Relative Position and Map Networks in Few-shot Learning for Image Classification

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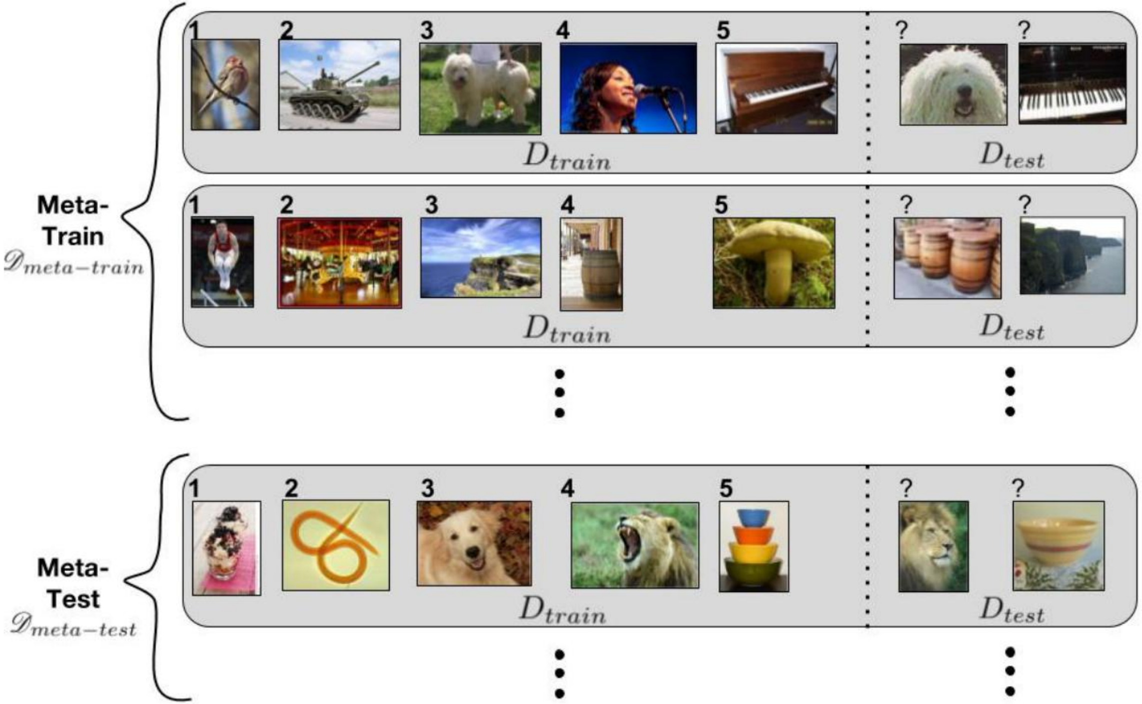
Our codes will be released at https://github.com/chrisyxue/RMN-RPN-for-FSL.

Introduction



Ravi, S., & Larochelle, H. (2016). Optimization as a model for few-shot learning.

Baseline

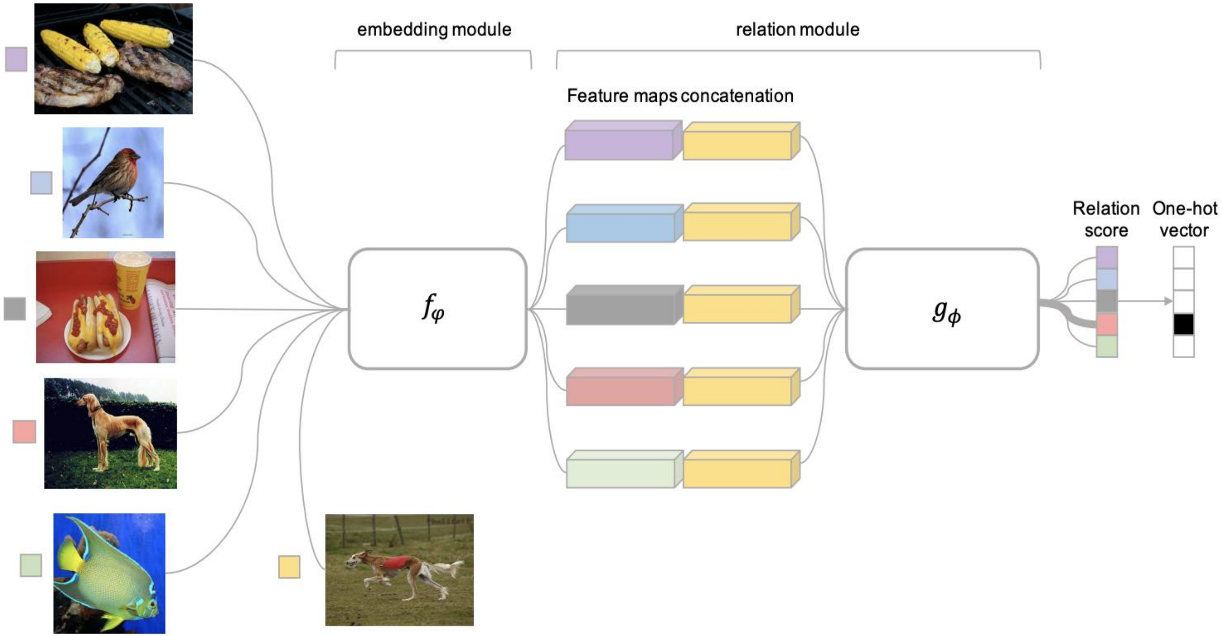
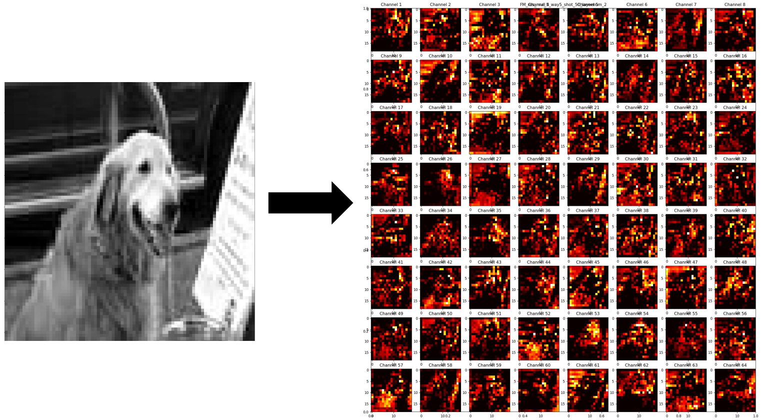


Figure 1: Relation Network architecture for a 5-way 1-shot problem with one query example.

Sung, Flood, et al. "Learning to compare: Relation network for few-shot learning." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2018.

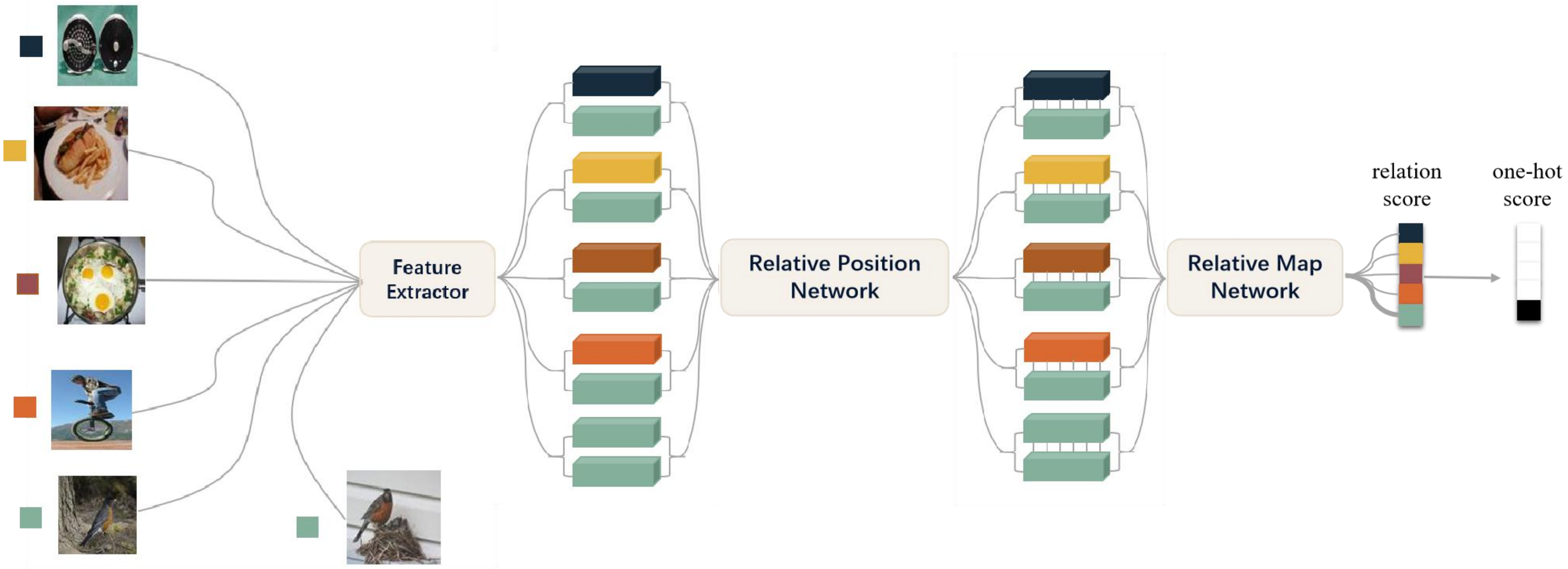
Motivation



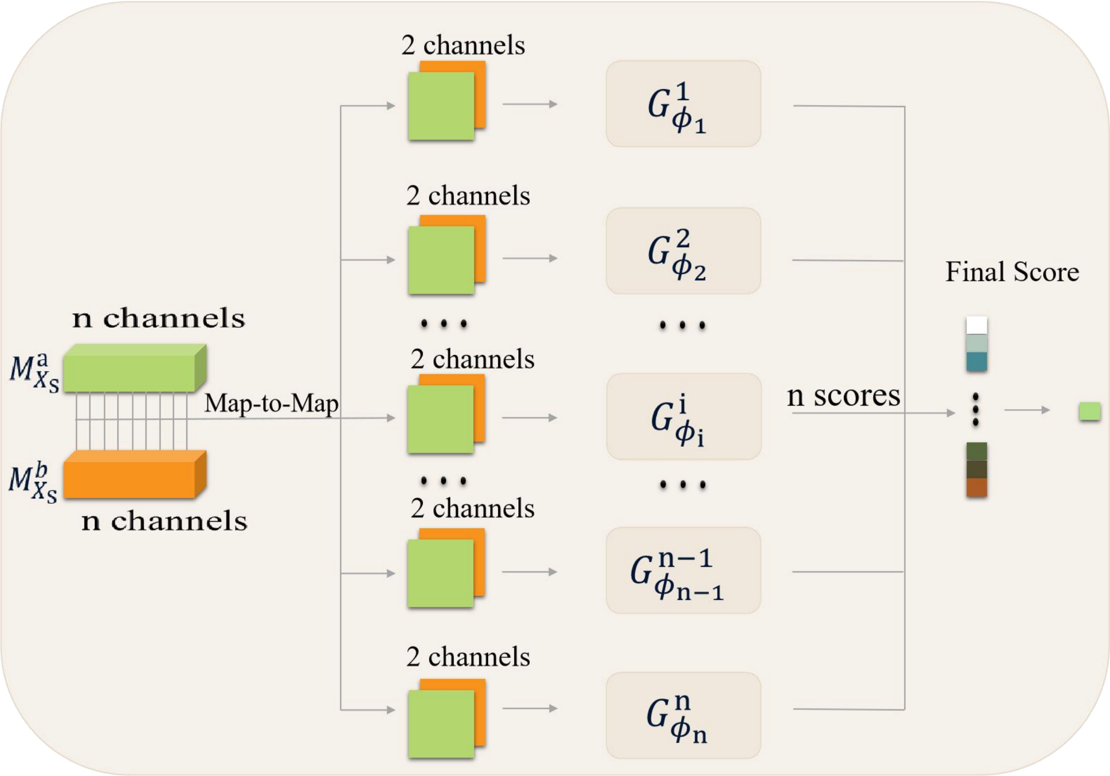
RMN:different channels have different descriptions

RPN: the importance of each position is different

Architecture

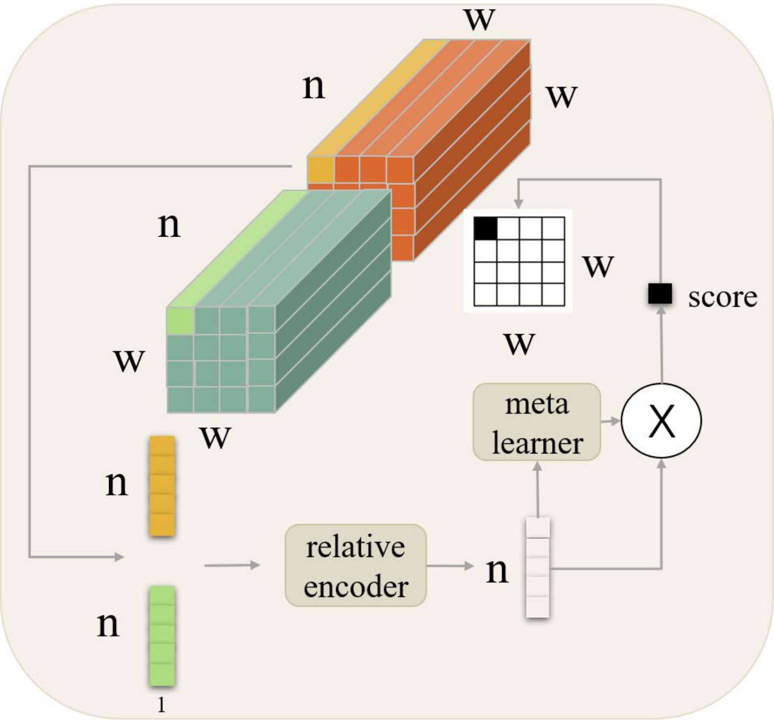


Relative Map Netwrok



$$P_{S,Q} = Sig(\sum_{i=1}^{n} w_i G^i_{\phi_i}(M^i_{x_S}, M^i_{x_Q}))$$

Relative Position Network



$$V_{i,j}^{s,q} = H([v_{i,j}^{S}, v_{i,j}^{Q}])$$

$$w = W_2 \cdot \sigma(W_1 \cdot V_{i,j}^{s,q})$$

$$Att_{i,j} = w^T V_{i,j}^{s,q}$$

$$M_{xQ} := M_{xQ} + Att \otimes M_{xQ}$$

Experiments

Table 1. Mean accuracies (%) of different methods on the MiniImageNet dataset. Results are obtained over 600 test episodes with 95% confidence intervals.

Model	MiniImageNet (5-way)	
	1-shot	5-shot
MATCHING NETS [21]	43.56±0.84	55.31±0.73
META LSTM [15]	43.44±0.77	60.60±0.71
MAML [3]	48.70±1.84	63.11±0.92
PROTOTYPICAL NETS [19]	49.42±0.78	68.20±0.66
META SGD [12]	50.47±1.87	64.03±0.94
RN [20]	50.44±0.82	65.32±0.70
GNN [17]	50.33±0.36	66.41±0.63
PABN [6]	51.87	65.37
TPN [13]	52.78±0.27	66.59±0.28
EGNN(No Trans) [8]	-	66.85
R2-D2 [2]	51.80±0.20	68.4±0.20
Ours(Conv4)	51.72±0.67	67.80±0.30
Ours(Our backbone)	**53.35± 0.77**	**69.35± 0.61**

Table 2. Mean accuracies (%) of different methods on the CIFAR-FS dataset. Results are obtained over 600 test episodes with 95% confidence intervals.

Model	CIFAR-FS (5-way)	
	1-shot	5-shot
MAML [3]	58.9±1.9	71.5±1.0
PROTOTYPICAL NETS [19]	55.5±0.7	72.0±0.6
RN [20]	55.0±1.0	69.3±0.8
GNN [17]	61.9	75.3
R2-D2 [2]	62.3±0.2	77.4±0.2
Ours	**61.43**	**76.16**

Table 3. Ablation study w.r.t. average accuracies (%) over 600 test episodes with 95% confidence intervals MiniImageNet in task 5-way K-shot about ablation study, where $K = 1, 3, 5, 7$ and 10.

Ave Acc	5-1	5-3	5-5	5-7	5-10
RN [20]	50.44	60.63	65.32	67.73	69.81
RPN	52.43	62.96	67.03	69.51	72.01
RMN	50.54	63.12	68.28	70.49	72.12
Ours	**53.35**	**63.94**	**69.35**	**70.87**	**73.17**

Thanks for watching

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