

# 반려동물

## 건강관리 서비스:

# 펫닥터



# PetDoctor

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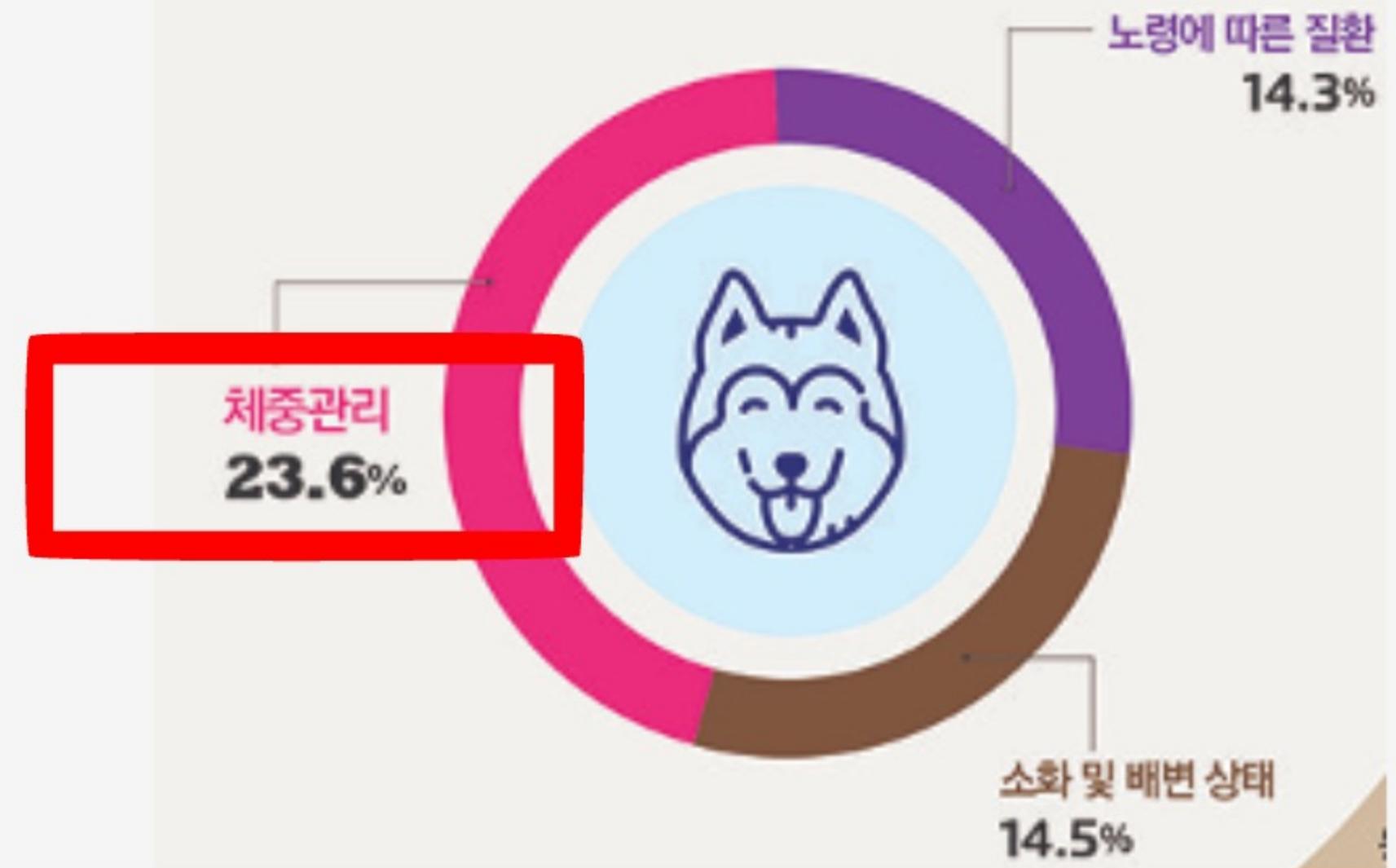
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### ♣ 반려견 건강 중 가장 우려하는 항목



### 반려견 비만에 대한 우려



## 반려동물 치료비 지출 증가

## 프로젝트 배경/필요성



## 반려동물 주인들의 경제적 합리성 추구

## 프로젝트 배경/필요성



동물 관련 정보 수집에 인터넷 검색 비율 높음

반려견 비만에 대한 우려

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사진 촬영 → AI분석만으로  
반려동물 건강관리가 가능하다면  
경제적 합리성을 충족시킬 것

반려동물 치료비 지출 증가

반려동물 주인들의 경제적 합리성 추구

## 반려동물 카테고리 모바일 앱 사용자 연령 비중 분석

(단위:%)

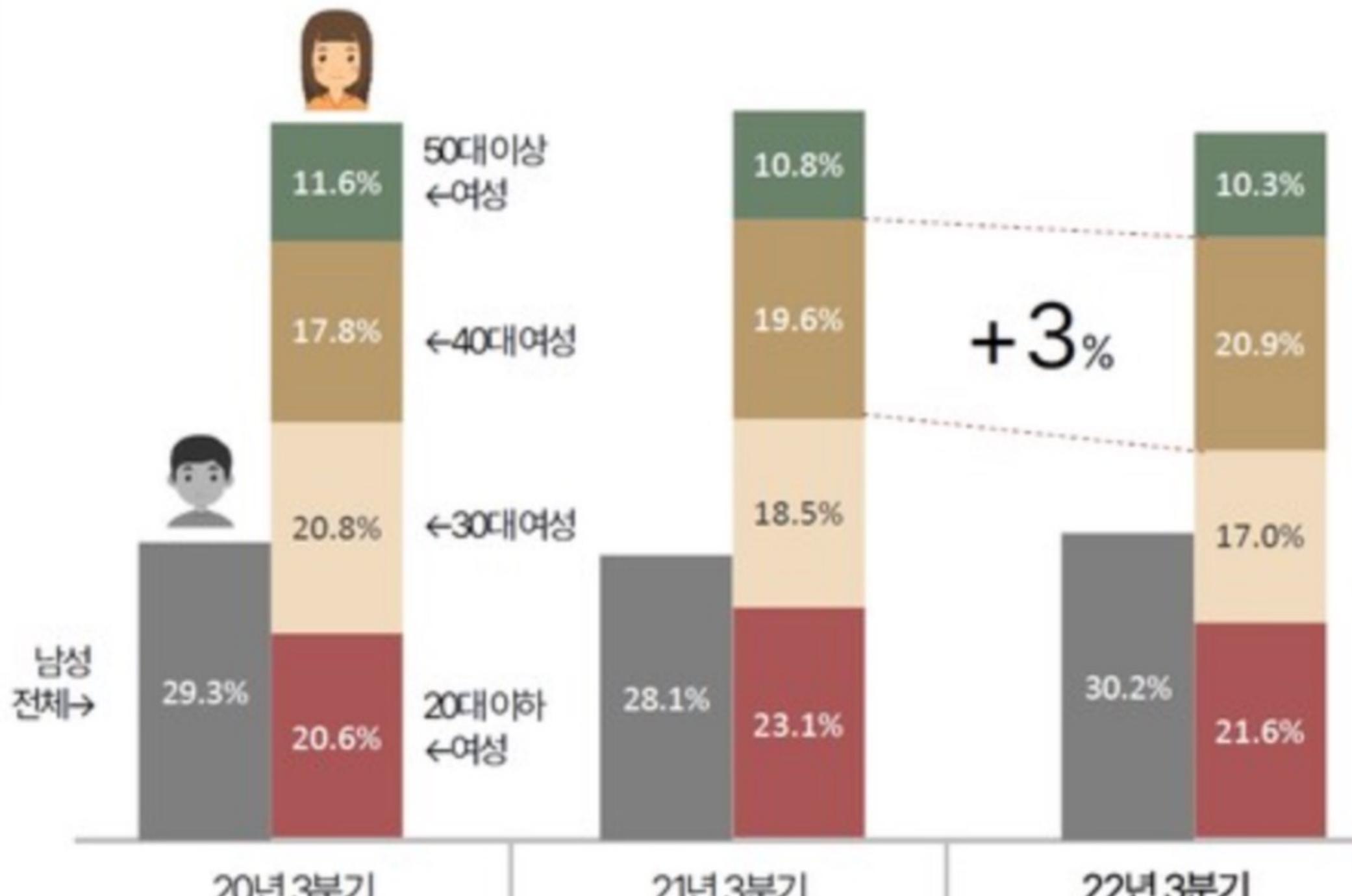


사진 촬영 → AI분석만으로  
반려동물 건강관리가 가능하다면  
경제적 합리성을 충족시킬 것

+MZ세대 여성의 니즈를 충족시켜야 한다.

반려동물 주인들의 경제적 합리성 추구

사진 촬영 → AI분석만으로  
반려동물 건강관리가 가능하다면  
경제적 합리성을 충족시킬 것

내 반려동물의 기록을  
야기자기하고 감성적으로 기록할 수 있어야 할 것

# 프로젝트 데모

Project Demo

# 핵심 기능

- BCS(비만도) 진단
- 피부 질환 진단
- 기록 확인하기

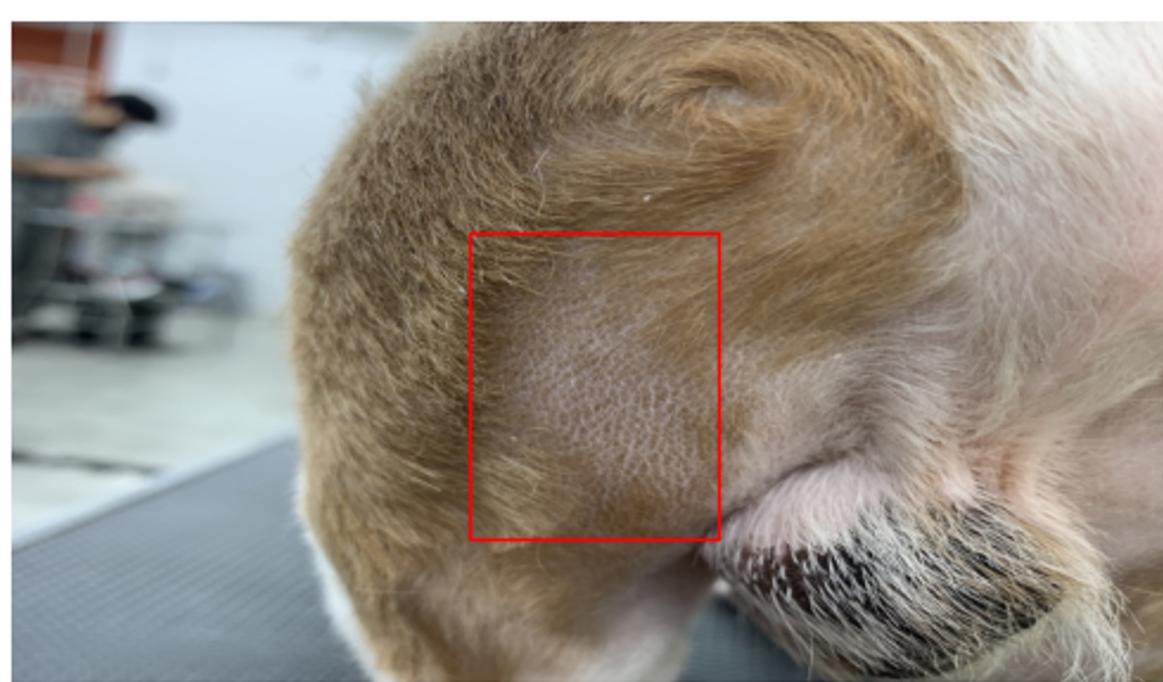


# Dataset preparation

구진, 플라크



비듬, 각질, 상피성 잔고리



태선화, 과다색소침착



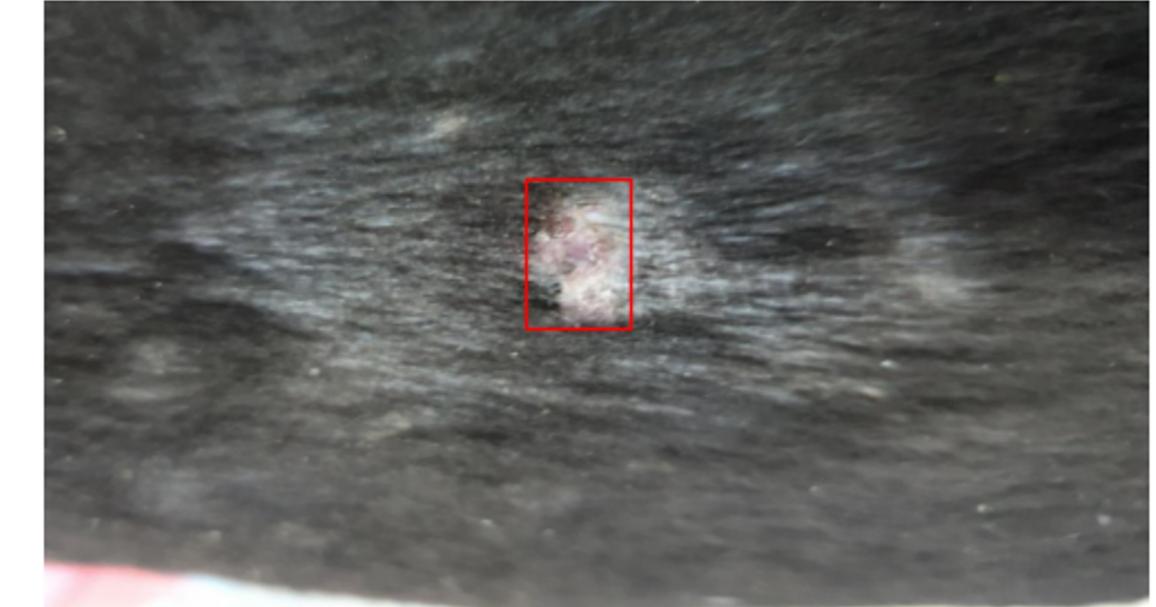
농포, 여드름



미란, 궤양

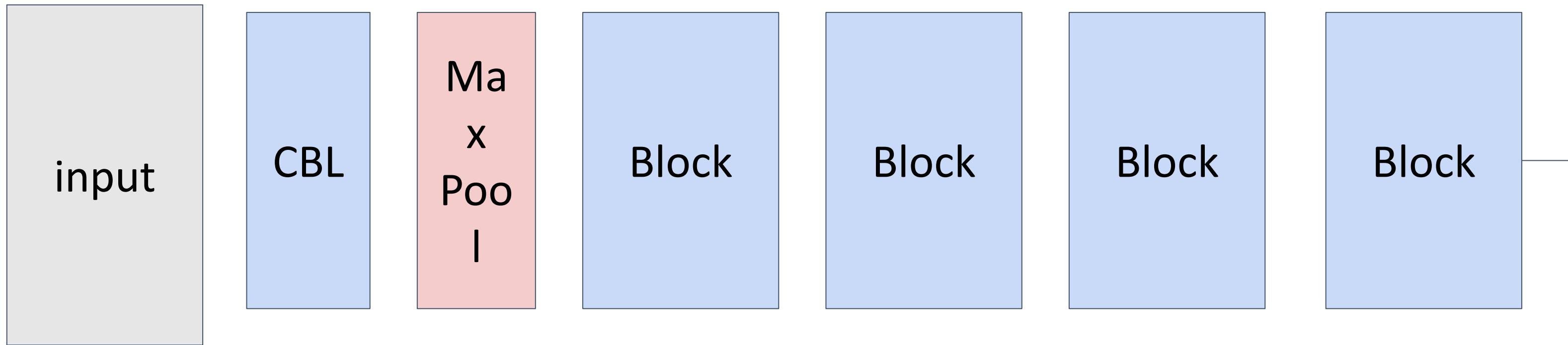
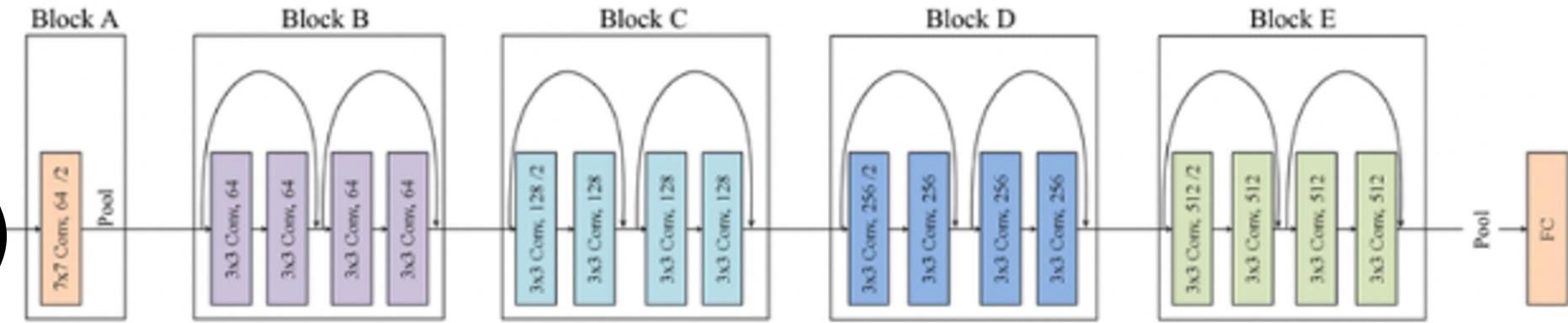


결절, 종괴

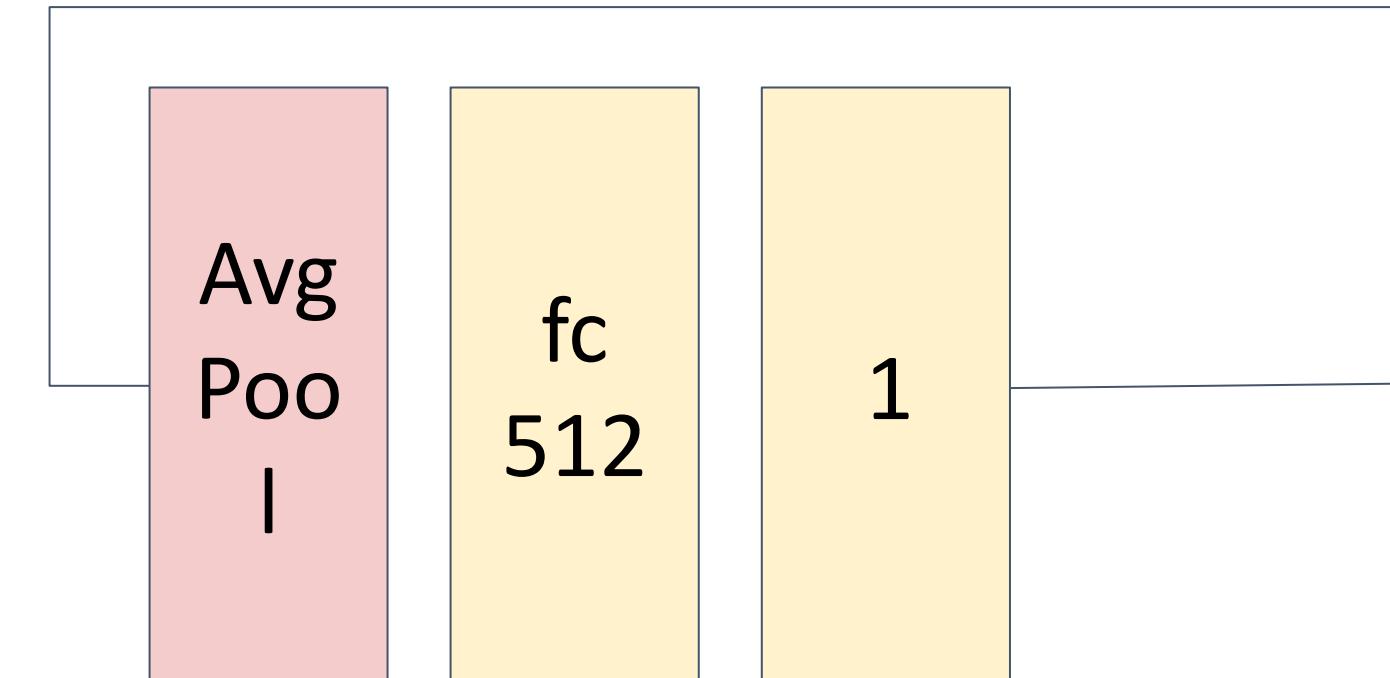


# model

ResNet-18 ( Binary Classification)



Bx3x64x64



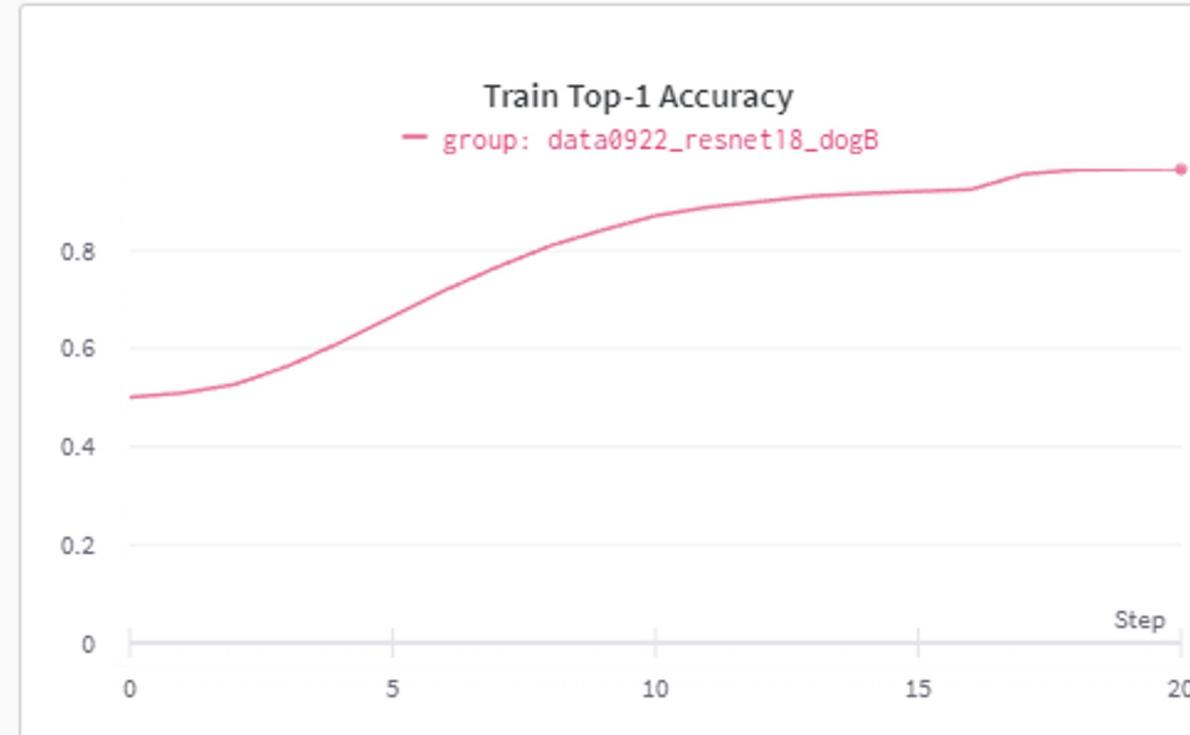
# Train

learning rate	1e-3	Loss	BinaryCrossEntropy
epoch	100 (1epoch:5h)	optimizer	Adam
batch_size	64	scheduler	ReduceLROnPlateau

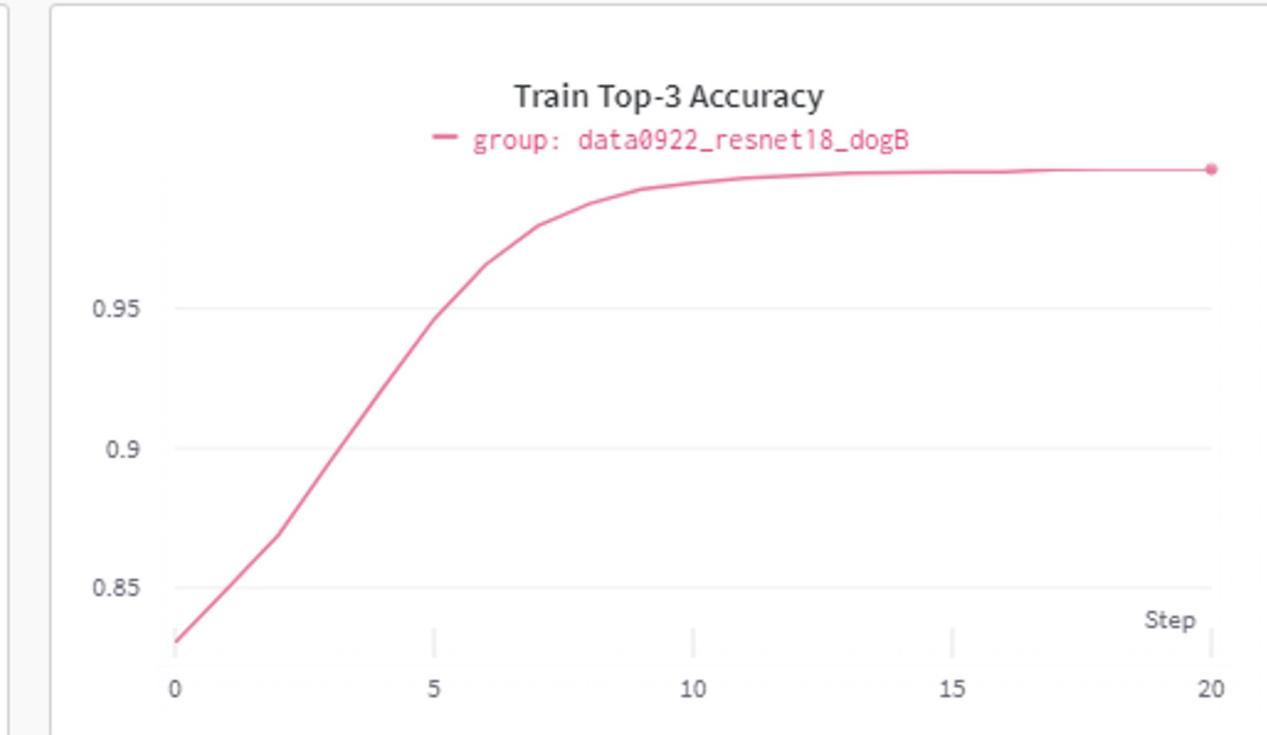
Train Loss  
— group: data0922\_resnet18\_dogB



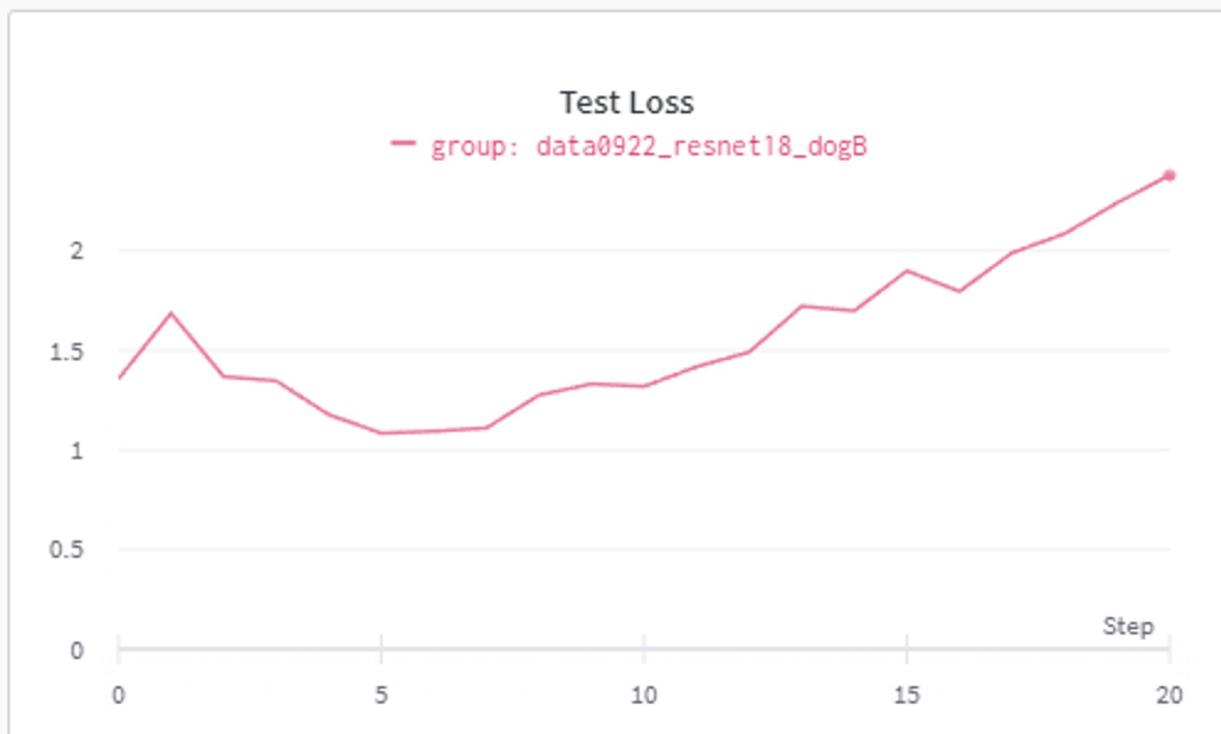
Train Top-1 Accuracy  
— group: data0922\_resnet18\_dogB



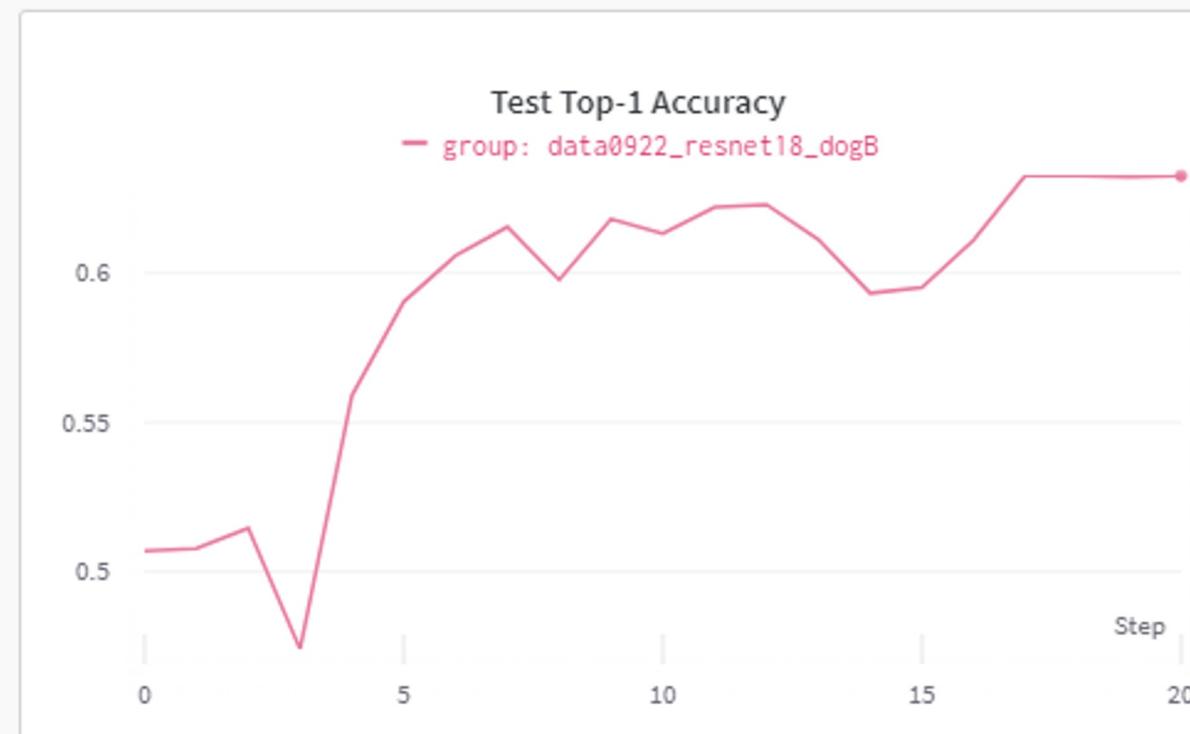
Train Top-3 Accuracy  
— group: data0922\_resnet18\_dogB



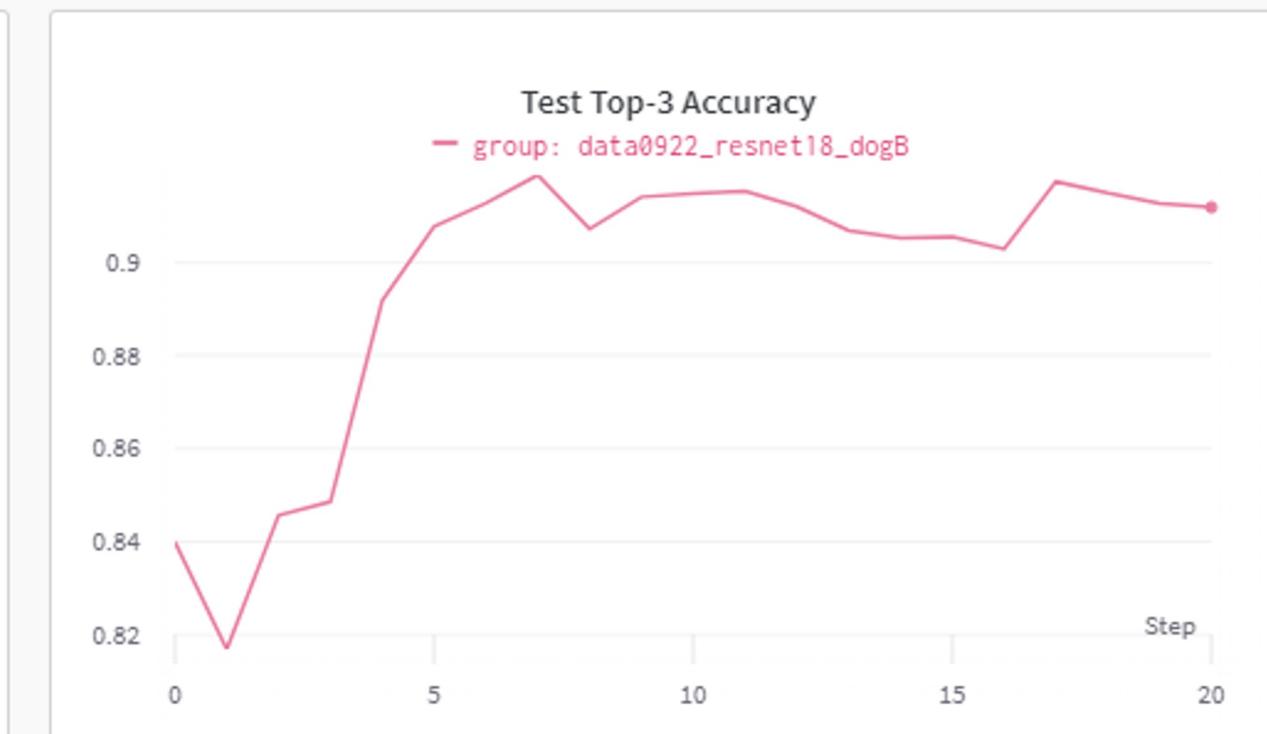
Test Loss  
— group: data0922\_resnet18\_dogB



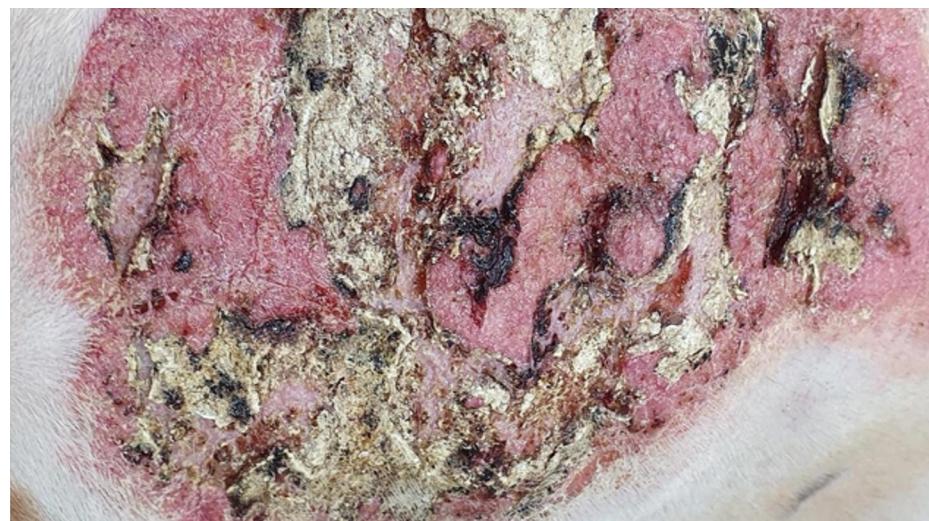
Test Top-1 Accuracy  
— group: data0922\_resnet18\_dogB

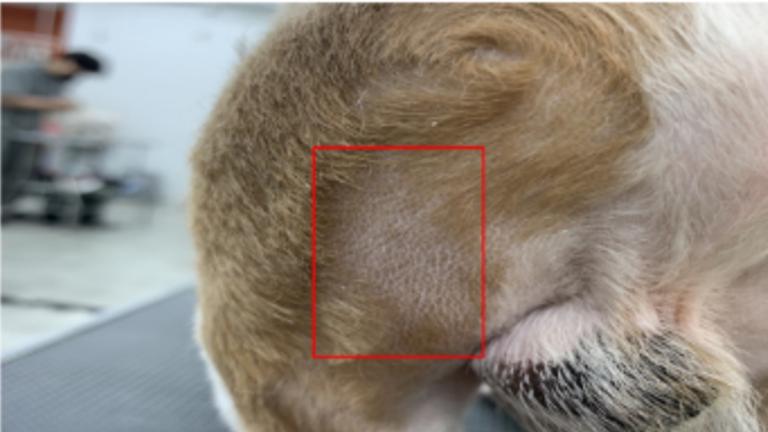
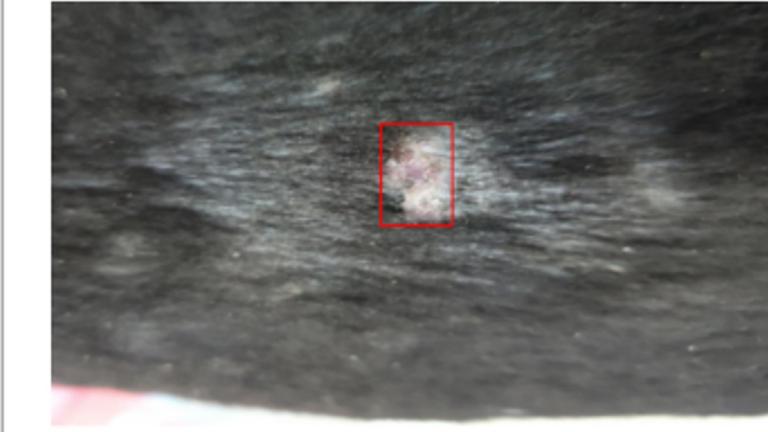


Test Top-3 Accuracy  
— group: data0922\_resnet18\_dogB



# Inference



구진, 플라크	비듬, 각질, 상피성 잔고리	태선화, 과다색소침착
		
농포, 여드름	미란, 궤양	결절, 종괴
		

# BCS란?

BMI : kg / m<sup>2</sup> (체질량 지수) 인간의 비만 판정 지표

BCS : Body Condition Score (신체 충실 지수) 가축의 비만 판정 지표

측정 방법 : 외형으로 평가한다. 만져보기, 위에서 보기, 옆에서 보기

## Body Condition Scoring (BCS) Systems

Point	Point	Description	Point	Point	Description
1/5	1/9	<b>Dogs:</b> Ribs, lumbar vertebrae, pelvic bones and all bony prominences evident from a distance. No discernible body fat. Obvious loss of muscle mass. <b>Cats:</b> Ribs visible on short-haired cats; no palpable fat; severe abdominal tuck; lumbar vertebrae and wings of ilia obvious and easily palpable.	3.5/5	6/9	<b>Dogs:</b> Ribs palpable with slight excess fat covering. Waist is discernible viewed from above but is not prominent. Abdominal tuck apparent. <b>Cats:</b> Shared characteristics of BCS 5 and 7.
1.5/5	2/9	<b>Dogs:</b> Ribs, lumbar vertebrae and pelvic bones easily visible. No palpable fat. Some evidence of other bony prominence. Minimal loss of muscle mass. <b>Cats:</b> Shared characteristics of BCS 1 and 3.	4/5	7/9	<b>Dogs:</b> Ribs palpable with difficulty; heavy fat cover. Noticeable fat deposits over lumbar area and base of tail. Waist absent or barely visible. Abdominal tuck may be present. <b>Cats:</b> Ribs not easily palpable with moderate fat covering; waist poorly distensible; obvious rounding of abdomen; moderate abdominal fat pad.
2/5	3/9	<b>Dogs:</b> Ribs easily palpated and may be visible with no palpable fat. Tops of lumbar vertebrae visible. Pelvic bones becoming prominent. Obvious waist. <b>Cats:</b> Ribs easily palpable with minimal fat covering; lumbar vertebrae obvious; obvious waist behind ribs; minimal abdominal fat.	4.5/5	8/9	<b>Dogs:</b> Ribs not palpable under very heavy fat cover, or palpable only with significant pressure. Heavy fat deposits over lumbar area and base of tail. Waist absent. No abdominal tuck. Obvious abdominal distension may be present. <b>Cats:</b> Shared characteristics of BCS 7 and 9.
2.5/5	4/9	<b>Dogs:</b> Ribs easily palpable, with minimal fat covering. Waist easily noted, viewed from above. Abdominal tuck evident. <b>Cats:</b> Shared characteristics of BCS 3 and 5.	5/5	9/9	<b>Dogs:</b> Massive fat deposits over thorax, spine and base of tail. Waist and abdominal tuck absent. Fat deposits on neck and limbs. Obvious abdominal distension. <b>Cats:</b> Ribs not palpable under heavy fat cover; heavy fat deposits over lumbar area, face and limbs; distention of abdomen with no waist; extensive abdominal fat pad.
3/5	5/9	<b>Dogs:</b> Ribs palpable without excess fat covering. Waist observed behind ribs when viewed from above. Abdomen tucked up when viewed. <b>Cats:</b> Well proportioned; waist observed behind ribs; ribs palpable with slight fat covering; abdominal fat pad minimal.			

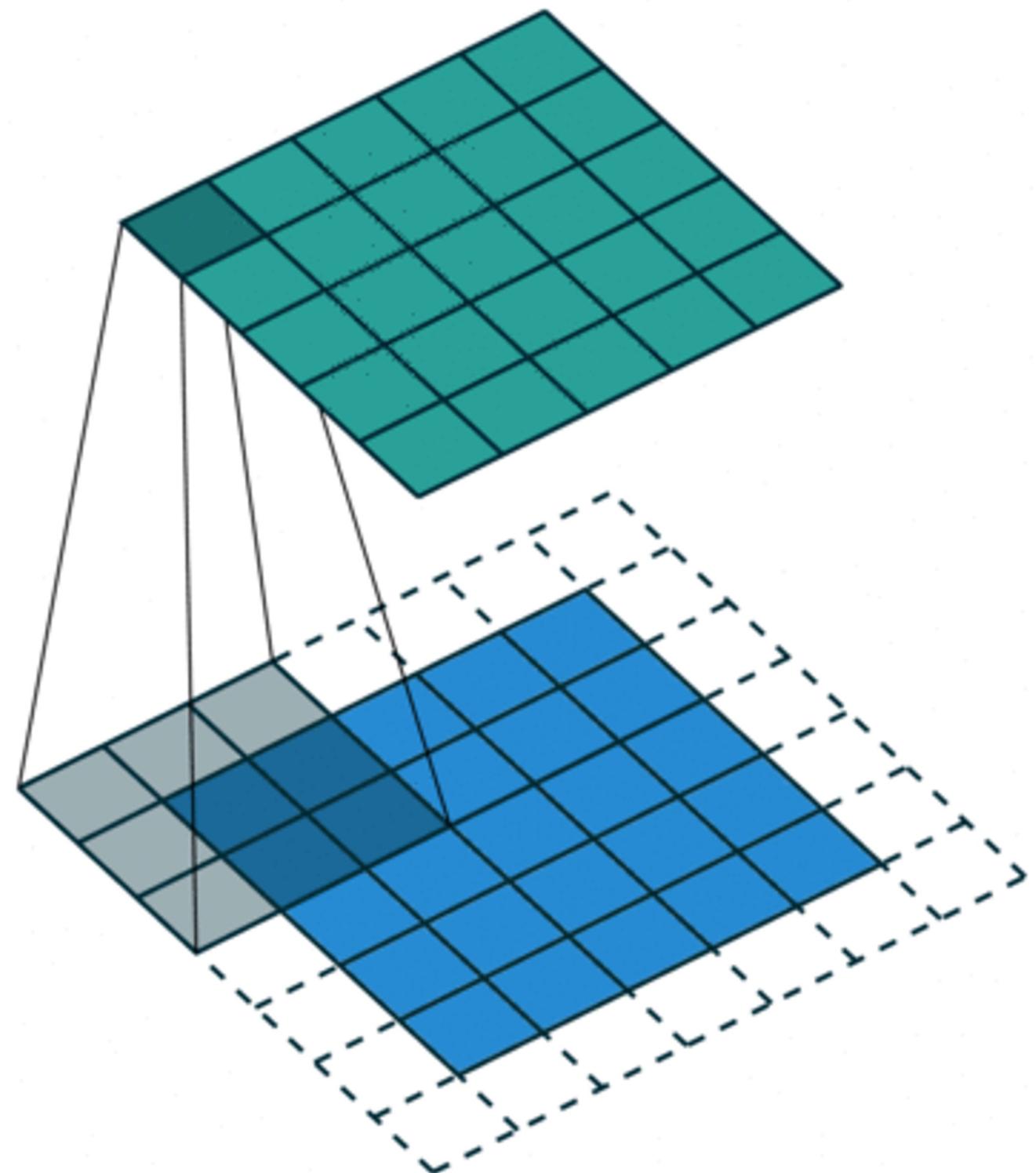
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Available at aaah.org/PublicDocuments/NutritionalAssessmentGuidelines.pdf

# Data

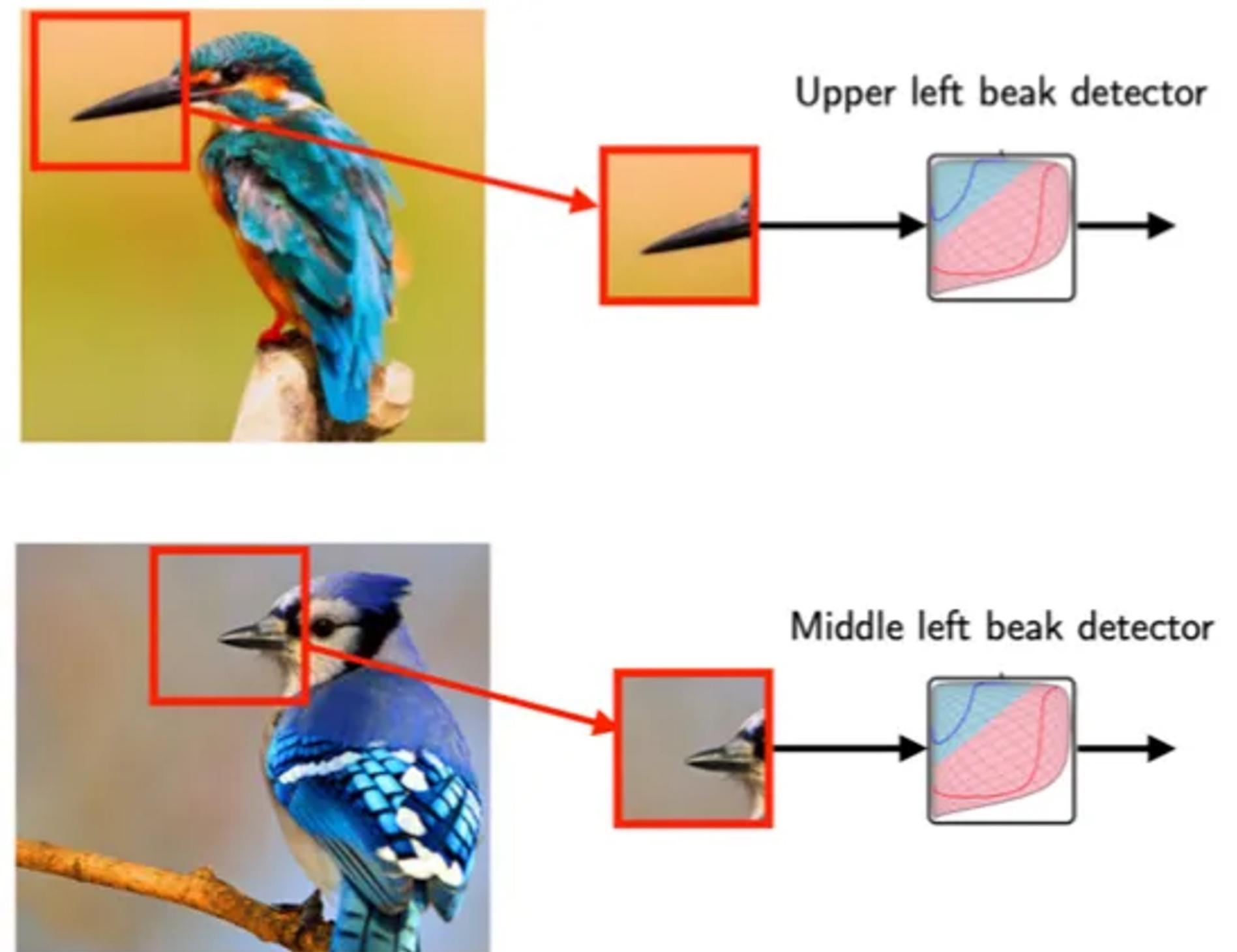


BCS 5인 강아지의 전신 사진

# 2D CNN

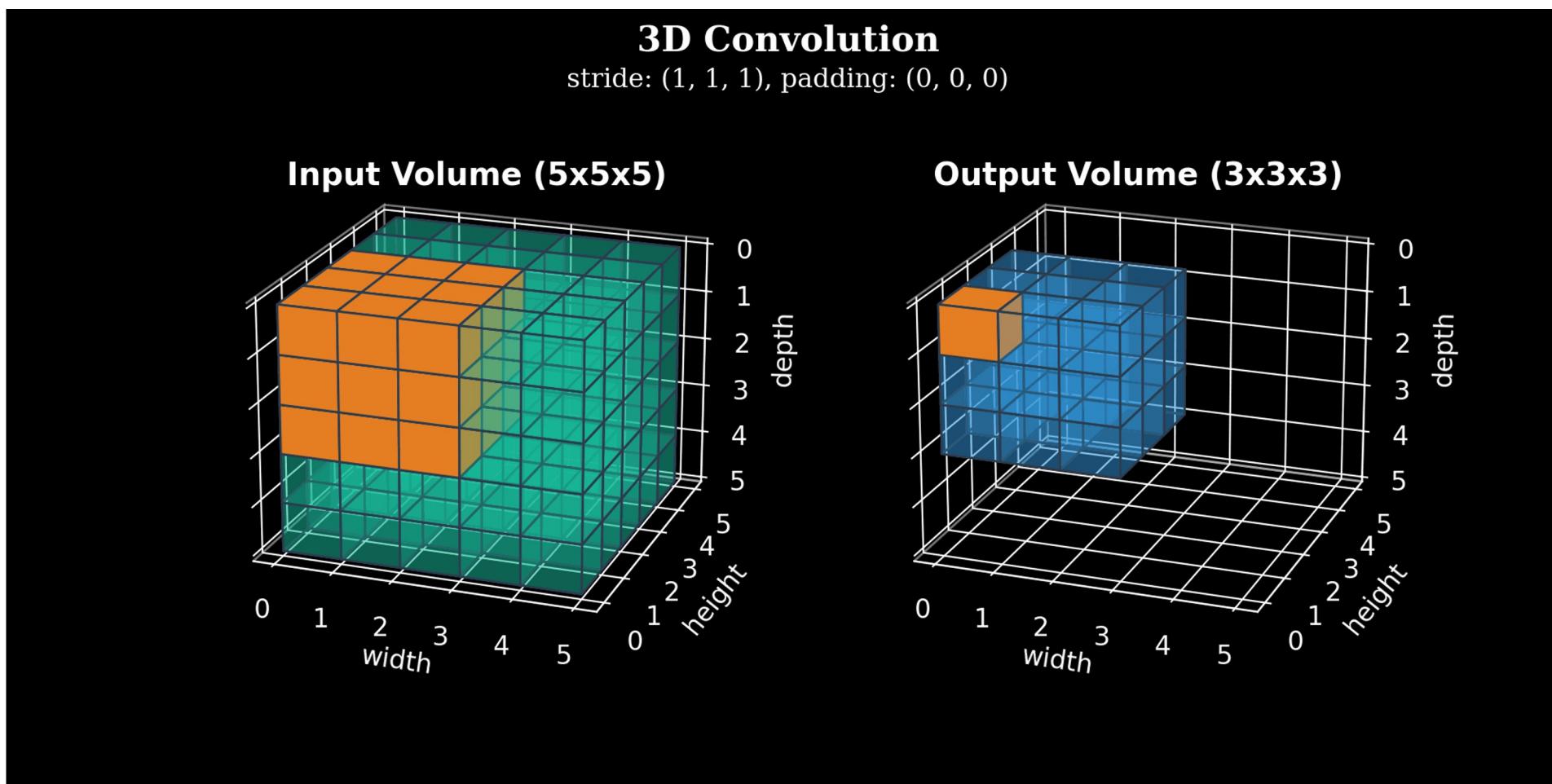


2D convolution



새 판별

# 3D CNN

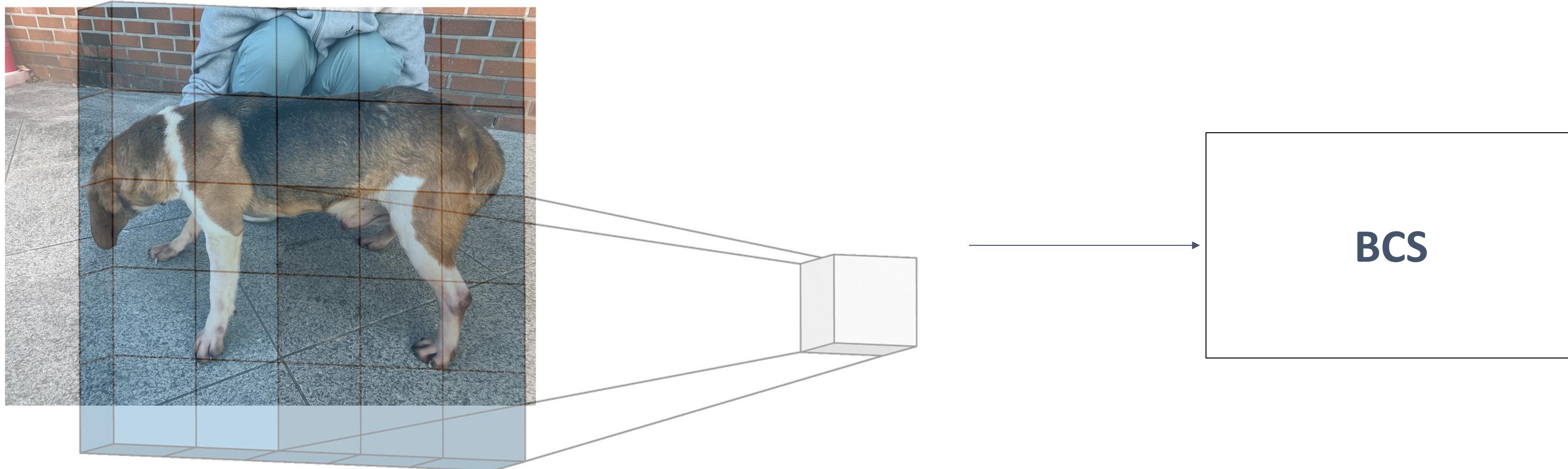


3D convolution



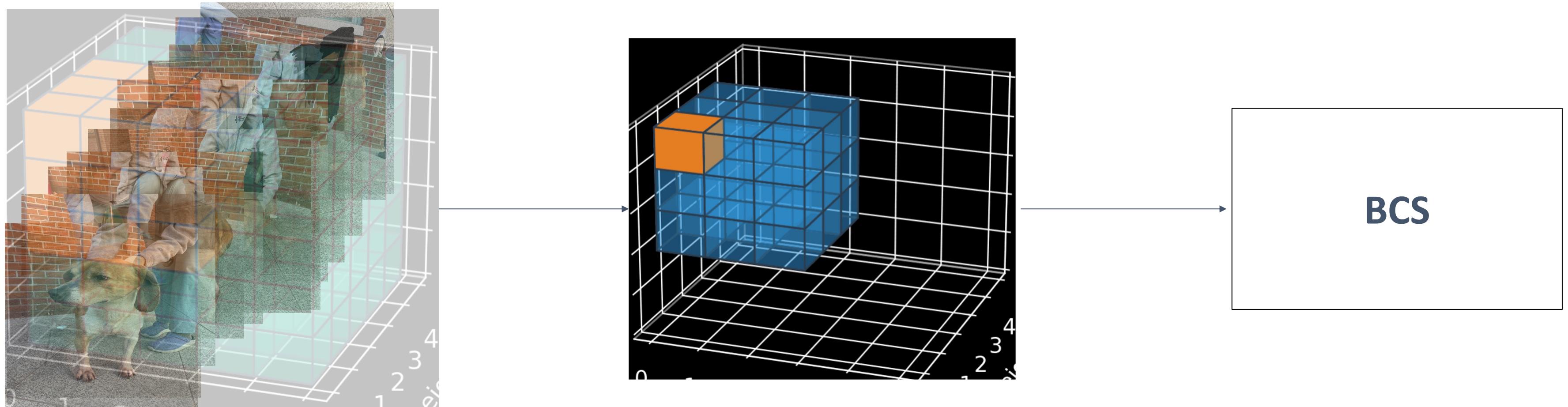
CT Image

# Method 2D CNN



강아지의 팔, 몸통, 다리 특징을 학습하여 강아지 또는 비만도 판별

# Method 3D CNN

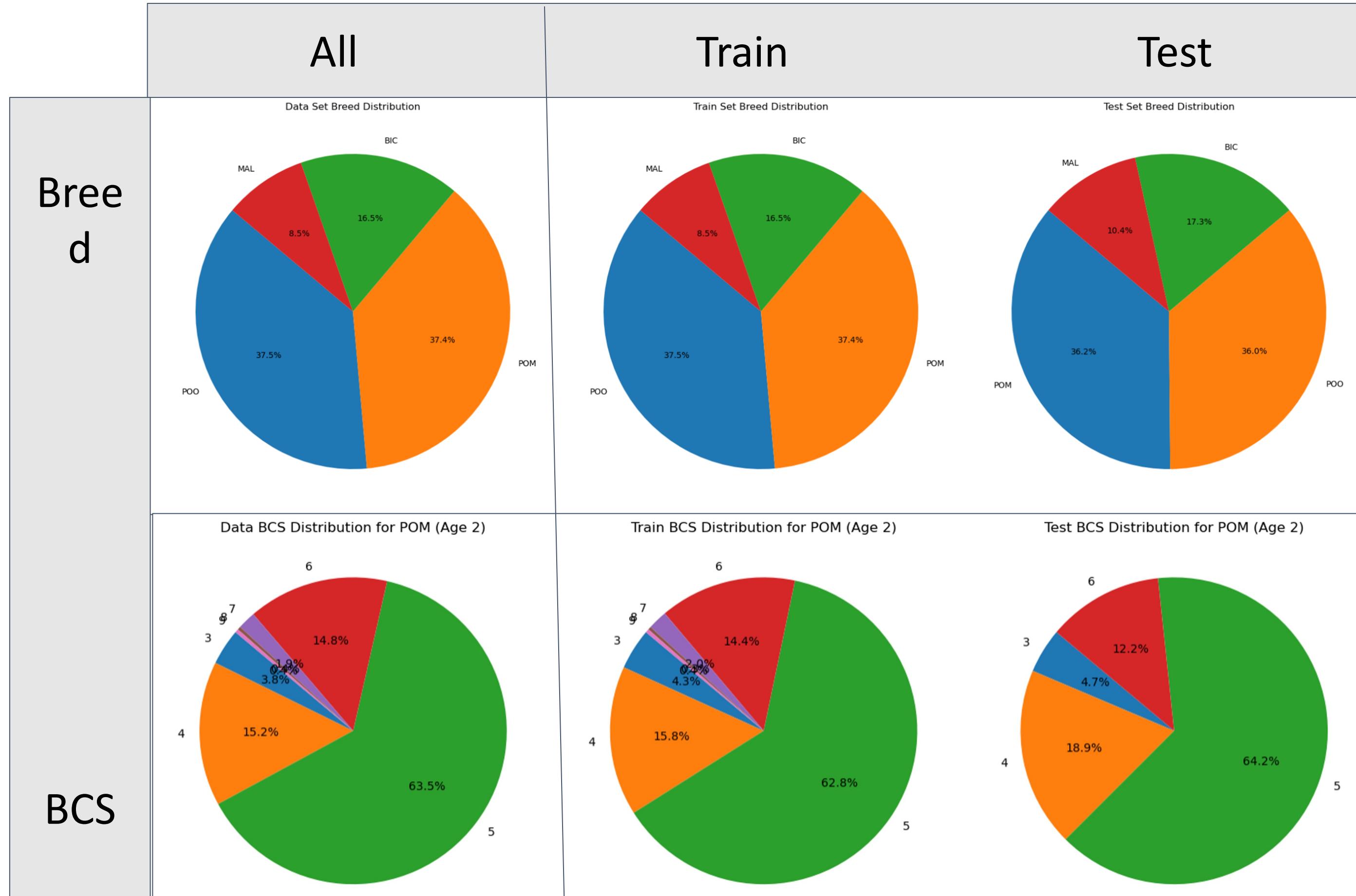


강아지의 입체적 특징을 학습하여 비만도 판별

# Problem

1. Data Analysis	2. Model	3. Data Imbalance	4. regression
5. Data Lack	6. Age Information	7. Data Augmentation	8. Crop

# 1. Data Analysis

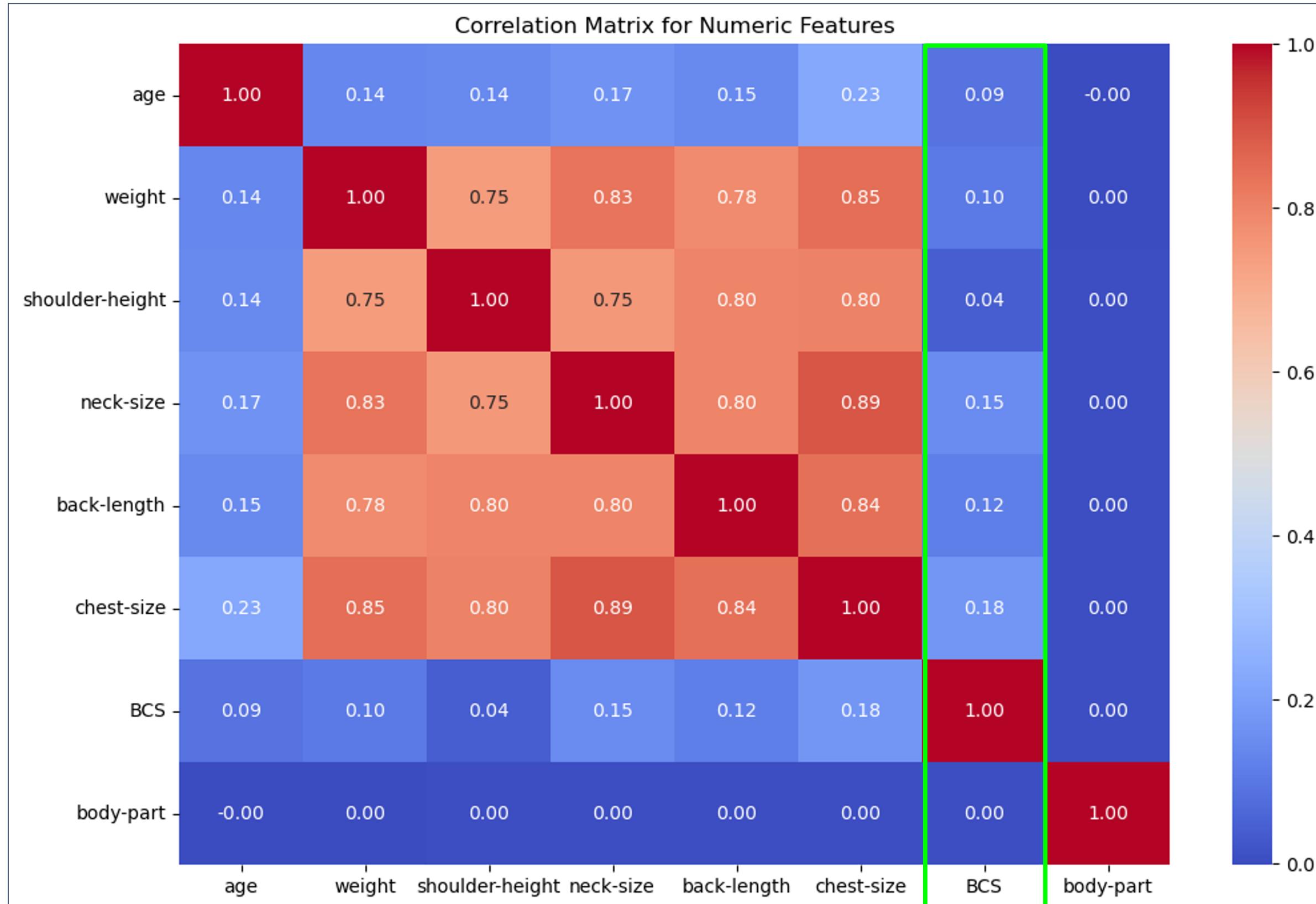


데이터의 분포 그래프

종별 분포

BCS 별 분포

# 1. Data Analysis



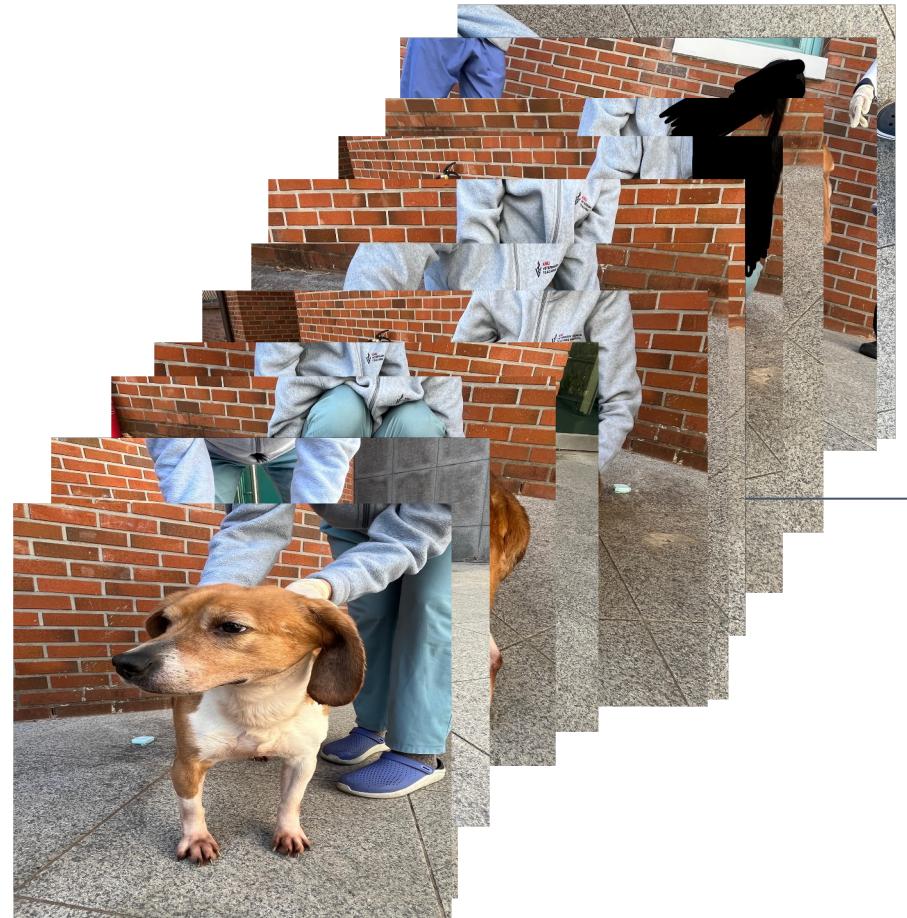
두 변수가 종속적  
ex) 키 ~ 몸무게

두 변수가 독립적  
ex) 키 ~ 시력

BCS는 독립적이다.

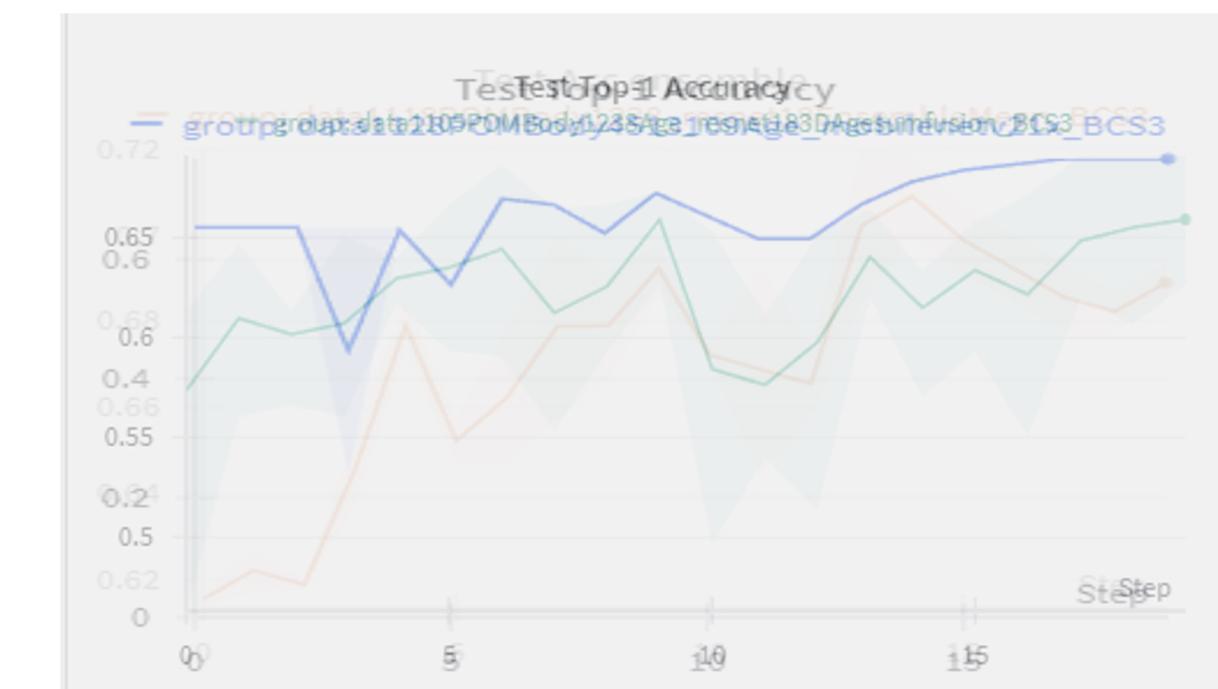
# Problem

1. Data Analysis	2. Model	3. Data Imbalance	4. Regression
4. data lack	6. Age Information	7. Data Augmentation	8. Crop



## 2. Model

	accuracy	time
<b>MobileNet</b>	<b>0.7914</b>	<b>1sec</b>
ResNet18	0.7551	4sec
Ensemble	0.7010	6sec
2D	0.6242	4sec



## 2. MobileNetv2

### Resource Efficient 3D Convolutional Neural Networks

Okan Köpüklü<sup>1</sup>, Neslihan Kose<sup>2</sup>, Ahmet Gunduz<sup>1</sup>, Gerhard Rigoll<sup>1</sup>

<sup>1</sup> Institute for Human-Machine Communication, TU Munich, Germany

<sup>2</sup> Dependability Research Lab, Intel Labs Europe, Intel Deutschland GmbH, Germany

Model	MFLOPs	Params	Speed (cps)		Accuracy (%)		
			Titan XP	Jetson TX2	Kinetics-600	Jester	UCF-101
3D-ShuffleNetV1 0.5x	78	0.55M	398	69	35.51	89.23	64.39
3D-ShuffleNetV2 0.25x	116	0.83M	442	82	25.73	86.91	56.52
3D-MobileNetV1 0.5x	98	1.17M	290	57	31.74	87.61	62.17
3D-MobileNetV2 0.2x	63	0.96M	357	42	24.14	86.43	55.56
3D-ShuffleNetV1 1.0x	199	1.52M	269	49	45.31	92.27	76.00
3D-ShuffleNetV2 1.0x	195	1.91M	243	44	46.10	91.96	77.90
3D-MobileNetV1 1.0x	241	3.91M	164	31	40.07	90.81	70.95
3D-MobileNetV2 0.45x	177	1.40M	203	19	36.47	90.21	68.31
3D-ShuffleNetV1 1.5x	347	2.92M	204	31	52.75	93.12	81.73
3D-ShuffleNetV2 1.5x	291	3.16M	186	34	52.05	93.16	82.32
3D-MobileNetV1 1.5x	429	8.22M	116	19	48.24	91.28	76.00
3D-MobileNetV2 0.7x	325	2.05M	130	13	45.59	93.34	77.32
3D-ShuffleNetV1 2.0x	538	4.76M	161	24	56.84	93.54	84.96
3D-ShuffleNetV2 2.0x	438	6.64M	146	26	55.17	93.71	83.32
3D-MobileNetV1 2.0x	662	14.10M	88	15	48.53	92.56	76.18
3D-MobileNetV2 1.0x	561	3.12M	93	9	50.65	94.59	81.60
3D-SqueezeNet	926	2.15M	682	46	40.52	90.77	74.94
ResNet-18	8323	33.36M	334	17	57.65	93.34	80.09
ResNet-50	9835	44.54M	183	11	63.00	93.70	88.92
ResNet-101	13664	83.58M	142	8	64.18	94.10	87.02
ResNeXt-101	9652	48.75M	122	7	68.30	94.89	89.08
I3D [2]	111331	12.70M	—	—	71.90	—	—

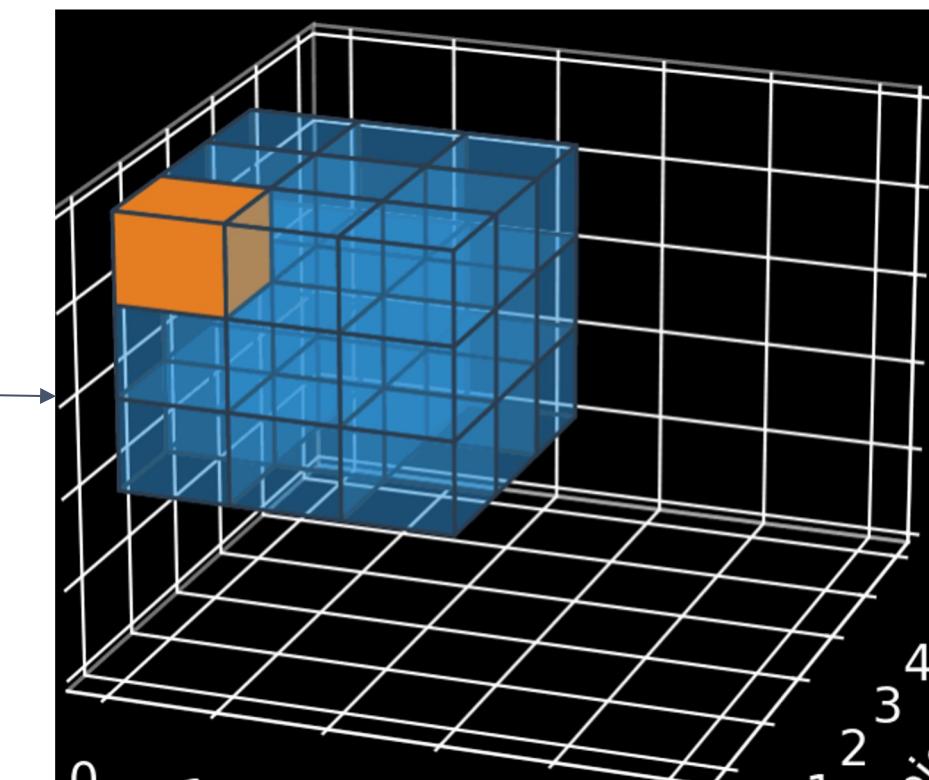
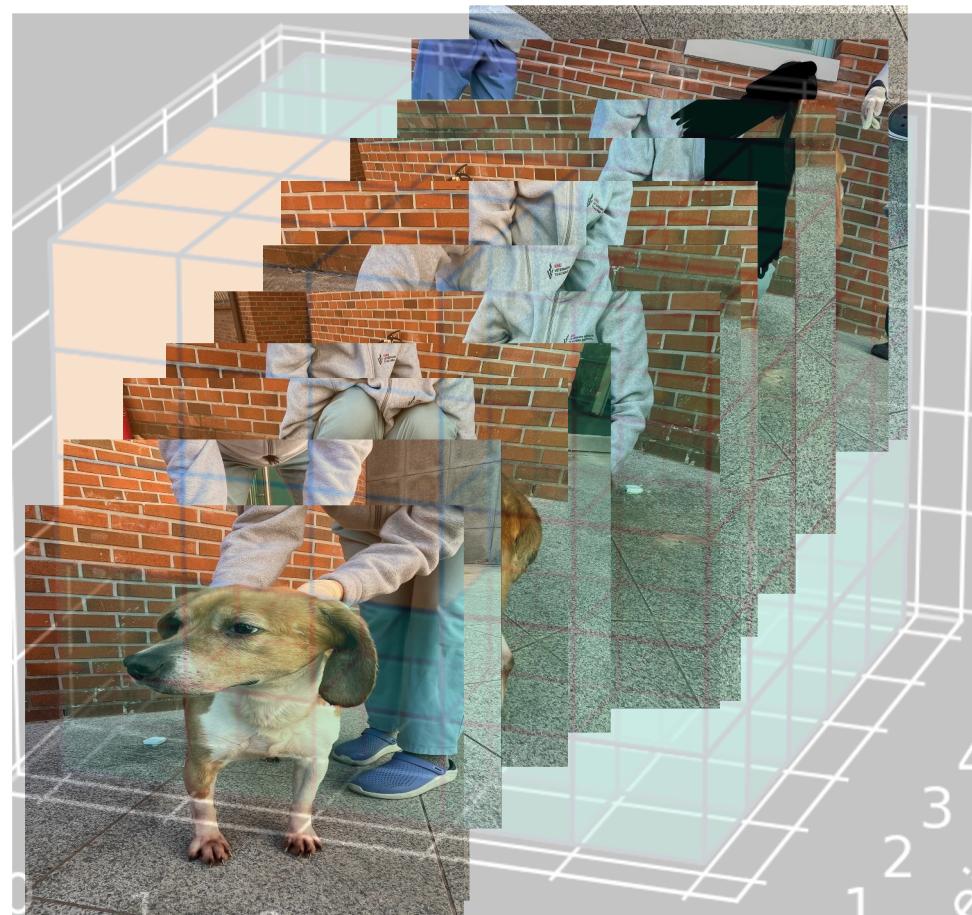
Table 8: Comparison of resource efficient 3D architectures over video classification accuracy, number of parameters and speed on two different platforms and four levels of computation complexity. The calculations of MFLOPs, parameters and speeds are done for Kinetics-600 benchmark. For speed calculations (clips per second (cps)), the used platforms are Titan Xp and Jetson TX2; and the batch size is set to 8. All models takes 16 frames input with 112 x 112 spatial resolution except for I3D, which takes 64 frames input with 224 x 224 spatial resolution.

1. parameter 10배 적음

1. 정확도는 유사

# Problem

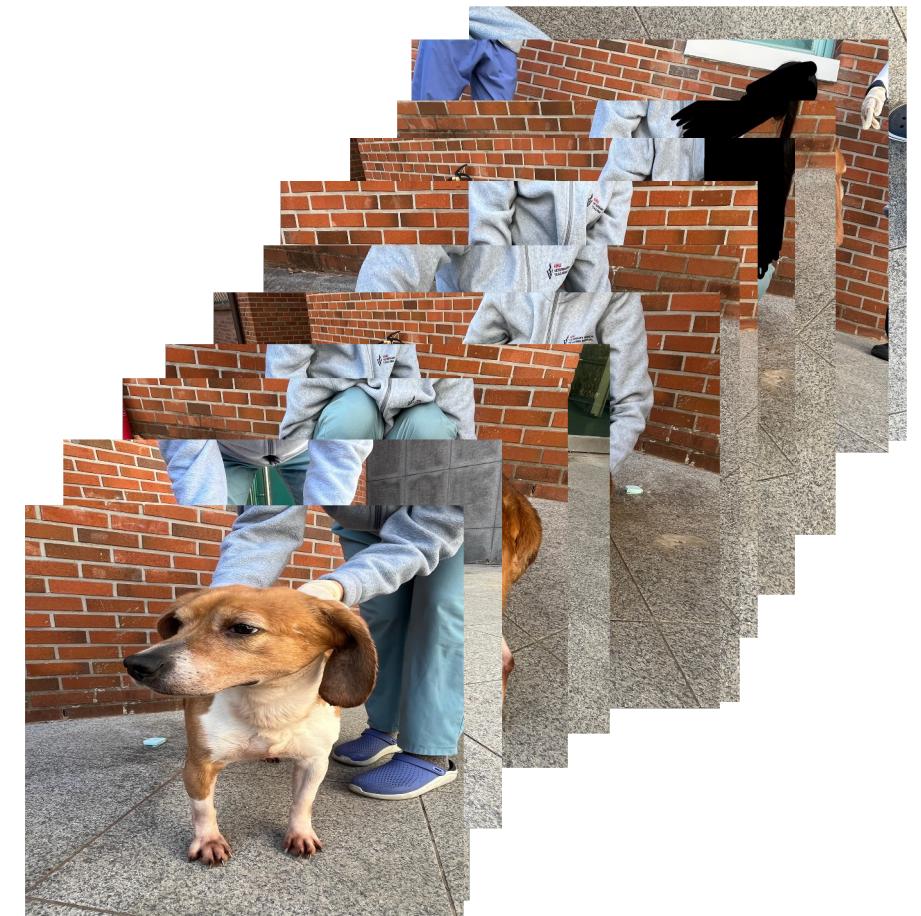
1. Data Analysis	2. Model	3. Data Imbalance	4. Regression
5. data lack	6. Age Information	7. Data Augmentation	8. Crop



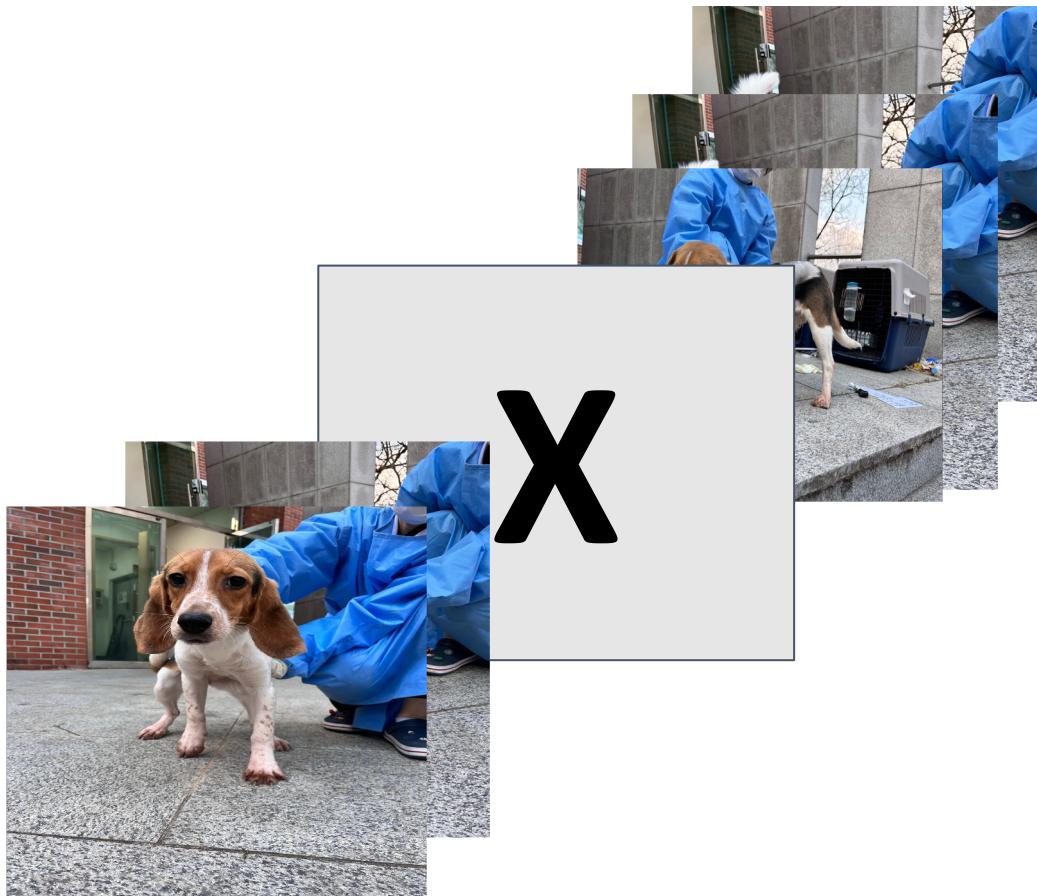
MobileNetv2

저체중(1-4)  
정상(5)  
과체중(6-9)

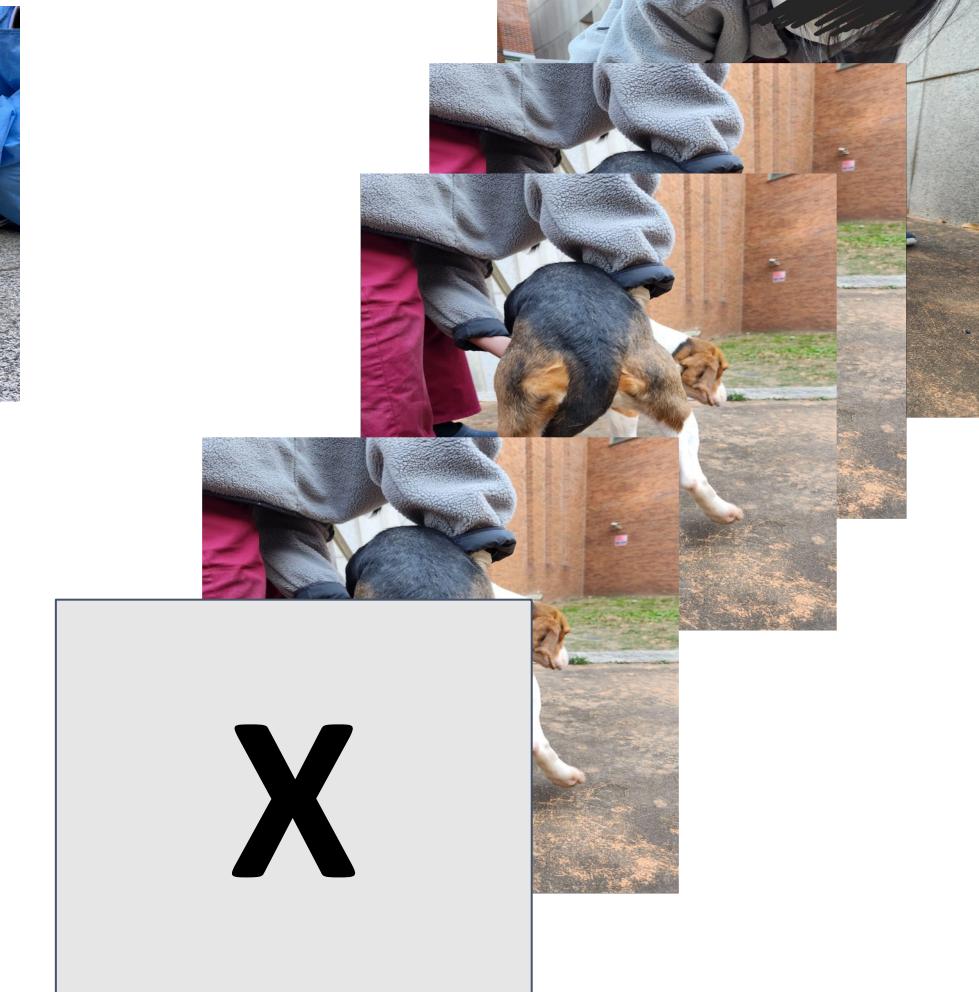
### 3. Data Imbalance



1~13 모두 존재

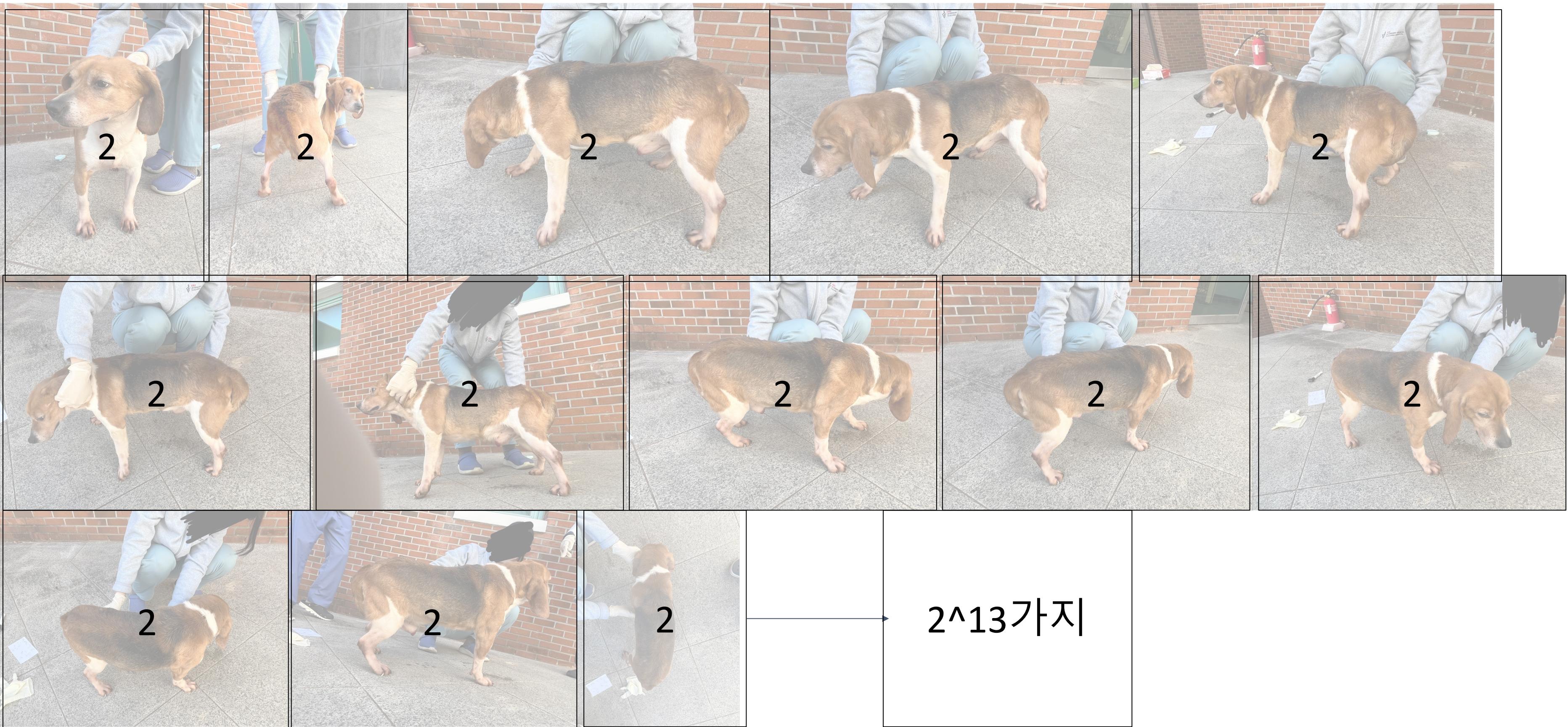


3, 4, 7 이미지 없음



1, 2, 3 이미지 없음

### 3. Data Imbalance



### 3. Data Imbalance



### 3. weighted score

$$score = \text{len}(part) * \text{len}(\text{valid})$$

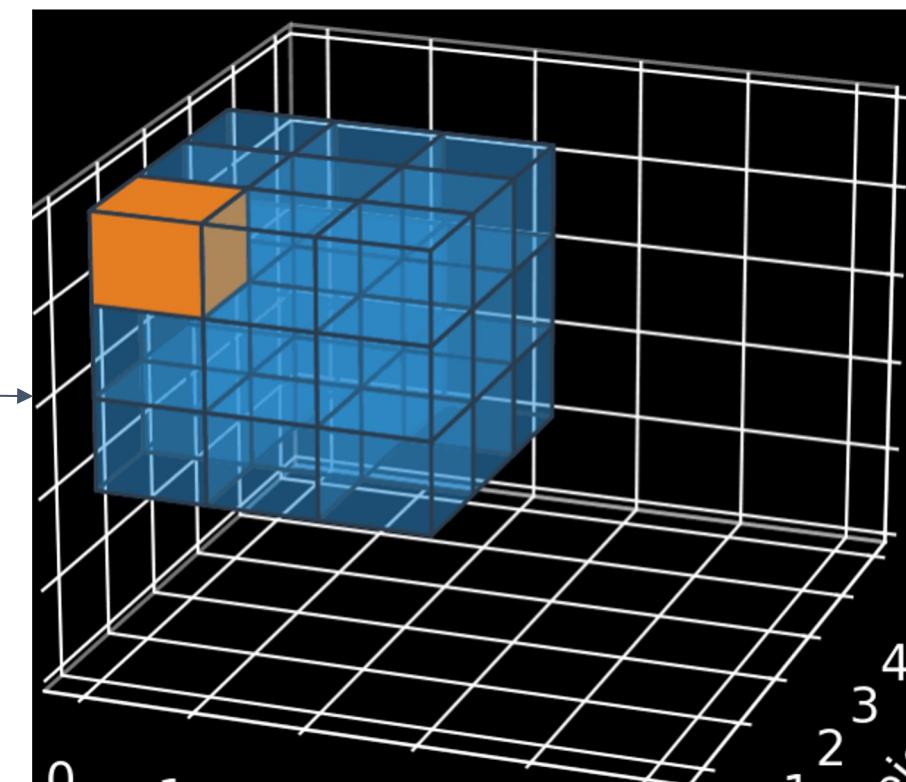
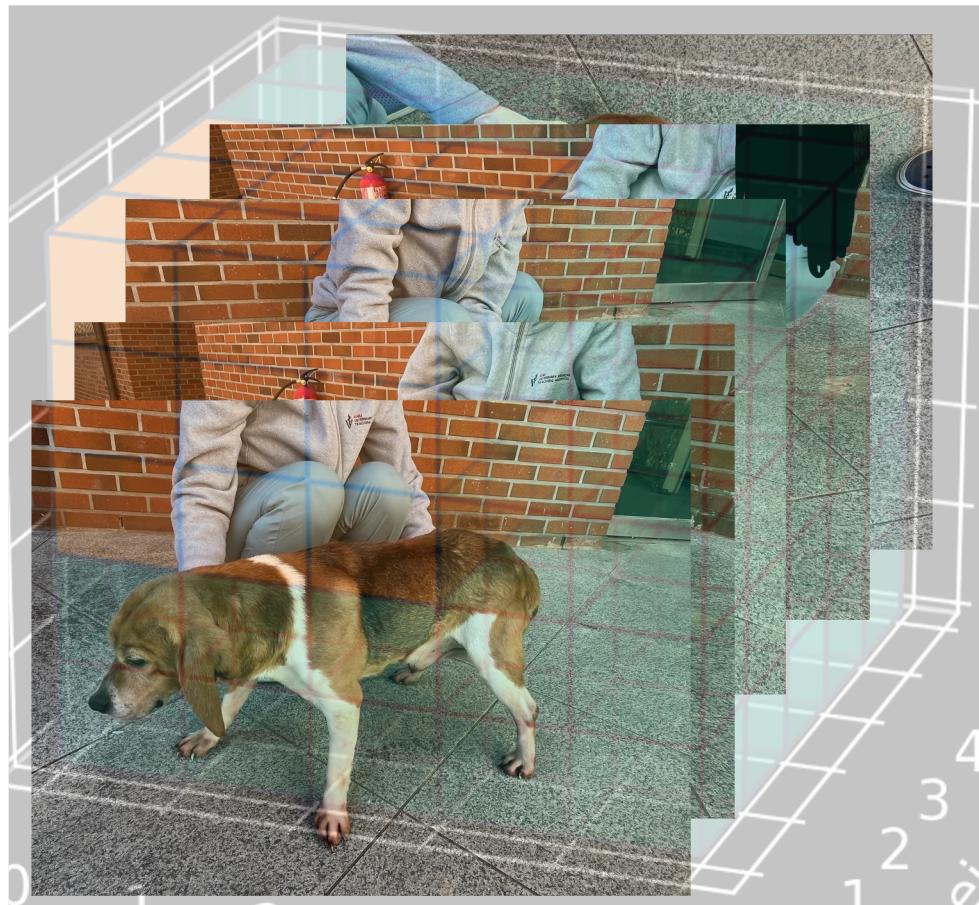
$$24175 = 5 \times 4835$$



Combination	Score
(4, 5, 9, 10, 13)	24175
(4, 5, 9, 10, 12)	23505
(4, 5, 8, 9, 10)	23455
(5, 9, 10, 12, 13)	23430
(4, 9, 10, 12, 13)	23415
...	...
(3, 11, 12)	5901
(3, 6, 7)	5793
(3, 7, 11)	5769

# Problem

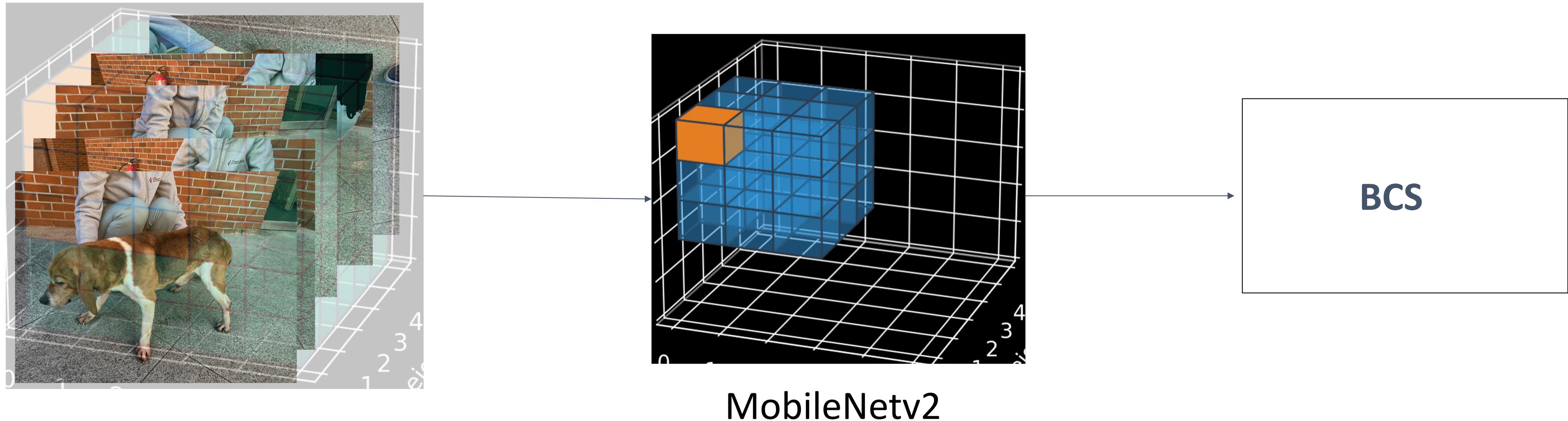
1. Data Analysis	2. Model	3. Data Imbalance	4. Regression
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MobileNetv2

저체중(1-4)  
정상(5)  
과체중(6-9)

# 4. Regression



# 4. Regression

MSE loss

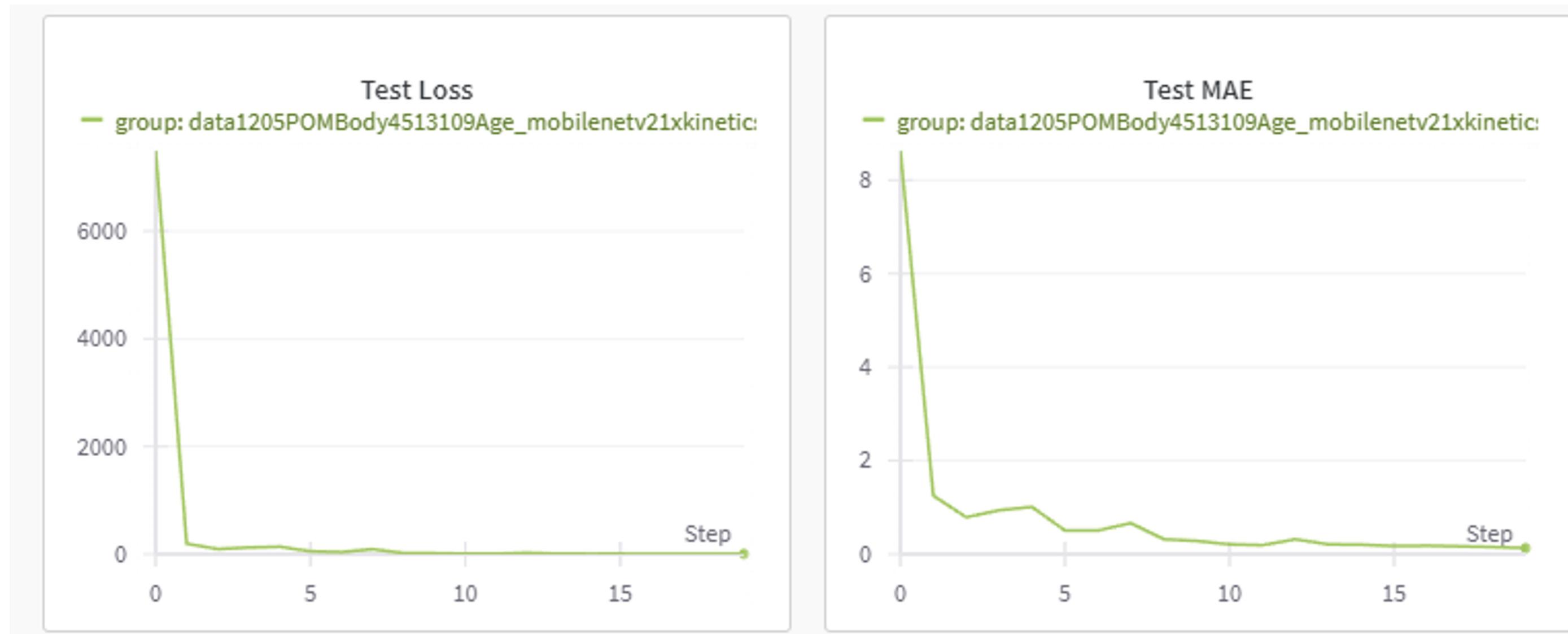
$$Loss = \frac{1}{n} \sum (truth - pred)^2$$

weighted MSE

$$Loss = \frac{1}{n} \sum 10 * (truth - pred)^2$$

truth : 5

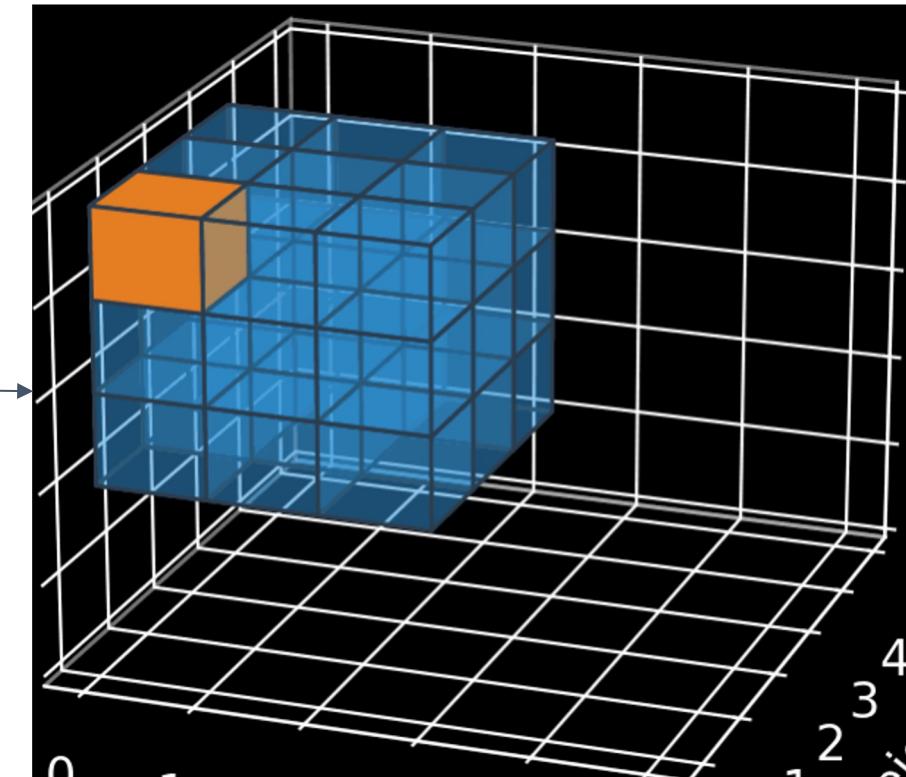
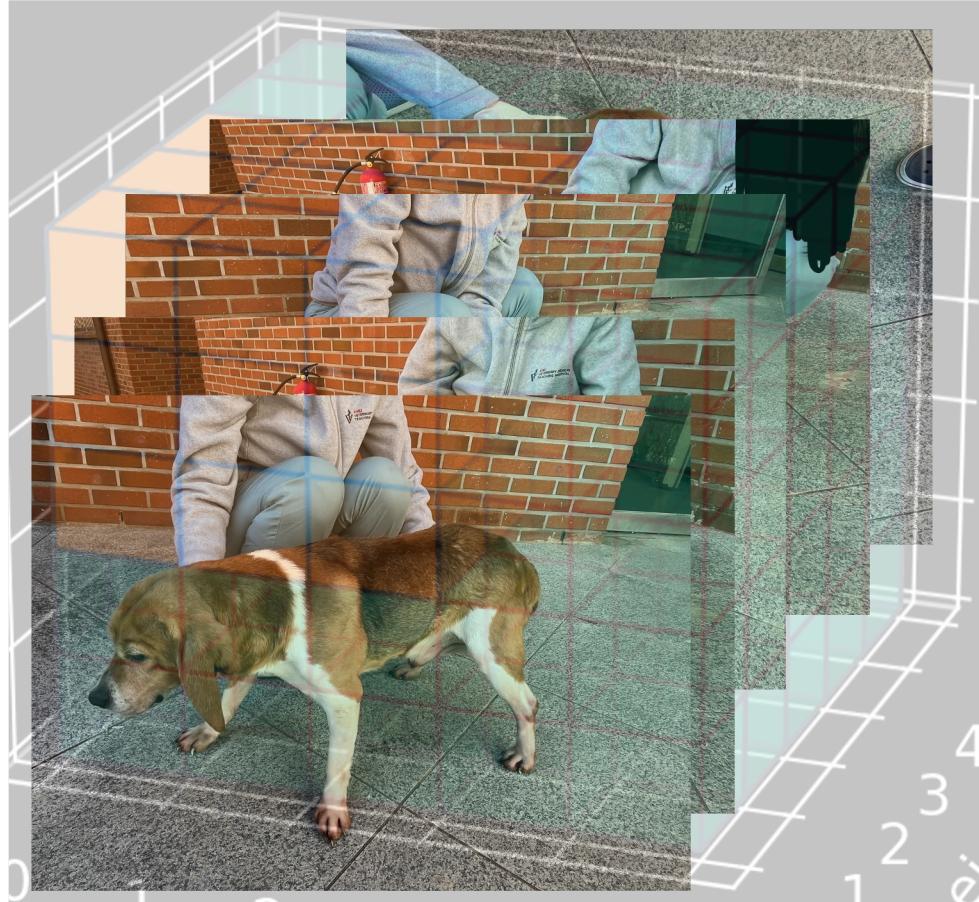
predict : 5.5



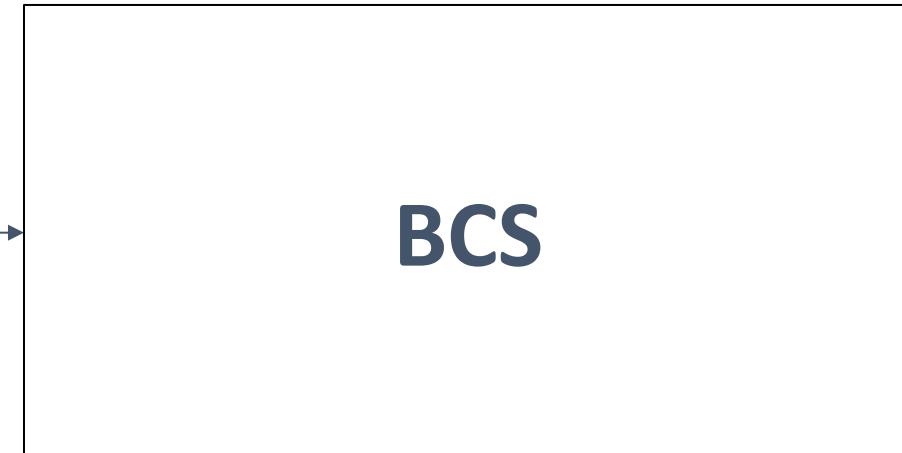
| 실제 - 예측 | < 0.5

# Problem

1. Data Analysis	2. Model	3. Data Imbalance	4. Regression
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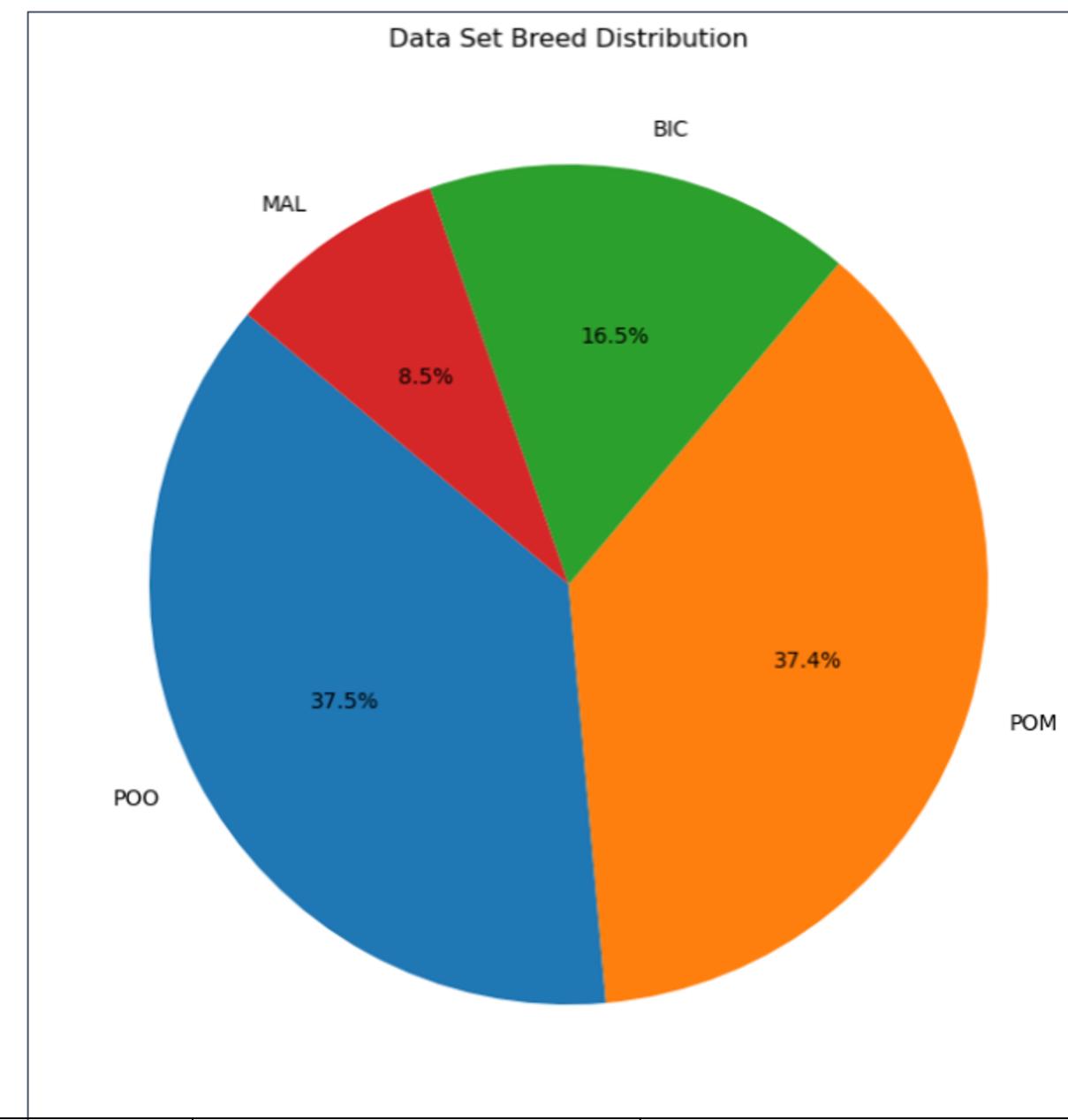


MobileNetv2



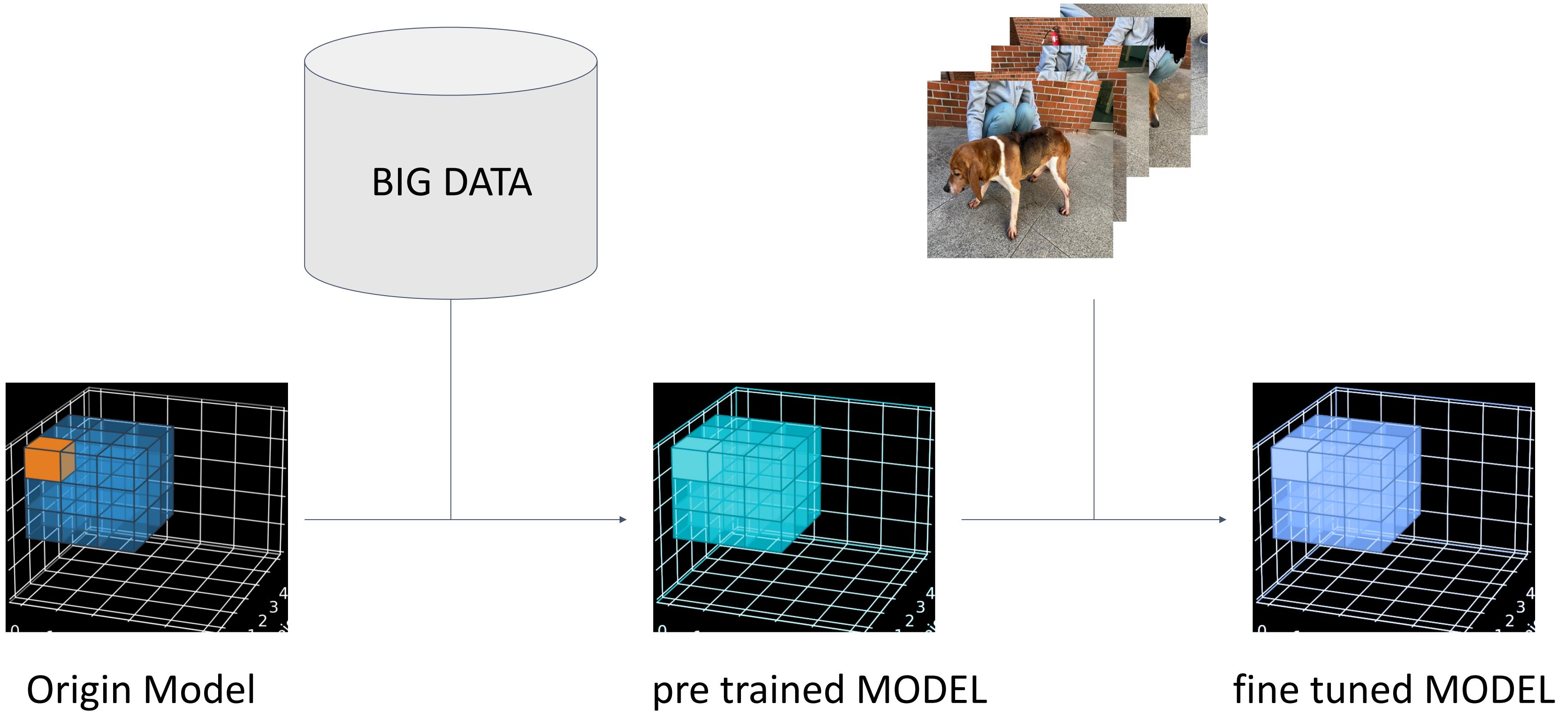
# 5. Data Lack

종별 데이터 분포

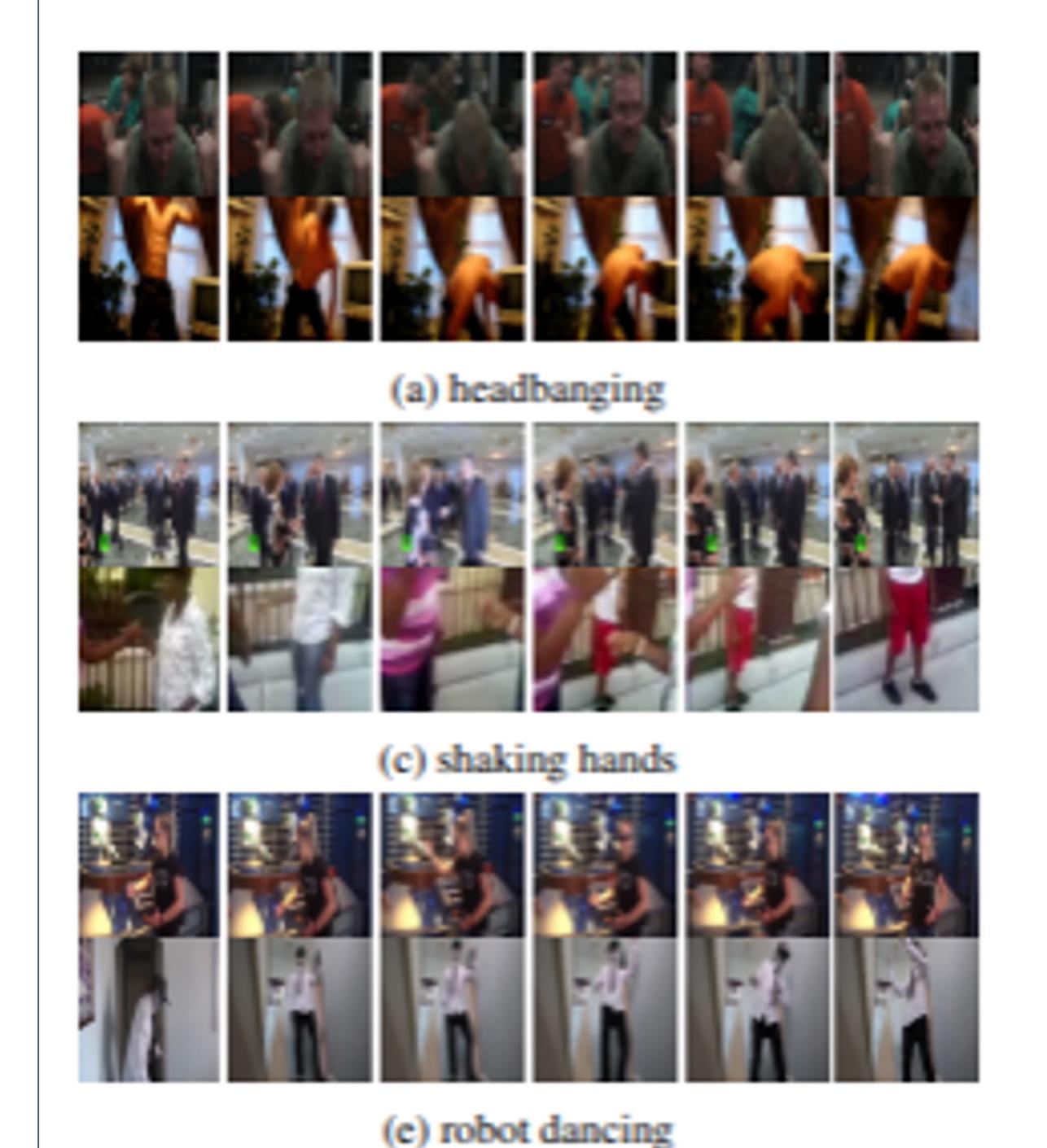
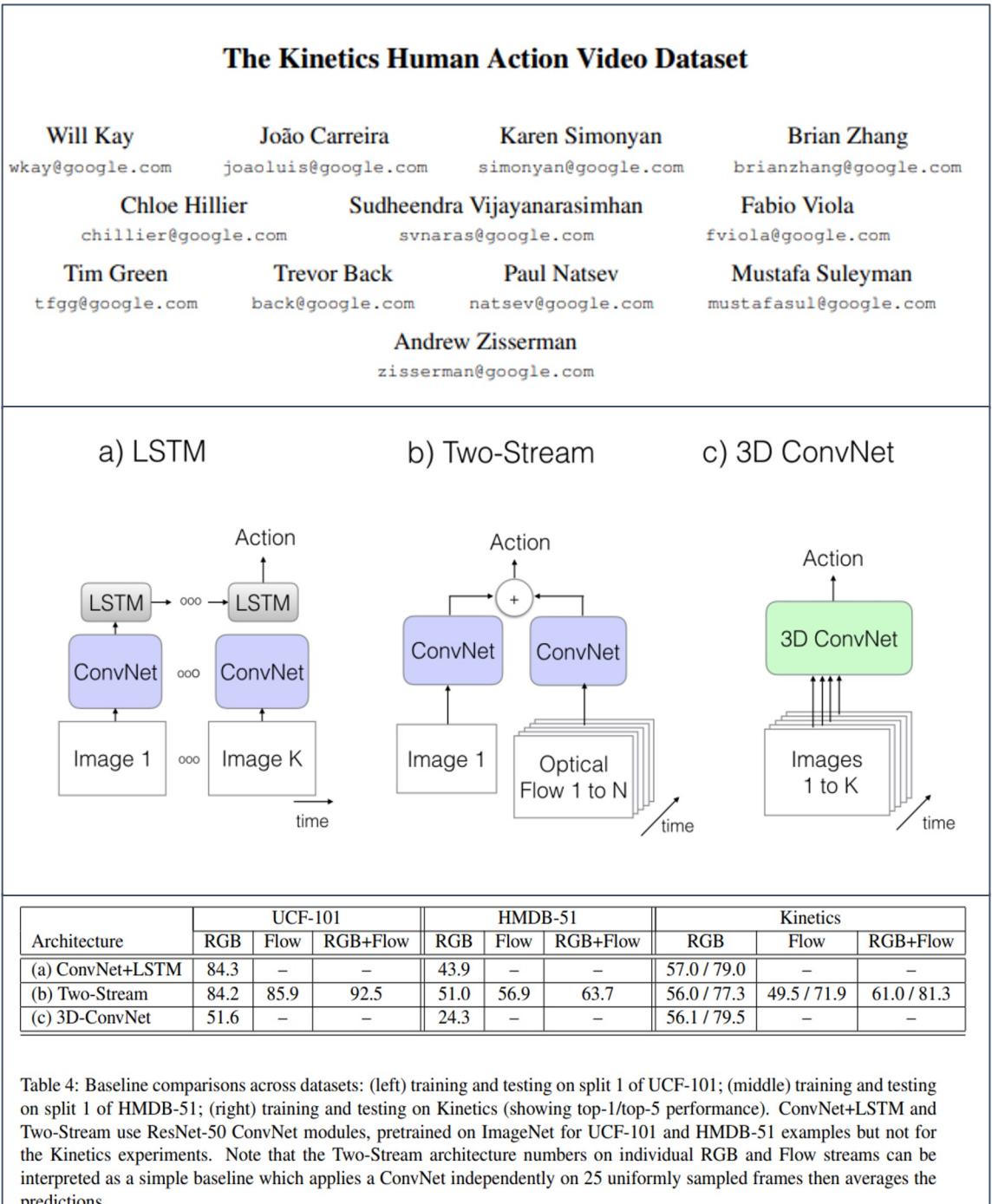


Breed	POM	POO	BIC	MAL	Total
Data length	24175	21175	16175	4654	66179

# 5. Fine-Tuning



# 5. Fine-Tuning

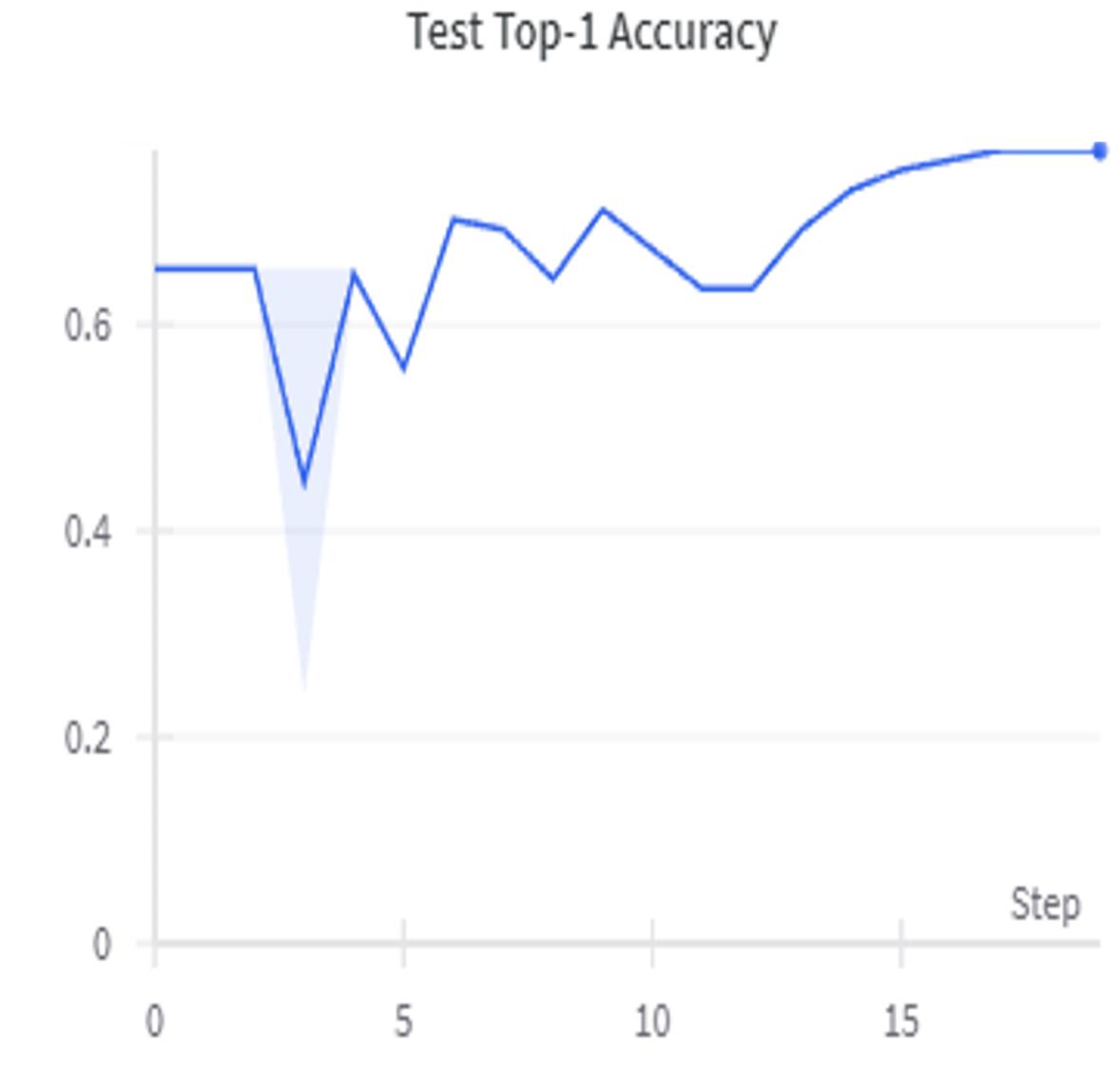


3D - Conv에서 성능 높음

충분하고 일반화 된 데이터

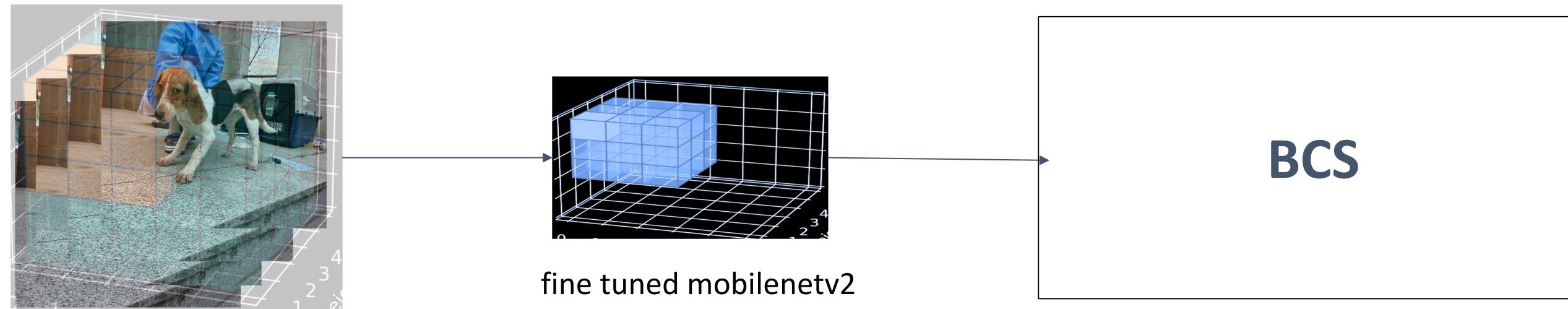
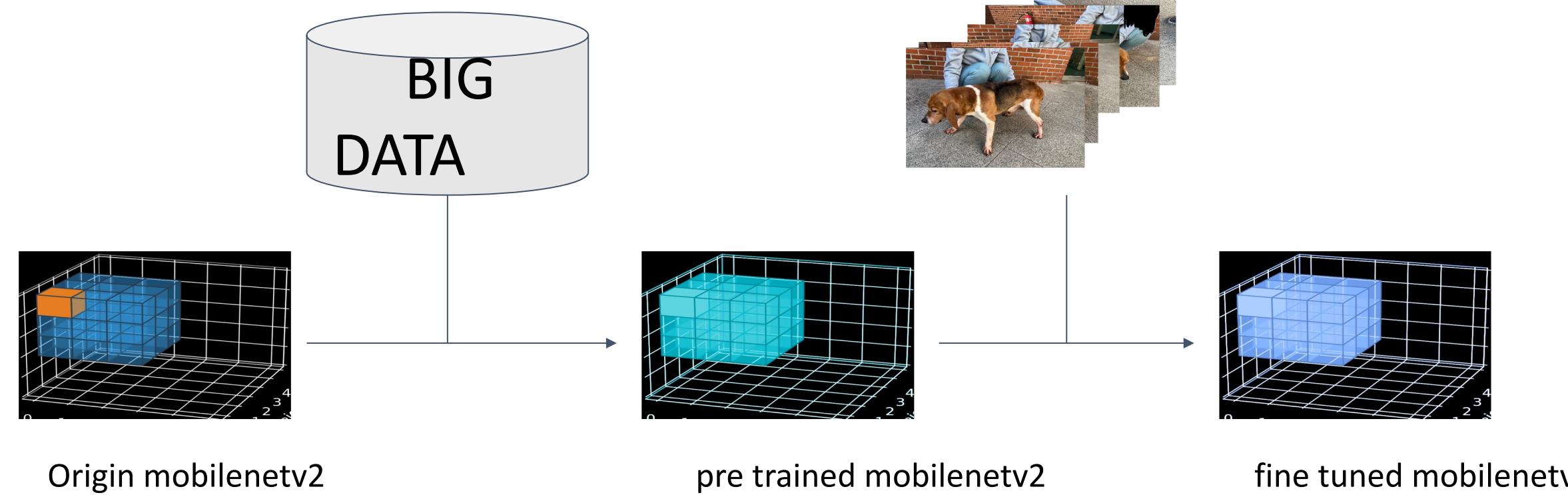
# 5. Fine-Tuning

method	accuracy
Fine tuning	<b>0.8431</b>
None	0.7914

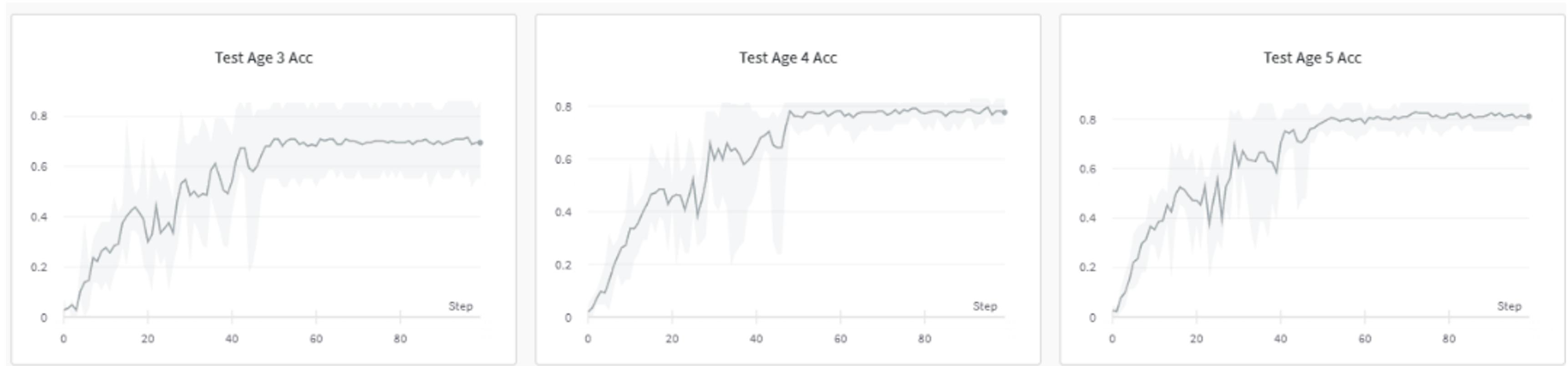


# Problem

1. Data Analysis	2. Model	3. Data Imbalance	4. regression
5. data lack	6. Age Information	7. Data Augmentation	8. Crop

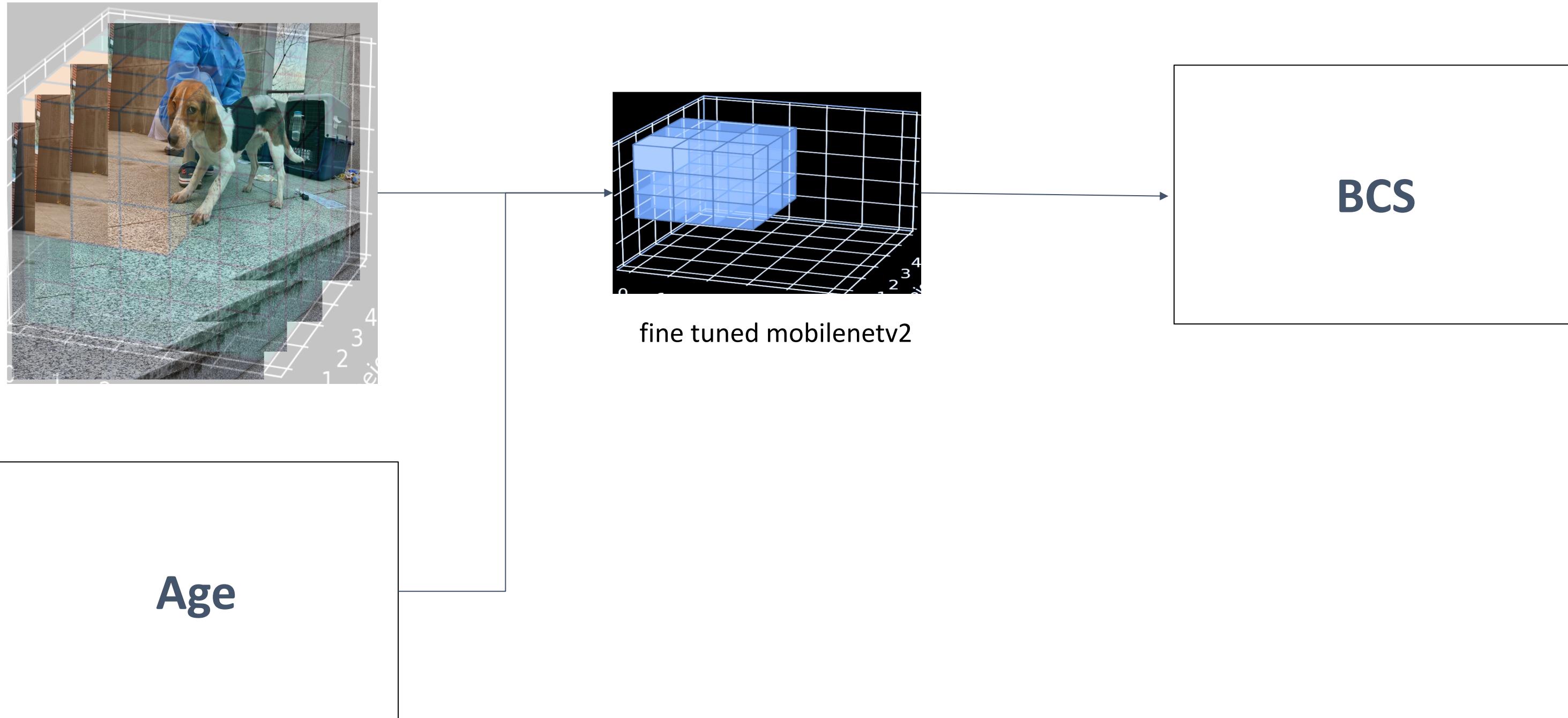


# 6. Age information



나이에 따른 정확도 그래프 , 나이가 커질수록 분산 감소

# 6. Age addition



# Problem

1. Data Analysis

2. Model

3. Data Imbalance

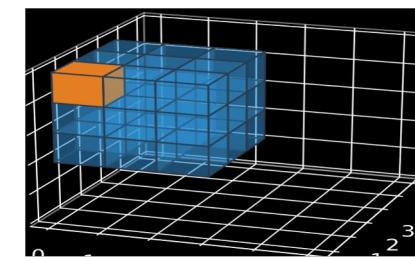
4. Regression

5. Data Lack

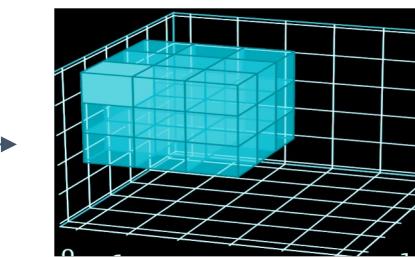
6. Age Information

7. Data Augmentation

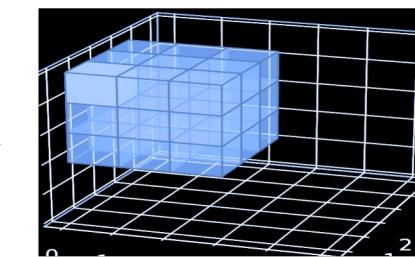
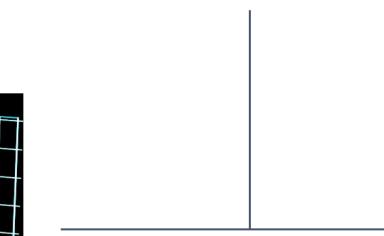
8. Crop



Origin mobilenetv2

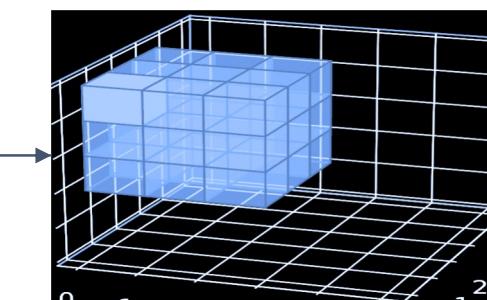
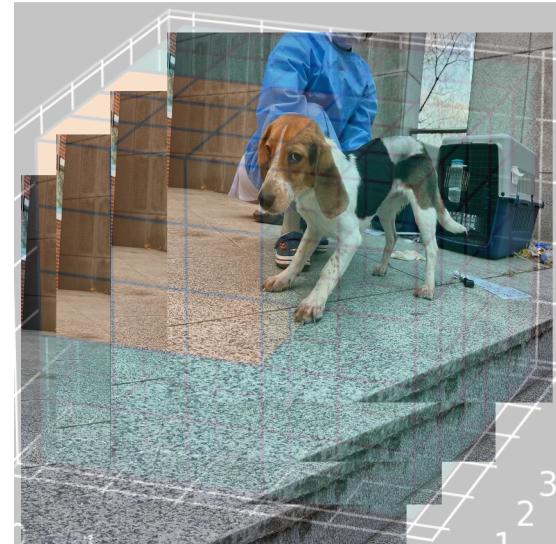


pre trained mobilenetv2



fine tuned mobilenetv2

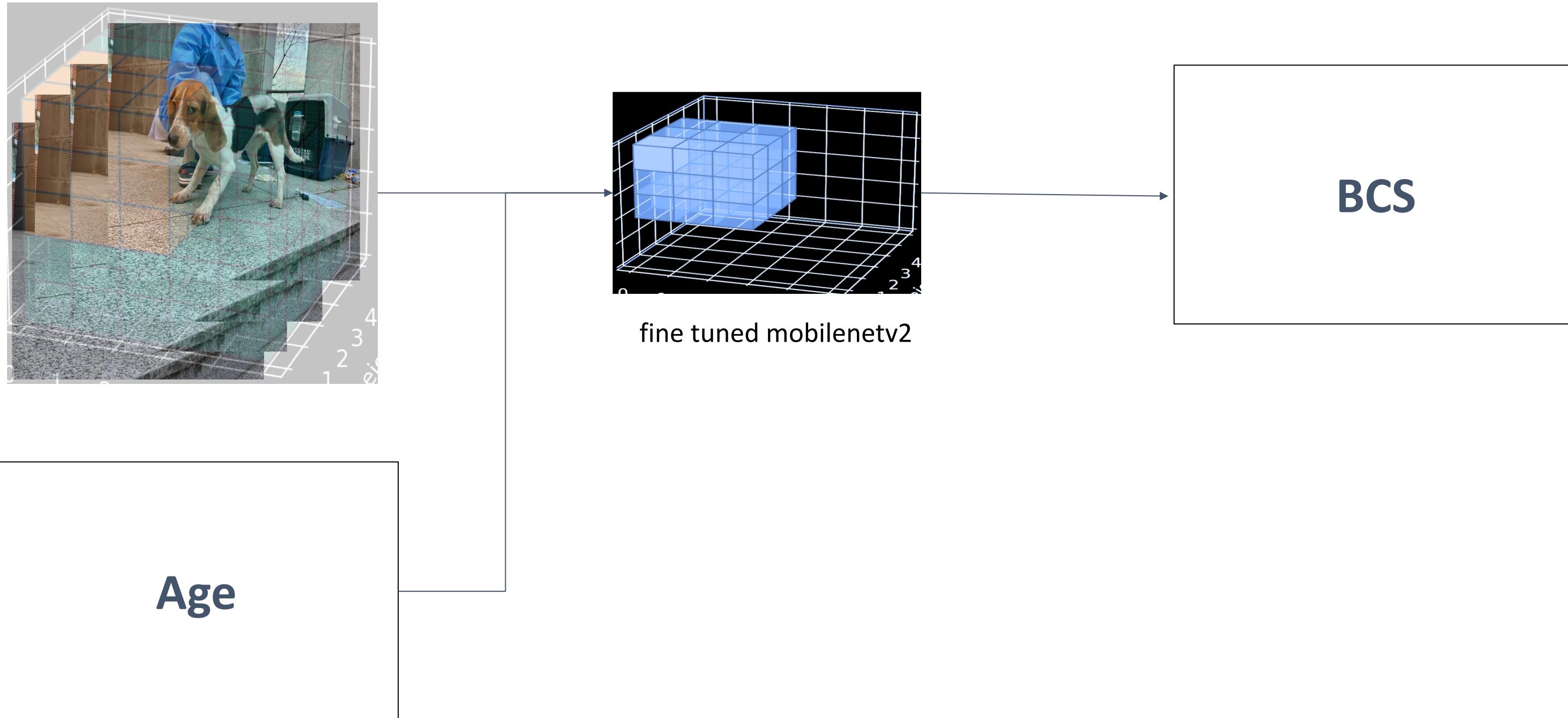
Age



fine tuned mobilenetv2

BCS

# 7. Data augmentation



# 7. Data Augmentation



# Problem

1. Data Analysis

2. Model

3. Data Imbalance

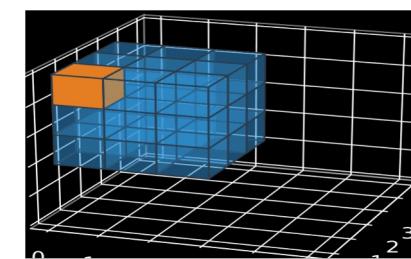
4. Regression

5. Data Lack

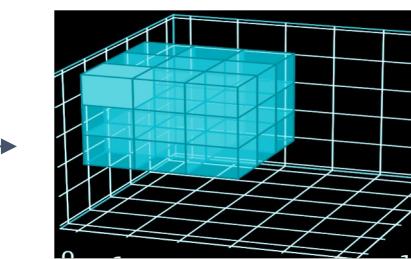
6. Age Information

7. Data Augmentation

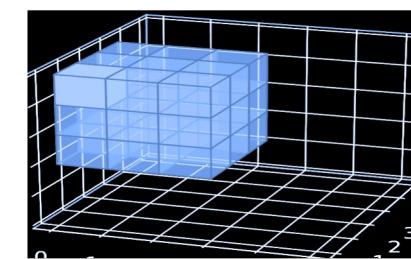
8. Crop



Origin mobilenetv2

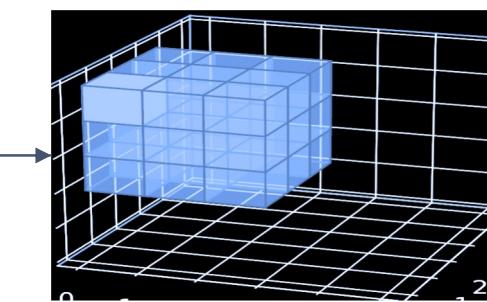
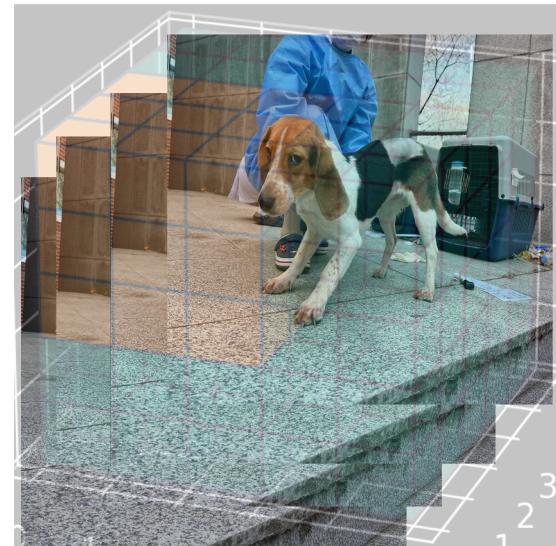


pre trained mobilenetv2



fine tuned mobilenetv2

Age



fine tuned mobilenetv2

BCS

# 프로젝트 차별성

## 프로젝트 차별성 1 - 비만도 진단



유사 서비스: 멍냥보감

- 비만도 진단 서비스는 있으나 사용자가 직접 항목을 선택하게 하여 비만도 진단
- 기록 저장하지 않음

# 프로젝트 차별성 1 - 비만도 진단

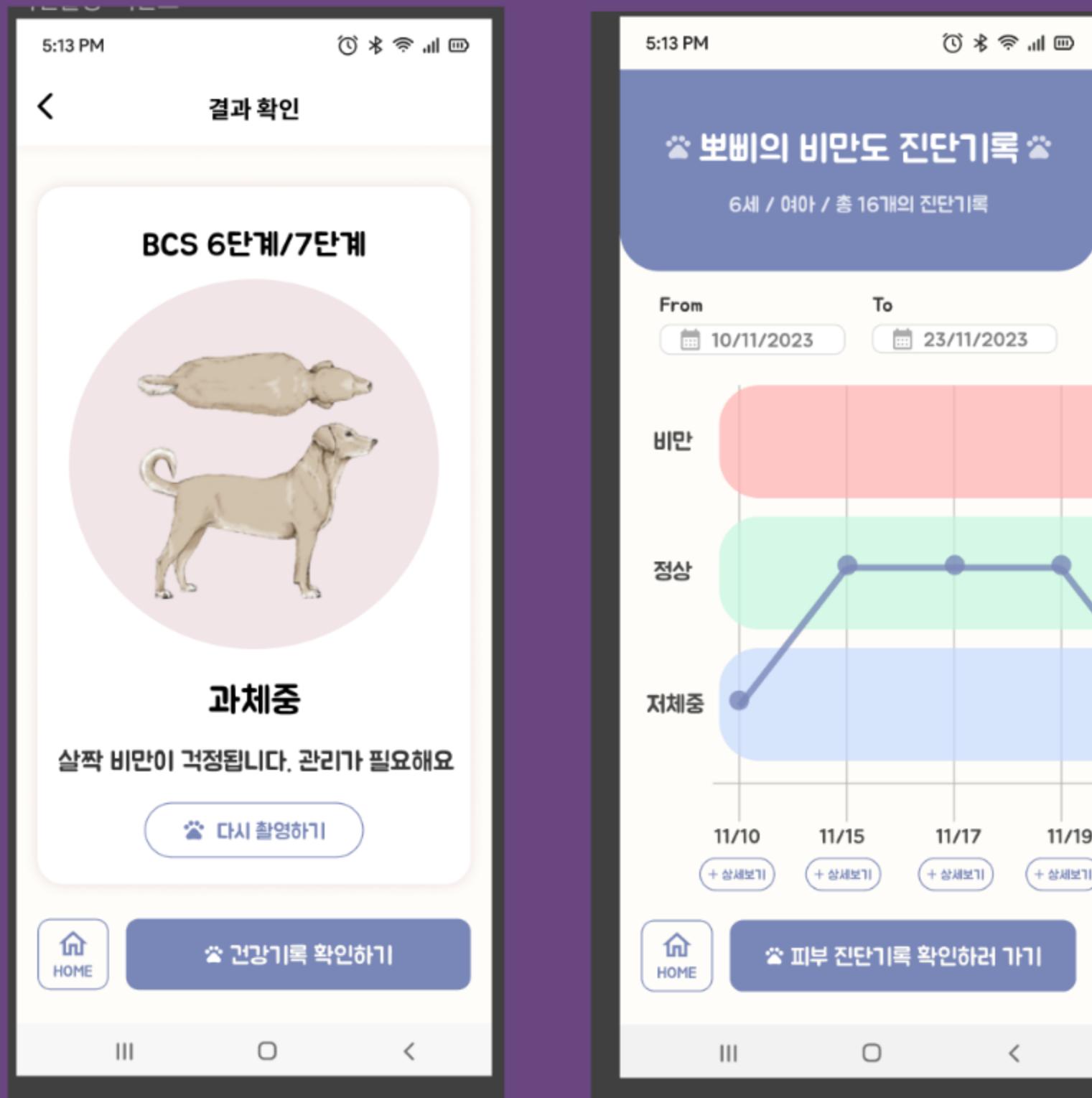
The image displays three screenshots of mobile applications:

- Screenshot 1 (Left):** A navigation menu for a pet-related app. It includes sections for '주요수칙' (Main Rules), 'kg' (Weight), '음식' (Food), '습식' (Semi-moist), '건식' (Dry), '이상증상' (Symptoms), '일정' (Schedule), '투약기록' (Medication Record), '대소변' (Urination/Defecation), '구토' (Vomiting), '혈액검사' (Blood Test), '일기' (Journal), and 'HOME', '간선일기', '검사결과', and '일정' buttons at the bottom.
- Screenshot 2 (Middle):** A '간단한 건강 체크' (Simple Health Check) screen. It features four cards: '눈' (Eye) with 10 items, '관절' (Joint) with 1 item, '치아' (Teeth) with 2 items, and '피부 귀, 발, 몸통' (Skin, Ears, Legs, Body) with 3 items. Below these is a section titled '쓸수록 건강해지는 기록' (The more you use, the healthier it becomes).
- Screenshot 3 (Right):** A shopping cart interface for '강아지' (Dog). It shows a search bar, a promotional banner for '방구석 연말파티' (End-of-the-Year Party) with a discount of ~90% off, and categories for '사료' (Food), '간식' (Snacks), and '용품' (Accessories). At the bottom, there are buttons for '전체보기' (View All), '오픈팜' (Open Farm), '유동기한일반' (General Expiry Date), '밀보기샘플관' (Sample Room), '퍼피' (Puppy), '어덜트' (Adult), '시니어' (Senior), and '더보기' (More).

타 반려동물 관련 서비스:  
티티케어/펫프렌즈/집사일기/어바웃펫

유사 서비스 없음

# 프로젝트 차별성 1: 비만도 진단



- 사진 촬영 후 AI를 활용한 비만도 진단
- AI 로그 기록을 제공해 사용자의 신뢰도 높임
- 이후 진단 기록 그래프로 나타내 변화 추이를 한 눈에 확인할 수 있도록 함

## 프로젝트 차별성 2 - 피부질환 기록

< 피부 체크 기록

2023.09.15(금)

오후 03:35      이상 징후 2 /5

발적      색소침착

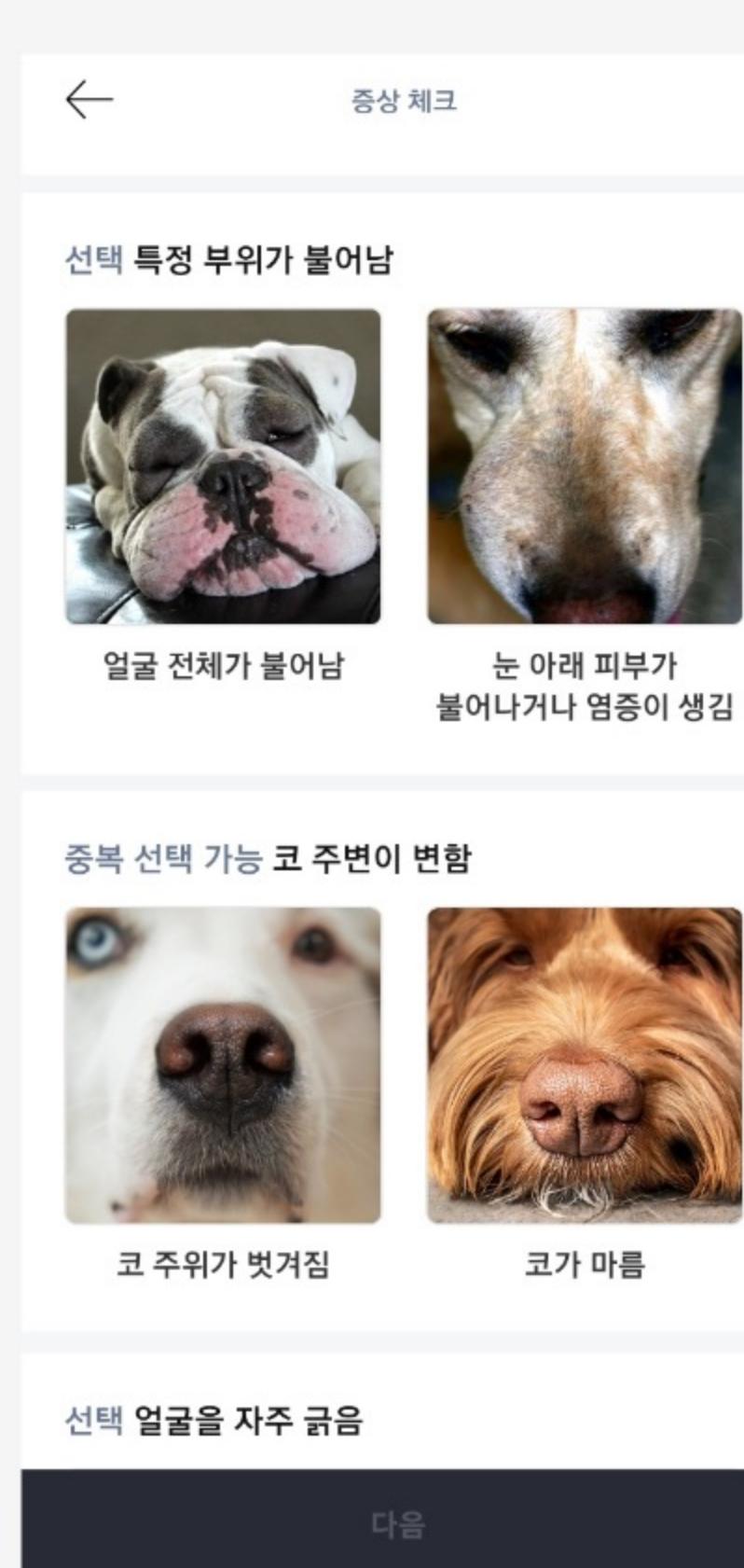
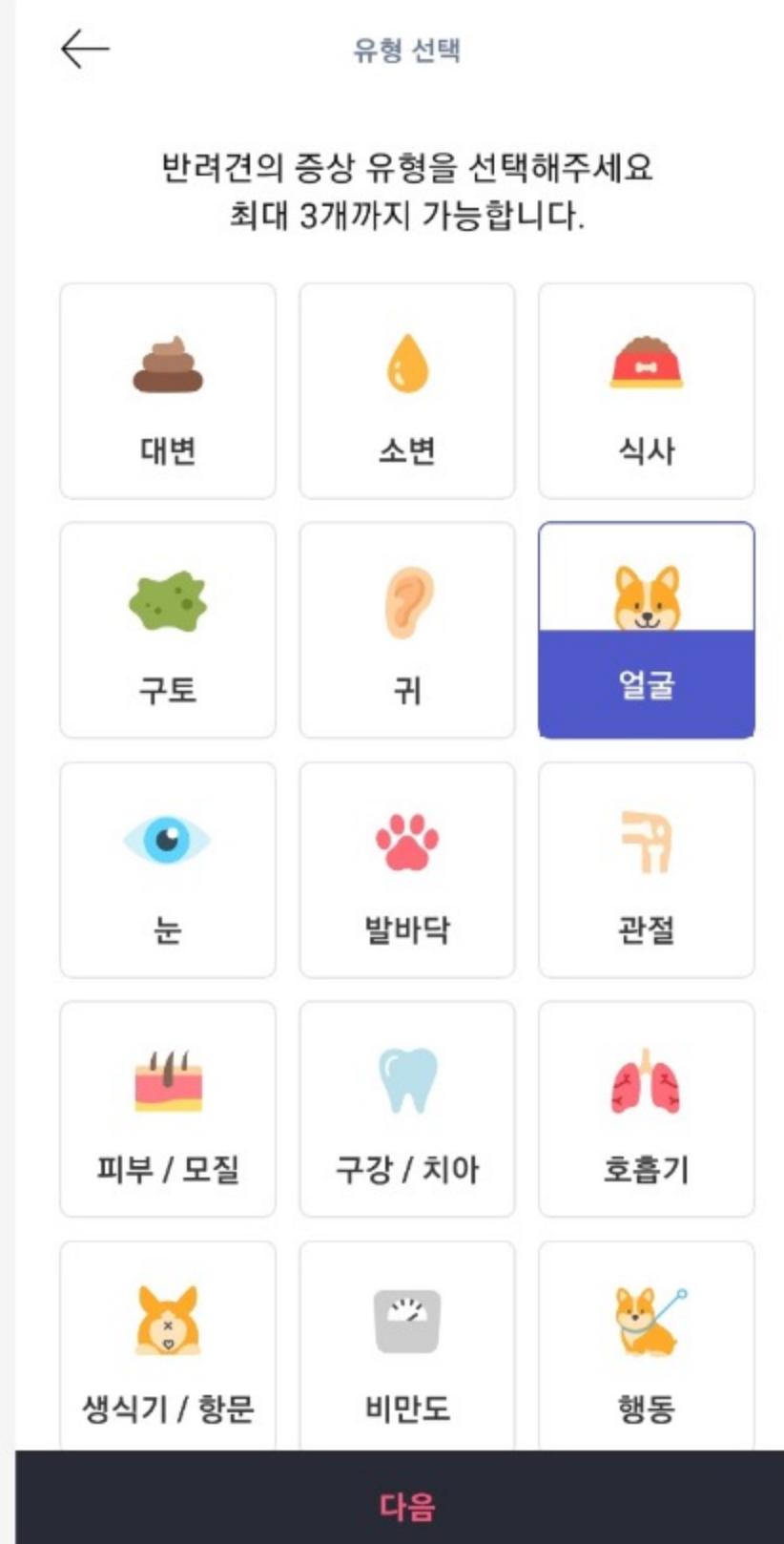
오후 03:33      이상 징후 0 /5

① 총 30건의 상세 결과를 제공해요.

유사 서비스: 티티케어

- 이상 징후 개수와 이상징후 기록을  
카드 형식으로만 제공

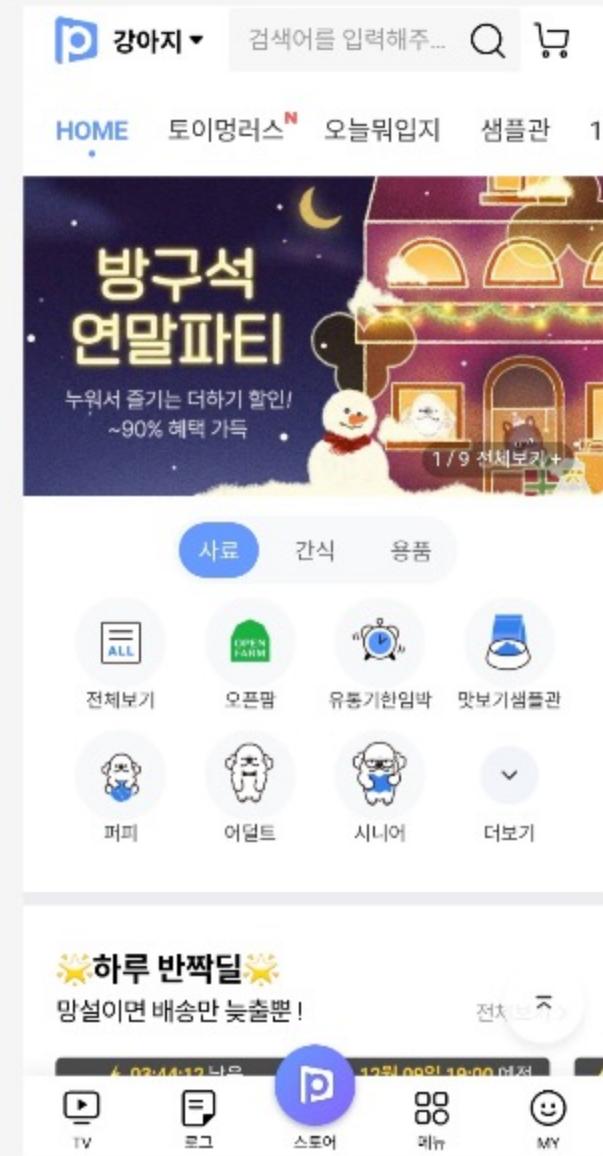
## 프로젝트 차별성 2 - 피부질환 기록



유사 서비스: 멍냥보감

- 피부질환 진단 서비스는 있으나 사용자가 직접 항목을 선택하게 하여 질환 진단
- 간단 측정이라는 이름으로 별다른 기록 저장하지 않음

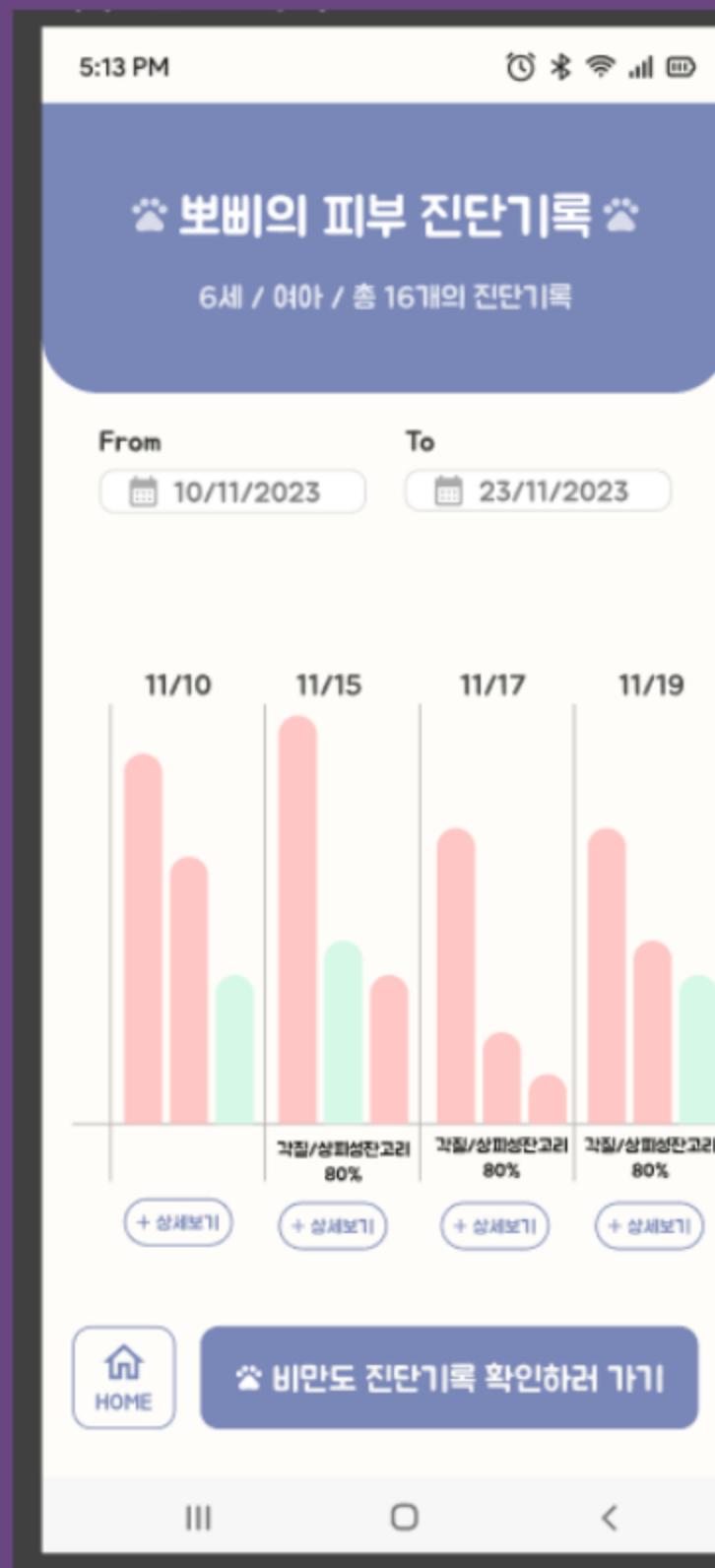
## 프로젝트 차별성 2 - 피부질환 진단



타 반려동물 관련 서비스:  
펫프렌즈/집사일기/어바웃펫

유사 서비스 없음

# 프로젝트 차별성 2: 피부진단 기록



- 명확하고 간결한 그래프로 기록 시각화
- 더 많은 정보를 원하는 사용자를 위해 추가 정보를 제공하는 사용자 중심 디자인
- 시각적 일관성 유지



## 추가적으로 고려한 사항

- UI/UX
- 자체 로그인 기능
- 기록 날짜별로 찾기 기능
- 플레이스토어 출시

## 추가 고려 사항 - 플레이스토어 출시

Play Console 검색

PETDOCTOR

### 출시 개요

#### 최신 버전

버전	최신 버전	트랙	버전 상태	최근 업데이트 날짜	국가/지역	설치한 사용자 수
first version	1	비공개 테스트 - Alpha	임시	-	1 /177	-
first version	1	내부 테스트	<input checked="" type="checkbox"/> 내부 테스터에게 제공됨 전체 출시	2023년 12월 2일 오후 8:08	-	0.00%
4	4	비공개 테스트 - Alpha	<input checked="" type="checkbox"/> Google Play에서 테스터에게 제공 전체 출시	2023년 12월 5일 오후 5:29	1 /177	0.00%

#### 국가/지역

국가/지역	트랙
가나	-
가봉	-

**내부 테스트 과정 전부 완료 → 현재 알파 테스트 중**

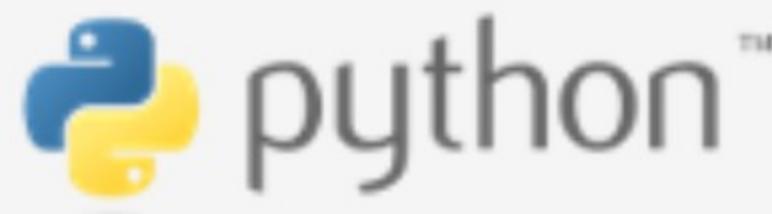
## 추가 고려 사항 - 플레이스토어 출시



**내부 테스트** 과정 전부 완료 → 현재 알파 테스트 중

## 기술스택

---



## TEAM MEMBER 포지션 소개 / 협업



### 문벼리

디자인  
프론트엔드



### 오용희

AI



### 정현서

백엔드

발표 내용에 관해

궁금한 점이 있으시다면

자유롭게 질문해주세요!

Q & A