



# Prototypical Networks for Few-shot Learning

(Few-shot, One-shot, Zero-shot)

Samsung Software Developer Community

Korea Vision & Robotics

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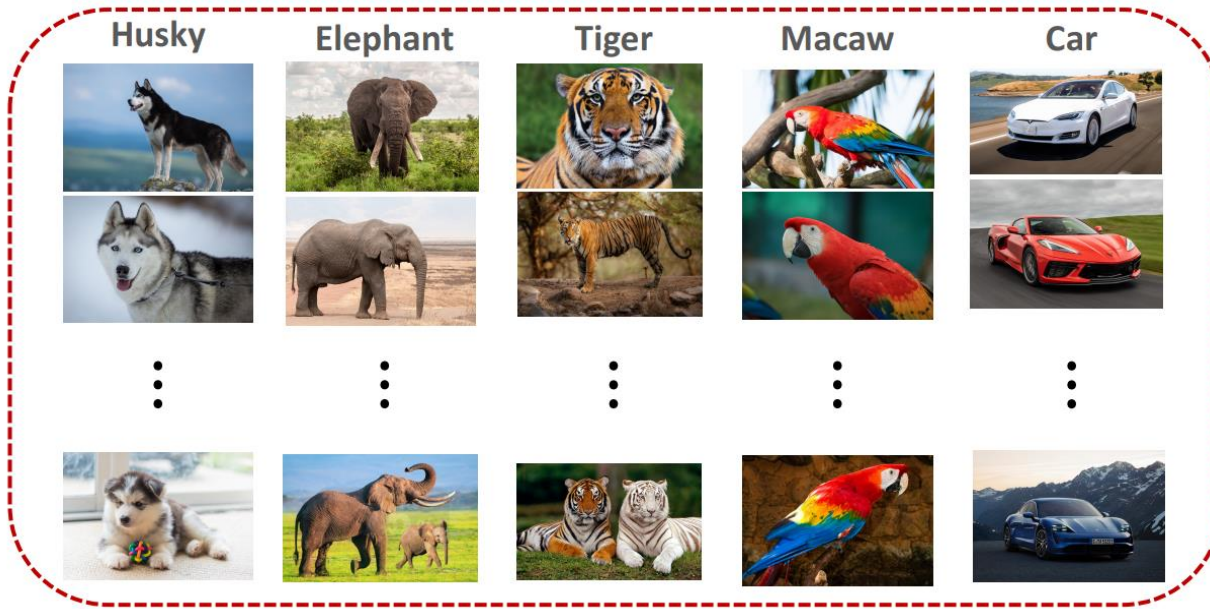
# Contents

- 1. Background**
- 2. Prototypical Networks for few-shot learning**
- 3. Code**

# 1. Background – Few-shot learning ?

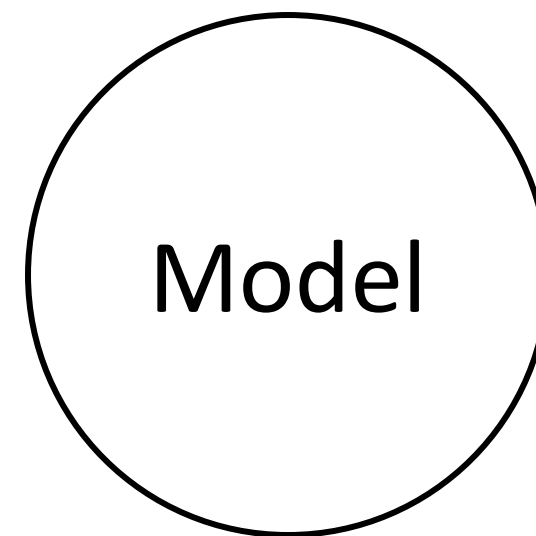
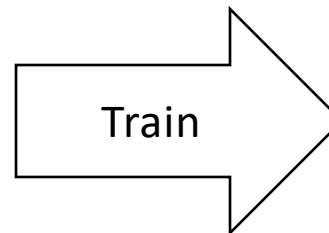
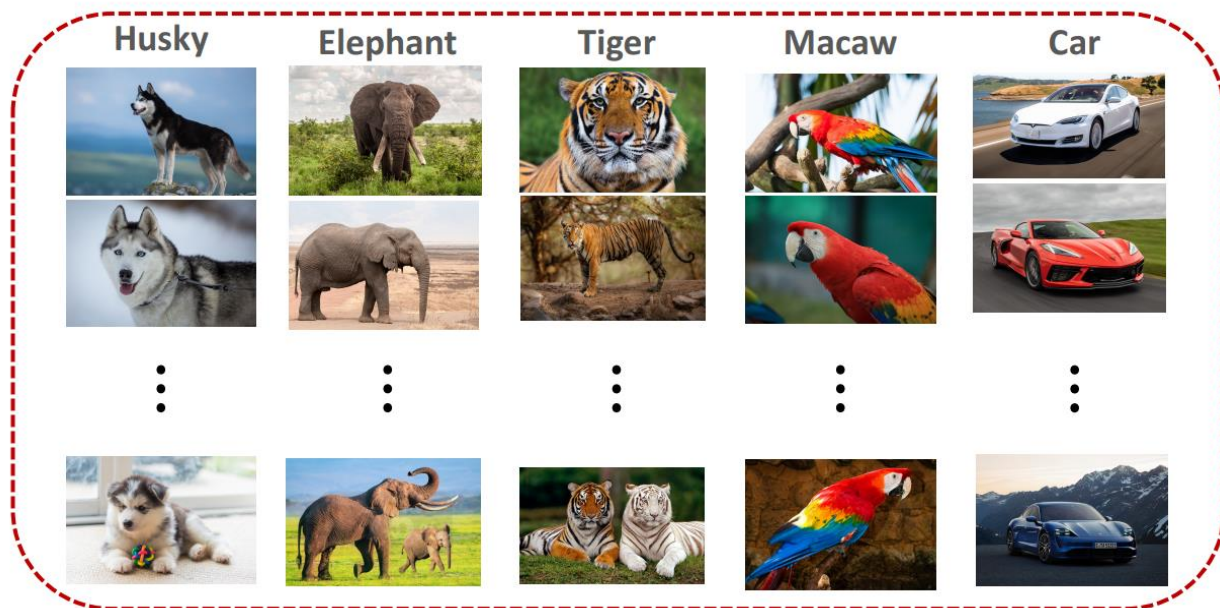
일반적인 Image classification...

## Training Set



# 1. Background – Few-shot learning ?

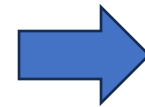
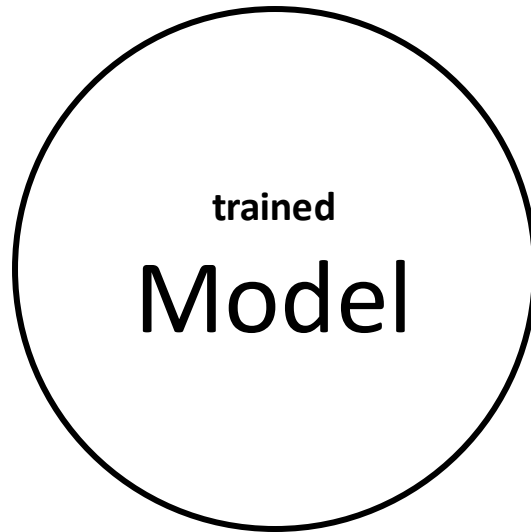
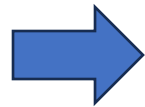
**Training Set**



# 1. Background – Few-shot learning ?



input

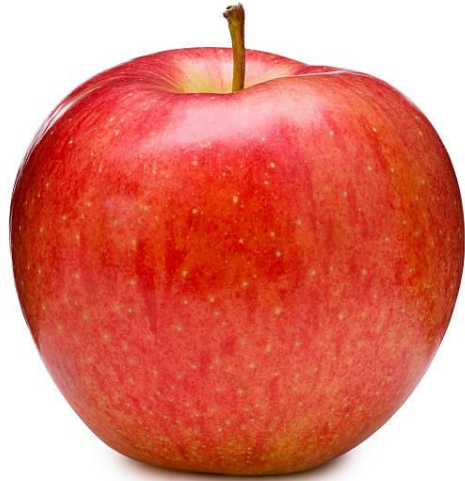


**"Tiger"**

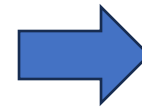
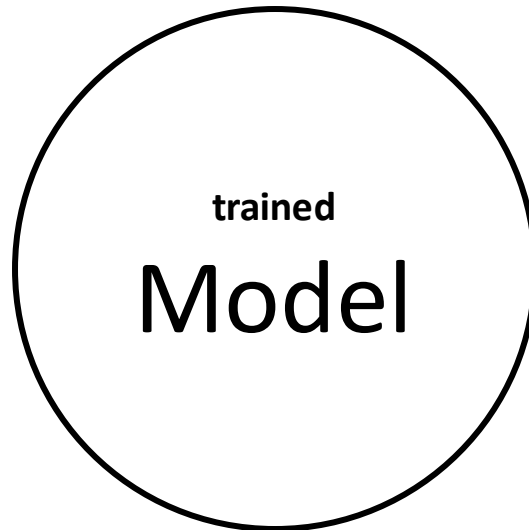
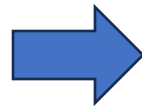
output

# 1. Background – Few-shot learning ?

그러면... 학습데이터에 존재하지 않았던 class 인 input을 넣는다면??



input



???

output



# 1. Background – Few-shot learning ?

앞에서 살펴 본 문제를 해결하기 위한 방법들

## 1. 새롭게 추가 된 class data를 활용하여 추가 학습

- 🖱 일반적으로 Pretrained model을 fine-tune 하는 과정

- 추가 학습시간 소요
- **Catastrophic forgetting** 문제가 발생, 이는 continual learning에서 다루는 핵심 주제

**그리고 만약에 새롭게 추가시킬 data의 수가 적다면???**

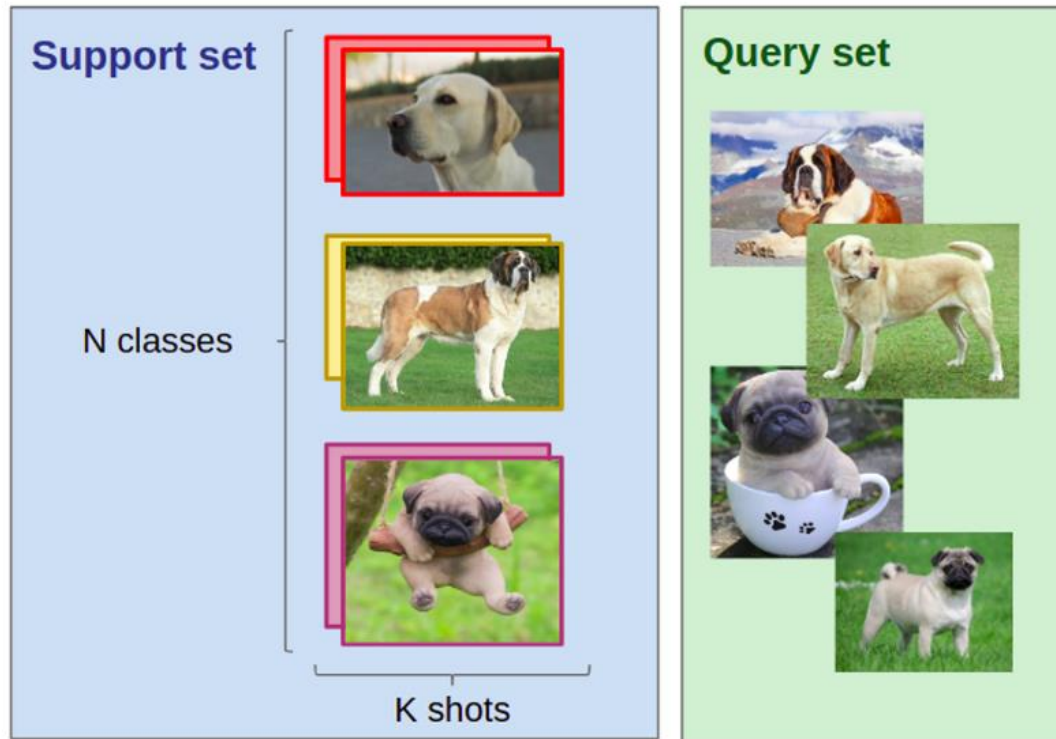
- 해당 data들에 over fitting 되는 문제가 발생

# 1. Background – Few-shot learning ?

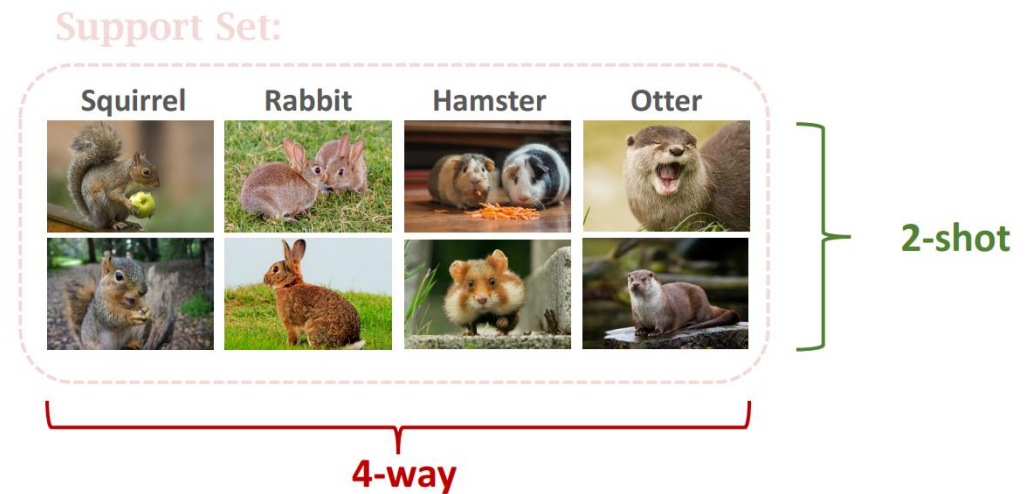
그래서

## 2. Few-shot, Zero-shot, One-shot 방법

### (1) Few-shot learning - Support Set, Query Set 구성



- One shot, Zero shot은 해당 **K**의 수





# 1. Background – Few-shot learning ?

Few-shot learning의 다양한 접근법

## 1.Data-Driven Approach:

- GAN 모델을 활용해서 데이터 추가

## 2.Model-based Approach:

- Support set과 query의 유사도를 학습, 또는 규제를 적용해서 정규화

## 2. Prototypical networks for few-shot learning

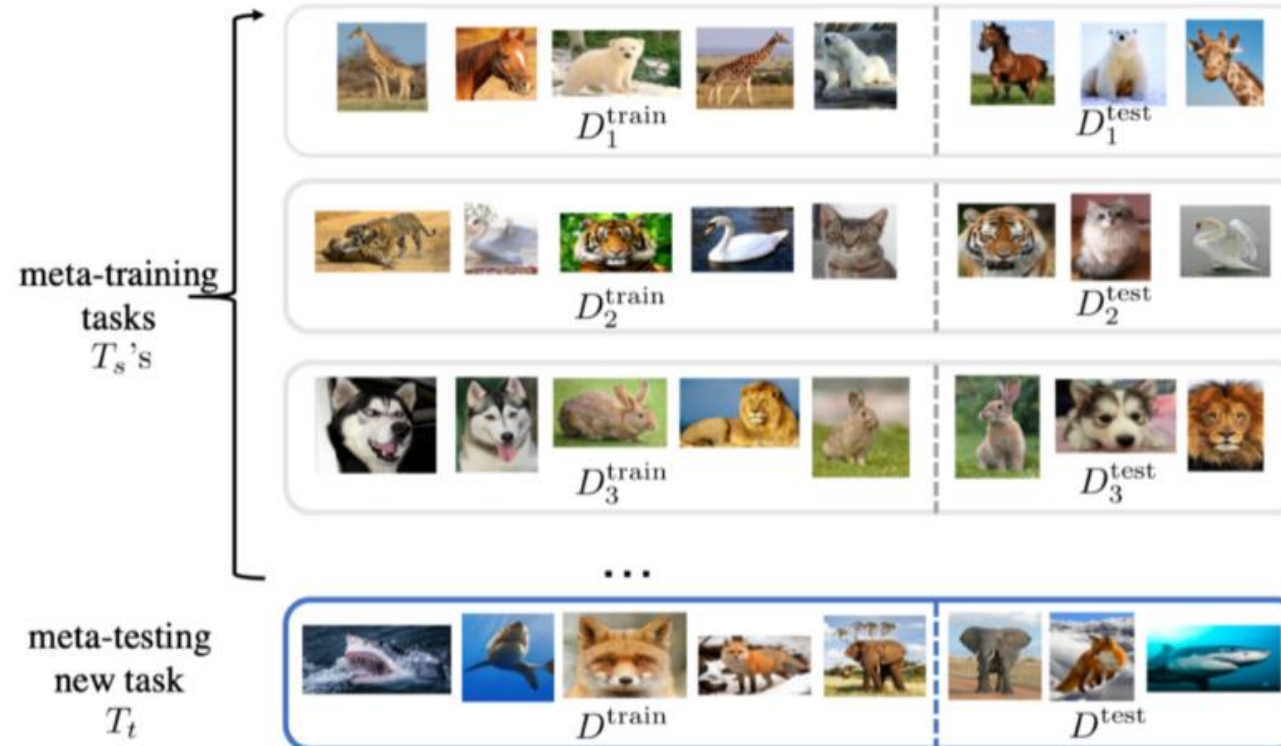
Few-shot learning 이전 연구들

Matching network

<https://arxiv.org/abs/1606.04080>

□ Episodes 학습

- 각 미니 배치마다



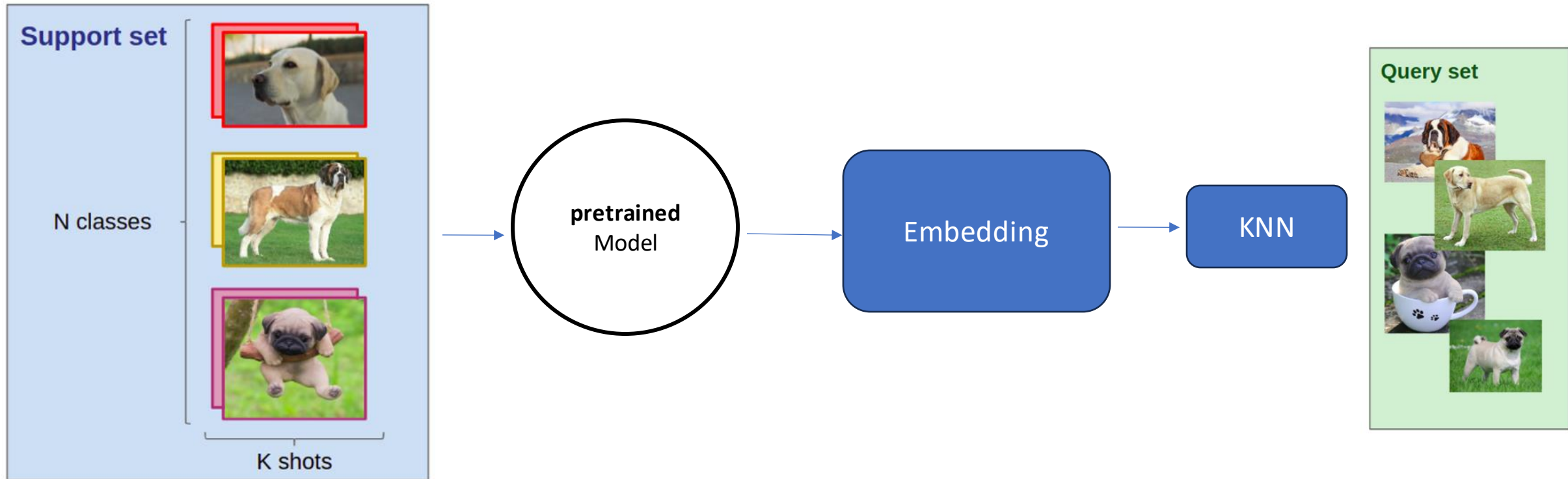
원래 모델을 학습시켰던,  
Basedataset에서  
Subsample해서  
support와 query 구성

## 2. Prototypical networks for few-shot learning

Few-shot learning 이전 연구들

Matching  
network

<https://arxiv.org/abs/1606.04080>



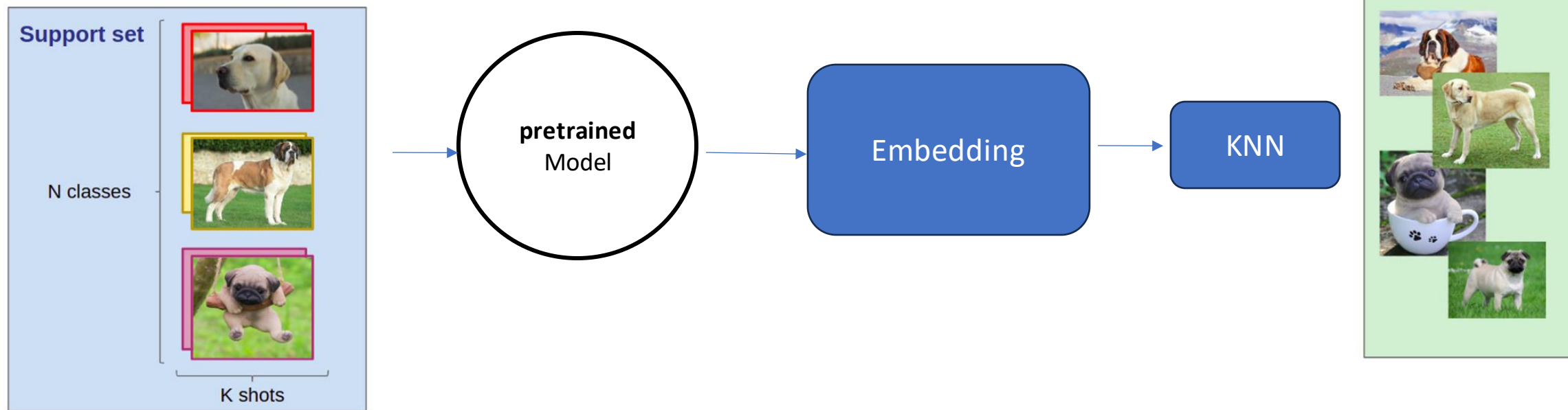
## 2. Prototypical networks for few-shot learning

Few-shot learning 이전 연구들

OPTIMIZATION AS A MODEL FOR FEW-SHOT LEARNING

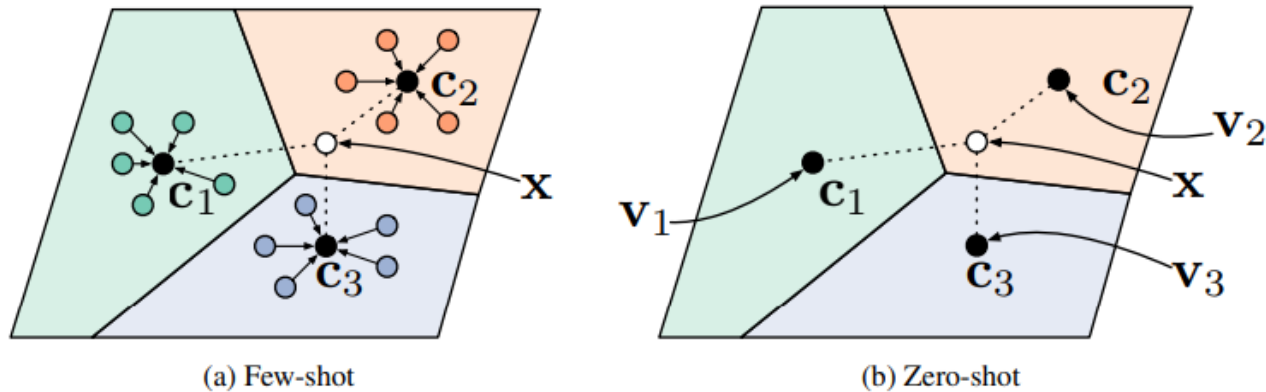
<https://openreview.net/pdf?id=rJY0-KcII>

**LSTM**



## 2. Prototypical networks for few-shot learning

본 논문에서는 과적합을 방지하는 모델인 prototypical network 제시



(1) Few-shot

prototype 표현을 중심으로  
주변에 모여있는 포인트들의 임베딩이 존재

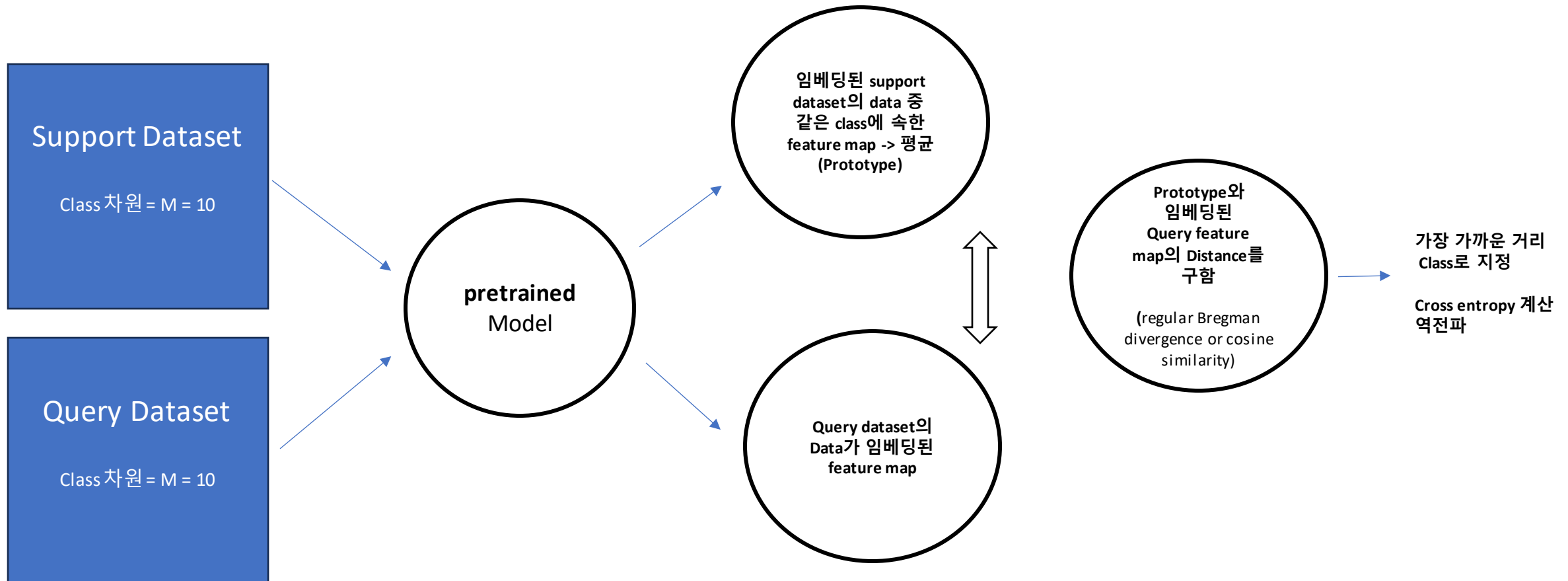
따라서 해당 support set의 포인트들의 평균 ->  
해당 클래스의 포인트다  
(support set의 임베딩 차원의 평균으로 표현)

(2) Zero-shot

Meta-learning 활용, 단순한 class 보다 메타  
정보활용 -> 이를 하나의 포인트로 맵핑

## 2. Prototypical networks for few-shot learning

### Pipeline





# 3. Code

[https://colab.research.google.com/github/sicara/easy-few-shot-learning/blob/master/notebooks/my\\_first\\_few\\_shot\\_classifier.ipynb#scrollTo=oXZTplhwoS0Z](https://colab.research.google.com/github/sicara/easy-few-shot-learning/blob/master/notebooks/my_first_few_shot_classifier.ipynb#scrollTo=oXZTplhwoS0Z)

## 4. 참고자료

- code : [https://colab.research.google.com/github/sicara/easy-few-shot-learning/blob/master/notebooks/my\\_first\\_few\\_shot\\_classifier.ipynb#scrollTo=oXZTplhwoS0Z](https://colab.research.google.com/github/sicara/easy-few-shot-learning/blob/master/notebooks/my_first_few_shot_classifier.ipynb#scrollTo=oXZTplhwoS0Z)
- paper : <https://arxiv.org/pdf/1703.05175.pdf>
- [https://zzaebok.github.io/machine\\_learning/FSL/](https://zzaebok.github.io/machine_learning/FSL/)
- <https://blog.si-analytics.ai/3>