Few-Shot Learning

汇报人:陈兆伟

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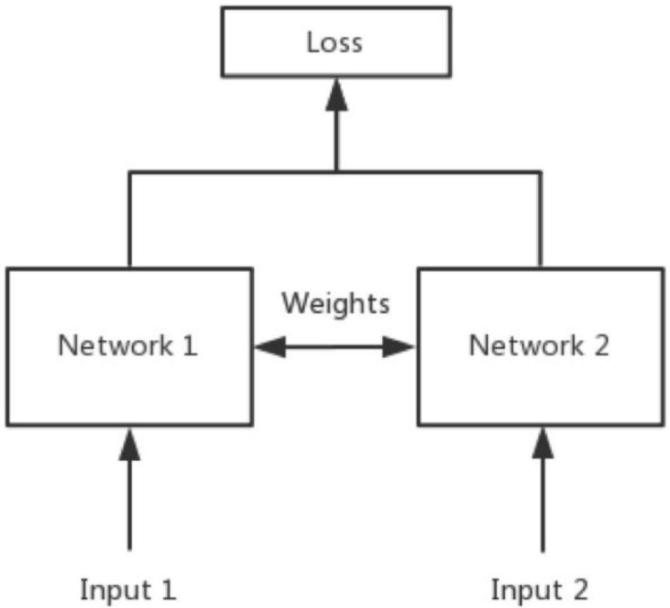
1.1 Siamese Neural Network



1、构造pairs输入，判断输入的两张图片是否是同一类别。

2、分别经过一个网络输出n维的特征，计算Loss。

[Learning a similarity metric discriminatively, with application to face verification]

1.1 Siamese Neural Network

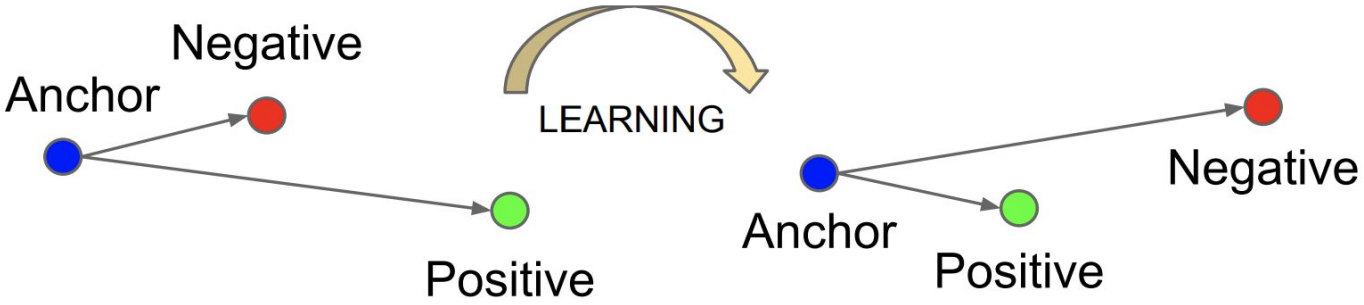
3、Contrastive Loss

$$Constractive\ Loss = (1-Y)\frac{1}{2}dis^2 + Y\frac{1}{2}[max(0,(m-dis))]^2$$

(Y=1, 当两张图片为不同类别)

[Learning a similarity metric discriminatively, with application to face verification]

1.2 Triplet Loss

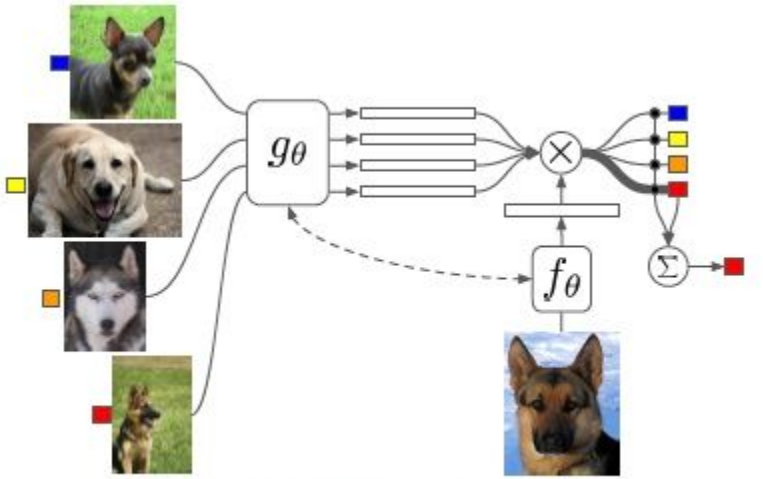


构建三元组训练。

$$\sum_{i}^{N}\left[\|f(x_i^a)-f(x_i^p)\|_2^2-\|f(x_i^a)-f(x_i^n)\|_2^2+\alpha\right]_+$$

FaceNet: A Unified Embedding for Face Recognition and Clustering

1.3 Matching Network



Omniglot数据集，共1623个手写字符，每个字符20个样本。

$$S = \{(x_i, y_i)\}_{i=1}^{k}$$

对测试样本的分类函数是a linear combination of the labels in the support set(attention机制)，即：

$$P(\hat{y}|\hat{x}, S) = \sum_{i=1}^{k} a(\hat{x}, x_i) y_i$$

Matching Networks for One-Shot Learning (2016)

1.3 Matching Network

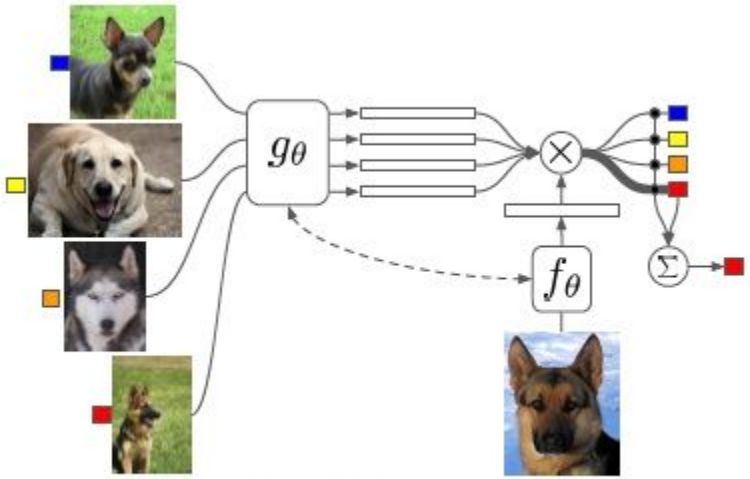


Figure 1: Matching Networks architecture

$$P(\hat{y}|\hat{x}, S) = \sum_{i=1}^{k} a(\hat{x}, x_i) y_i$$

其中，a(.)函数是测试样例和集合样例特征的余弦相似度的`softmax`，即：

$$a(\hat{x}, x_i) = \frac{e^{cosine(f(\hat{x}), g(x_i)))}}{\sum_{j=1}^{k} e^{cosine(f(\hat{x}), g(x_j))}}$$

Matching Networks for One-Shot Learning (2016)

1.4 Relation Network

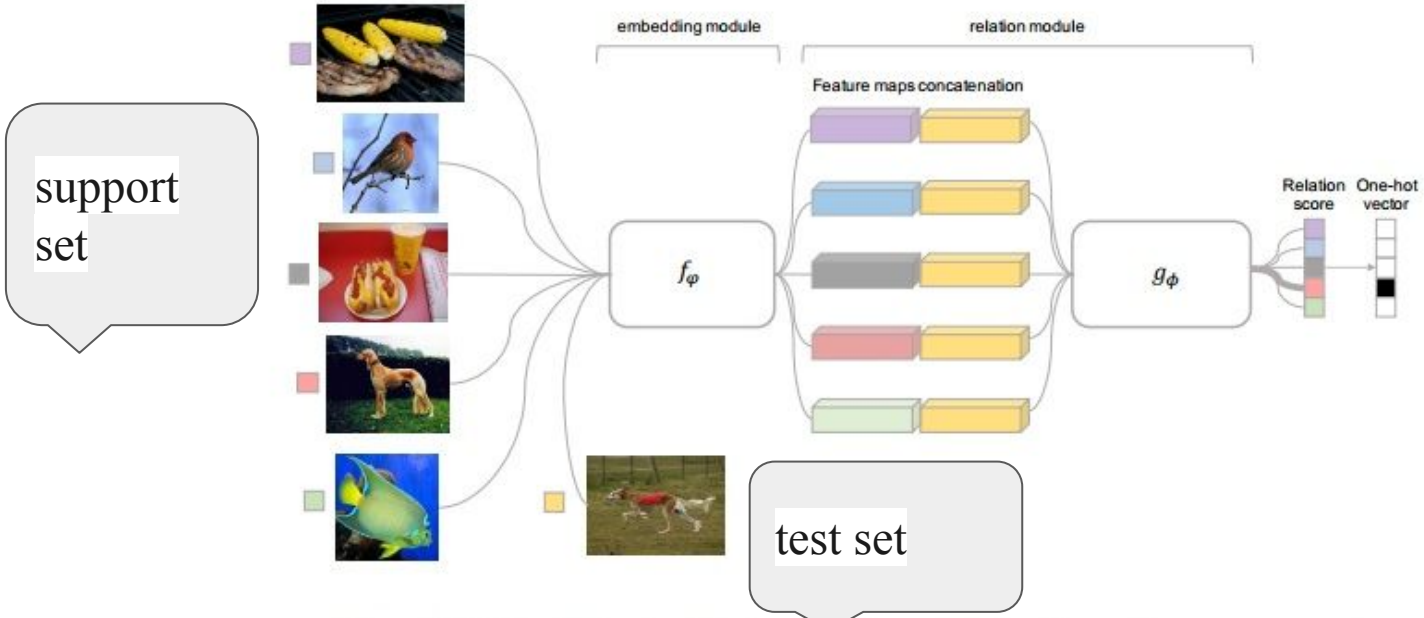


Figure 1: Relation Network architecture for a 5-way 1-shot problem with one query example.

创新点：让神经网络自己去学习一种合适的度量方法来评价样本之间的相似度。

Learning to Compare: Relation Network for Few-Shot Learning (2018)

1.4 Relation Network

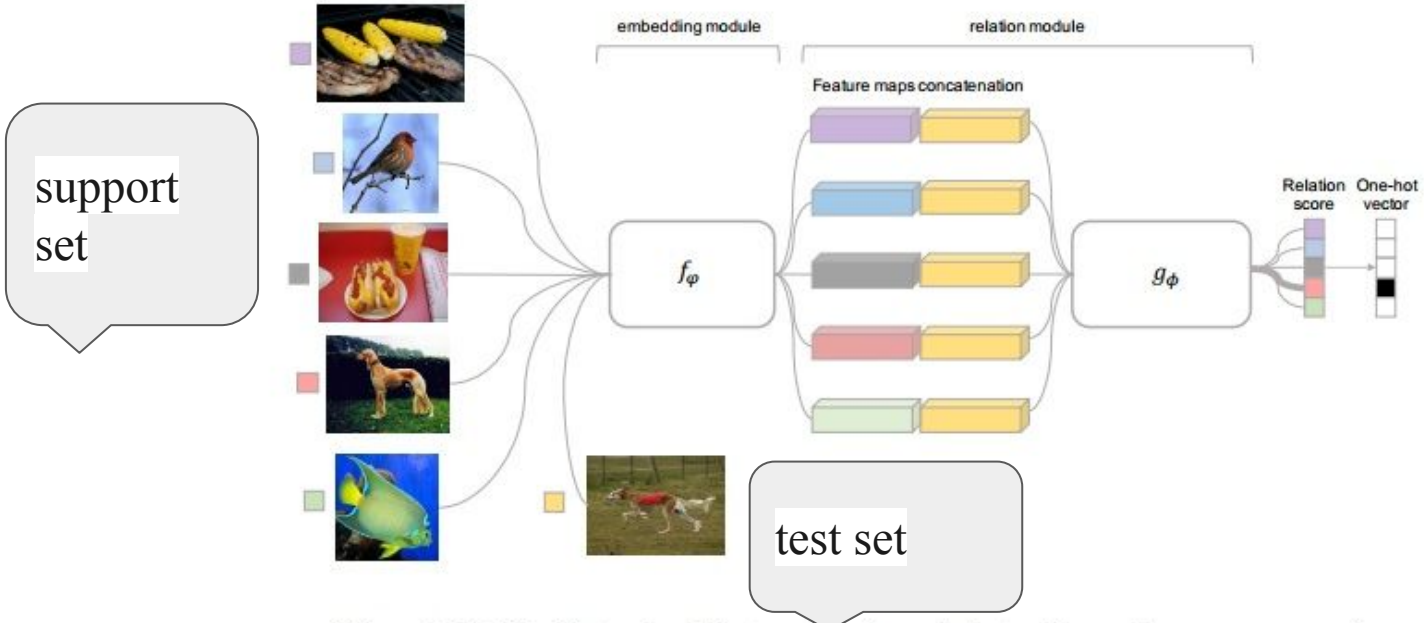


Figure 1: Relation Network architecture for a 5-way 1-shot problem with one query example.

对于包含c个不同的类别，每个类别有k个样本的support set，文中称之为c-way k-shot。如图就是一个5-way 1-shot的结构。

Learning to Compare: Relation Network for Few-Shot Learning (2018)

1.4 Relation Network

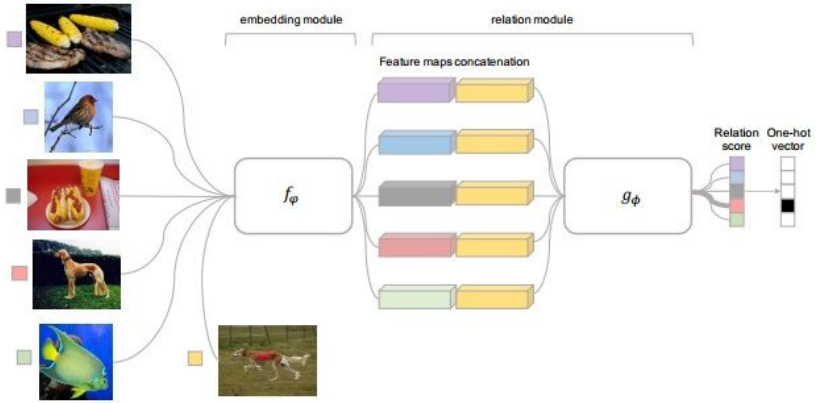


Figure 1: Relation Network architecture for a 5-way 1-shot problem with one query example.

在训练过程中构建的是sample set和query set，用来模拟测试时的support set和test set。

把输出的relation score看做是一个从0到1的数值。0就代表极不相似，而1则代表完全相似。因此就非常直接的平方差MSE作为网络训练的loss。

Learning to Compare: Relation Network for Few-Shot Learning (2018)

1.4 Relation Network

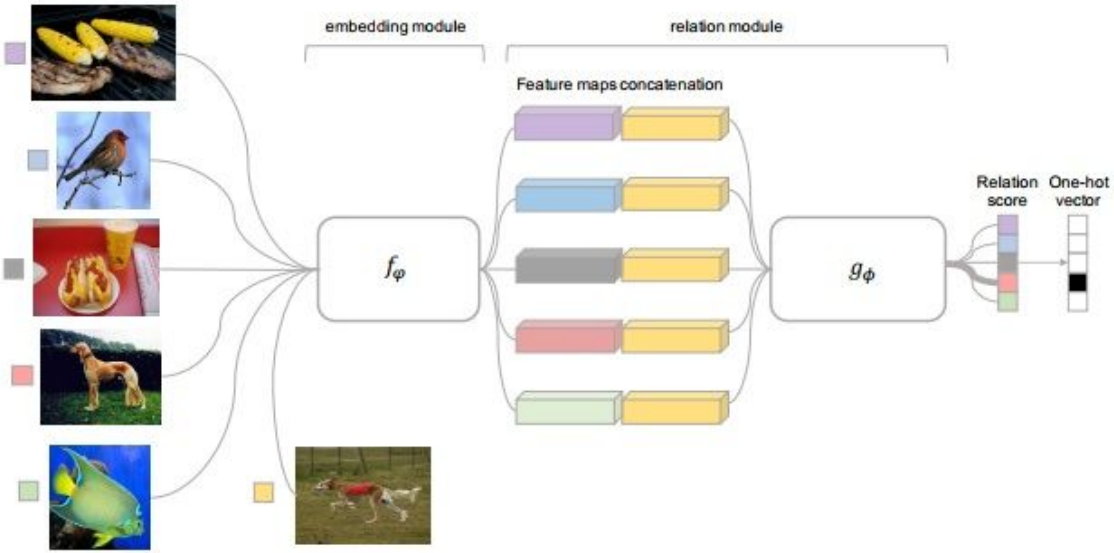


Figure 1: Relation Network architecture for a 5-way 1-shot problem with one query example.

(Zero-Shot Learning Part.)

Learning to Compare: Relation Network for Few-Shot Learning (2018)

谢谢！