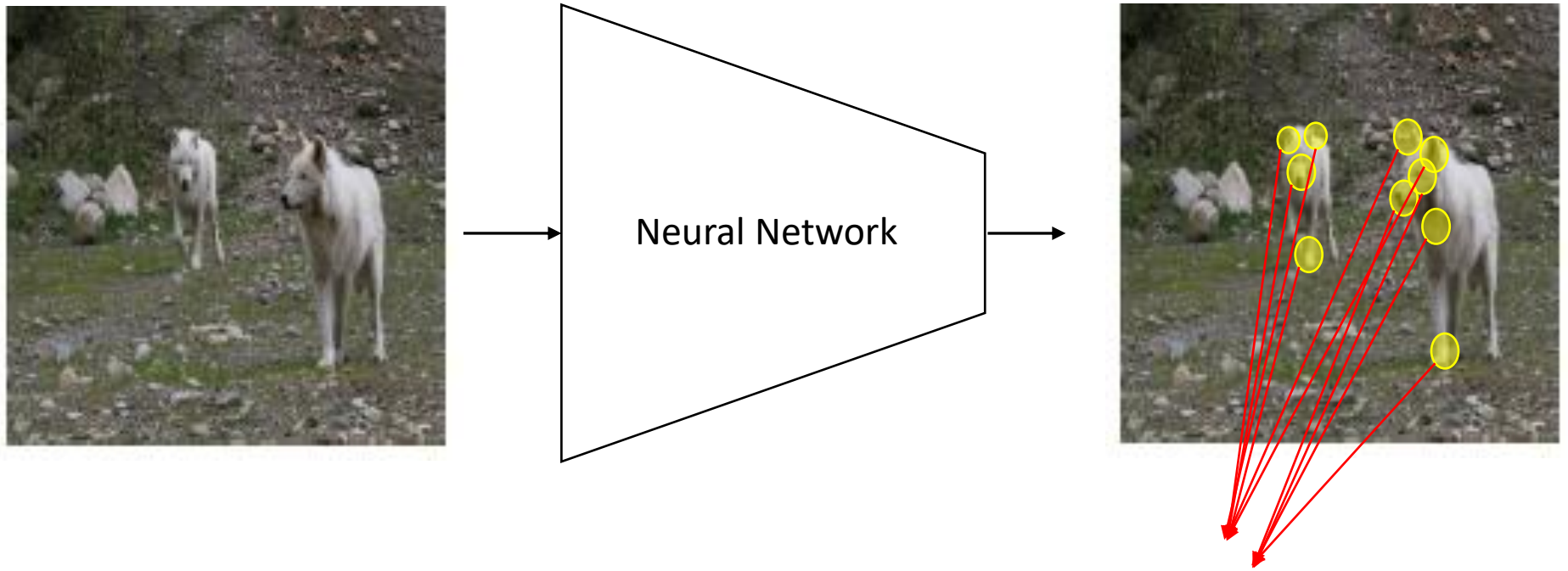
we take inspiration from Feature Pyramid Networks [1]



[1] Feature pyramid networks for object detection. *Lin et al.* cvpr 2017.

Matching feature set

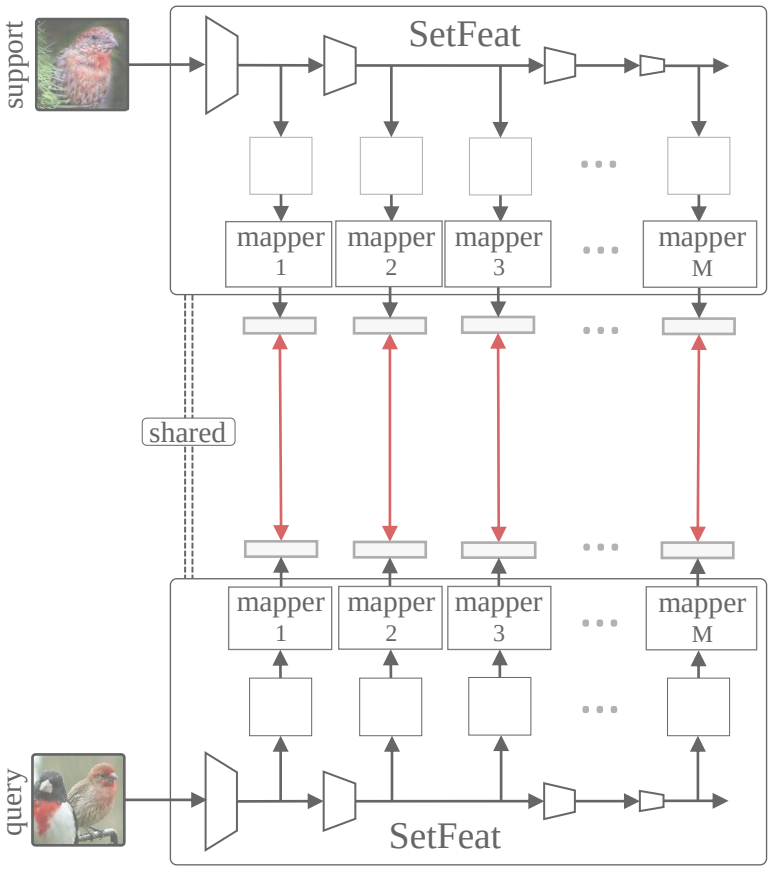
we aim at learning a richer feature space



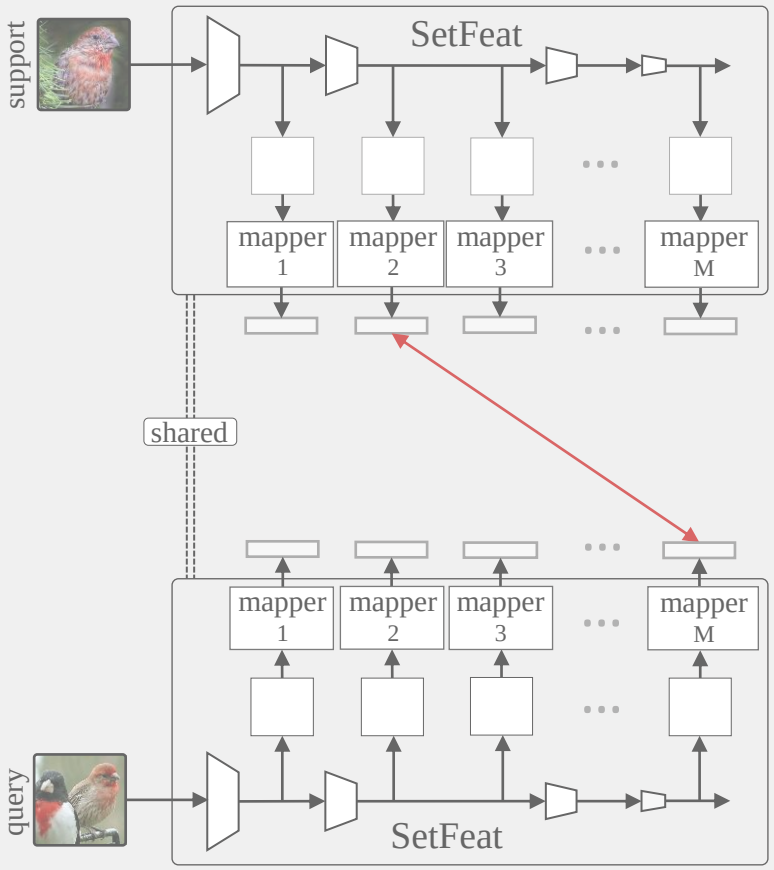
different features with different characteristics

Set Feature extractor (SetFeat)

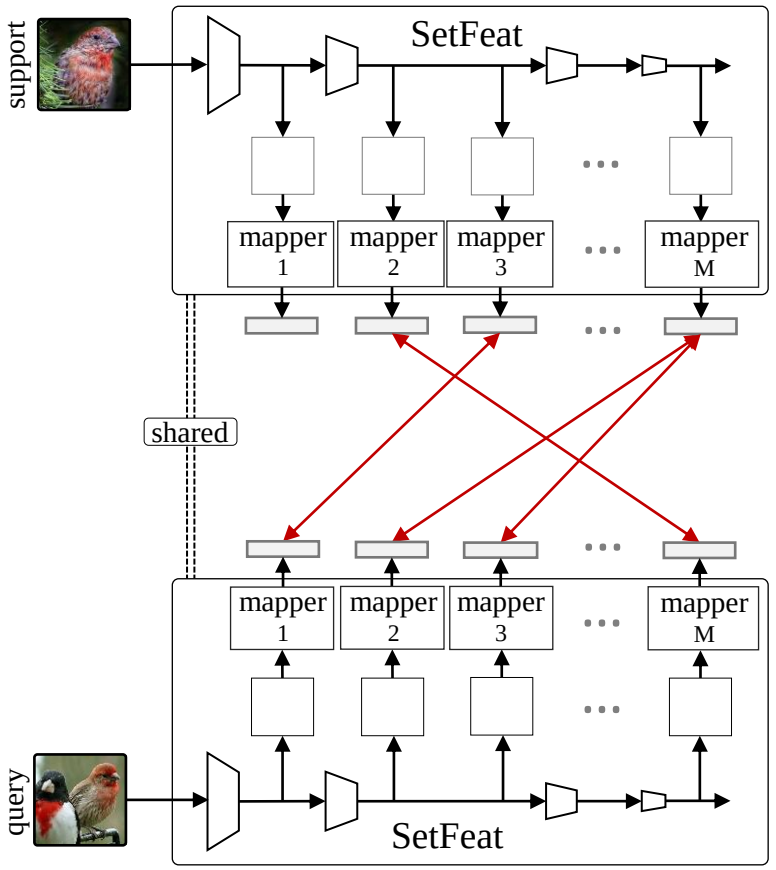
SetFeat



(a) match-sum



(b) min-min



(c) sum-min

Evaluation

Datasets	Backbones
MiniImageNet	Conv4
TieredImageNet	ResNet-12
CUB	ResNet-18

Evaluation:miniImageNet

	Method	Backbone	1-shot	5-shot
	ProtoNet [46]	Conv4-64	49.42	68.20
	MAML [18]		48.07	63.15
	RelationNet [49]		50.44	65.32
	Baseline++ [8]		48.24	66.43
	IMP [3]		49.60	68.10
	MemoryNet [7]		53.37	66.97
	Neg-Margin [33]		52.84	70.41
	MixtFSL [2]		52.82	70.67
	FEAT [64]		55.15	71.61
	MELR [16]		55.35	72.27
	BOIL [37]		49.61	66.45
– Ours –	Match-sum	SF4-64	55.74	72.18
	Min-min		56.22	72.70
	Sum-min		**57.18**	**73.67**

+1.83

Evaluation: tieredImageNet

	Method	Backbone	1-shot	5-shot
	OptNet [29]	ResNet12	65.99	81.56
	MTL [48]		65.62	80.61
	DNS [44]		66.22	82.79
	Simple [51]		69.74	84.41
	TapNet [66]		63.08	80.26
	ProtoNet† [46]		68.23	84.03
	FEAT [64]		70.80	84.79
	MixtFSL [2]		70.97	86.16
	Distill [51]		71.52	86.03
	DeepEMD [70]		71.16	86.03
	DMF [62]		71.89	85.96
	MELR [16]		72.14	87.01
	Distill [42]		72.21	87.08
– Ours –	Match-sum	- SF12 -	71.22	85.43
	Min-min		71.75	86.40
	Sum-min		**73.63**	**87.59**

†taken from [29]

1.42%

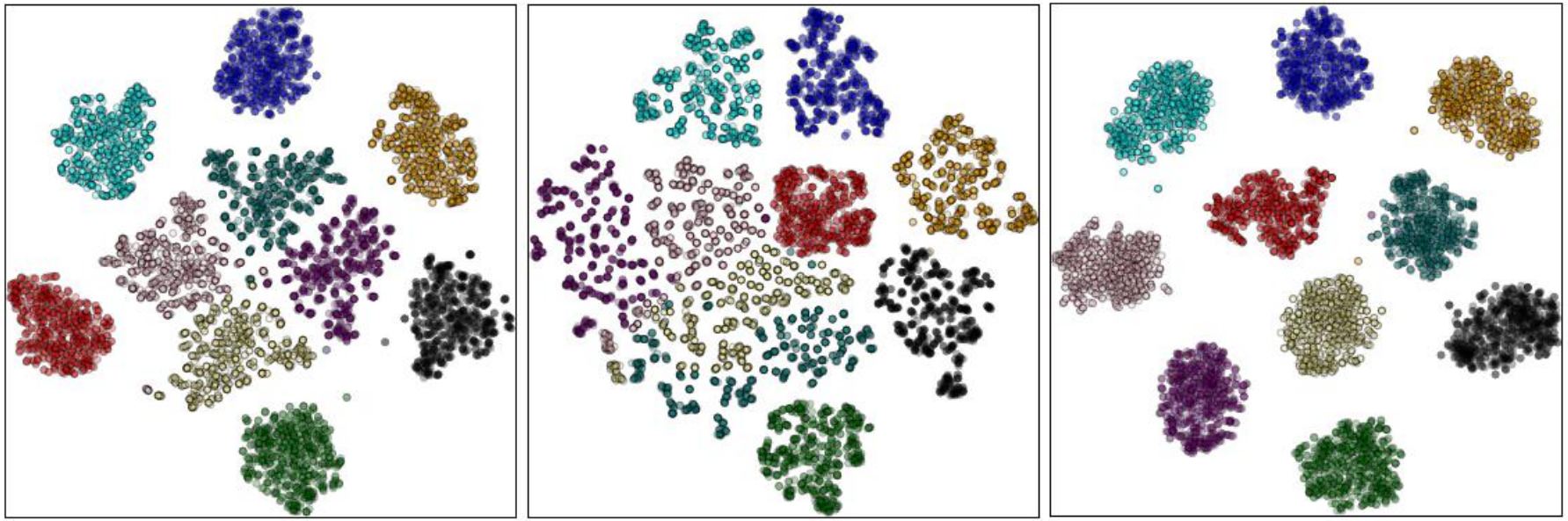
Evaluation: CUB

	Method	Backbone	1-shot	5-shot
	MatchingNet [55]	Conv4-64	61.16	72.86
	ProtoNet [46]		64.42	81.82
	MAML [17]		55.92	72.09
	RelationNet [49]		62.45	76.11
	FEAT [64]		68.87	82.90
	MELR [16]		70.26	85.01
Ours	Match-sum	SF4-64	67.35	83.82
Ours	Min-min	SF4-64	70.15	84.94
Ours	Sum-min	SF4-64	**72.09**	**87.05**

2.04%

Ablation

Probing the activation of mappers



(a) miniImageNet (b) CUB (c) tieredImageNet

Summary of our paper

- the idea of reasoning on sets and a set-based inference of feature vectors
- a straightforward way to adapt existing backbones
- extensive experiments and ablations with different few-shot datasets

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https://lvsn.github.io/SetFeat/

Thank you for your attention!

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