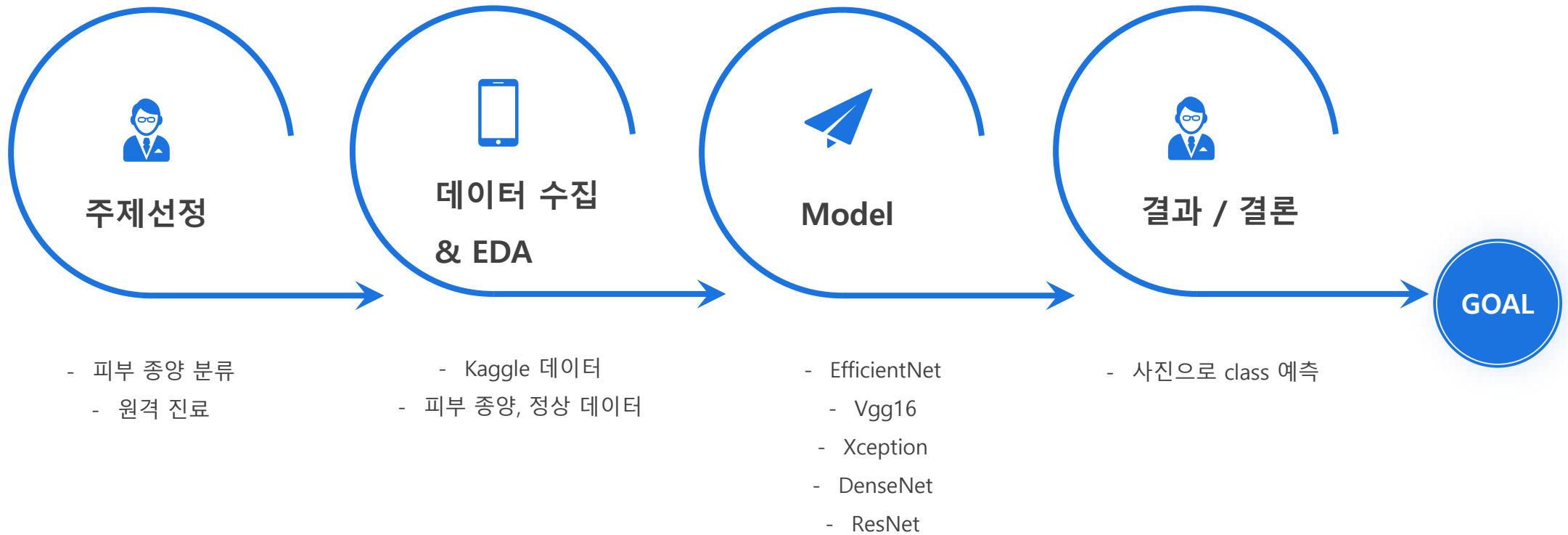


피부 종양 질환 이미지 분류

딥러닝 1팀 – 고지현, 윤정옥, 황지우

CONTENTS



주제 선정

코로나로 뜬 원격진료...피부질환 분야 '눈부신 발전'

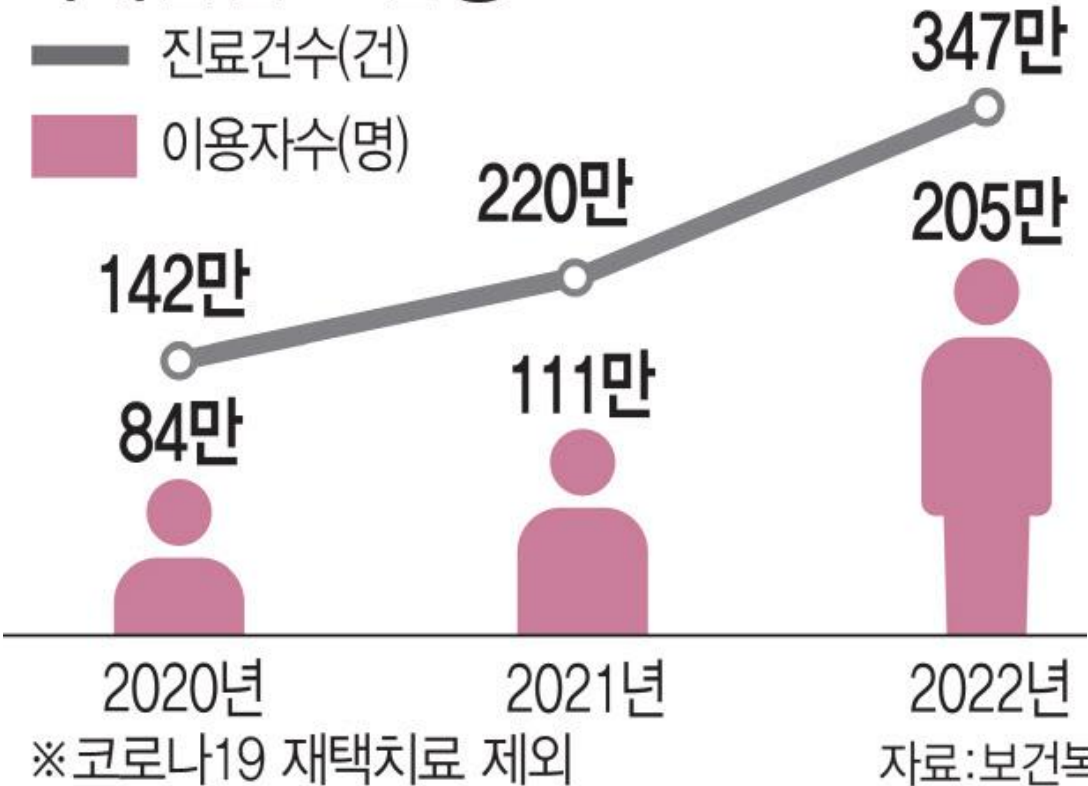
2023.02.10 06:00

원격 진료

- 코로나19 이후 여러 원격 진료분야가 활발해짐
- 그 중 원격피부질환진료(텔레더마톨로지)가 새로운 분야가 생겨남
- “AI를 사용한 피부질환 진단 기술은 현재 피부과에서 가장 주목받는 분야”

비대면 진료

비대면진료 현황 ※2020년은 2~12월 기준



〈7개 진료과목 비대면진료 초·재진 진료현황〉

(단위: 건)

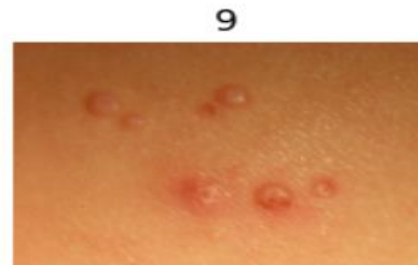
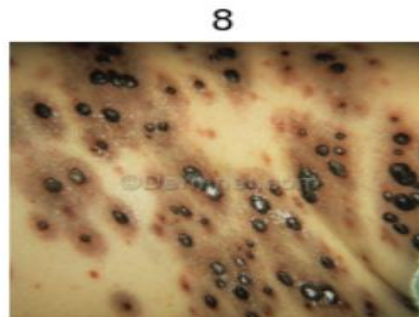
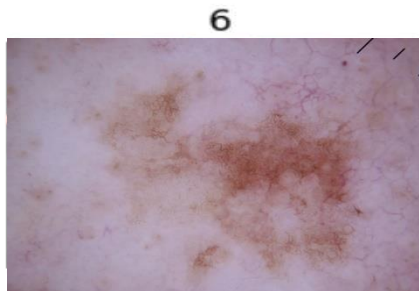
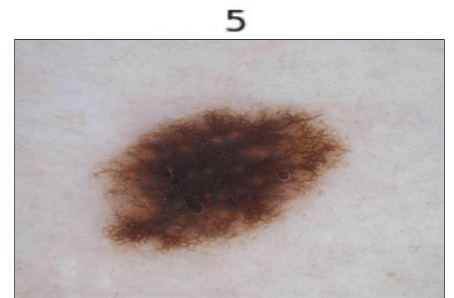
분류	초진 (A)	재진 (B)	합계*	초진비율 =A/(A+B)
피부과	5,456	15,633	21,089	25.9%
산부인과	31,114	200,894	232,008	13.4%
외과	34,232	261,898	296,130	11.6%
비뇨의학과	10,365	98,771	109,136	9.5%
소아과	365,296	3,743,016	4,108,312	8.9%
내과	442,828	4,621,228	5,064,056	8.7%
정신건강의학과	2,238	66,026	68,264	3.3%
7개 과목 합계	891,529	9,007,466	9,898,995	9.0%

건강보험심사평가원 보도자료

데이터 수집

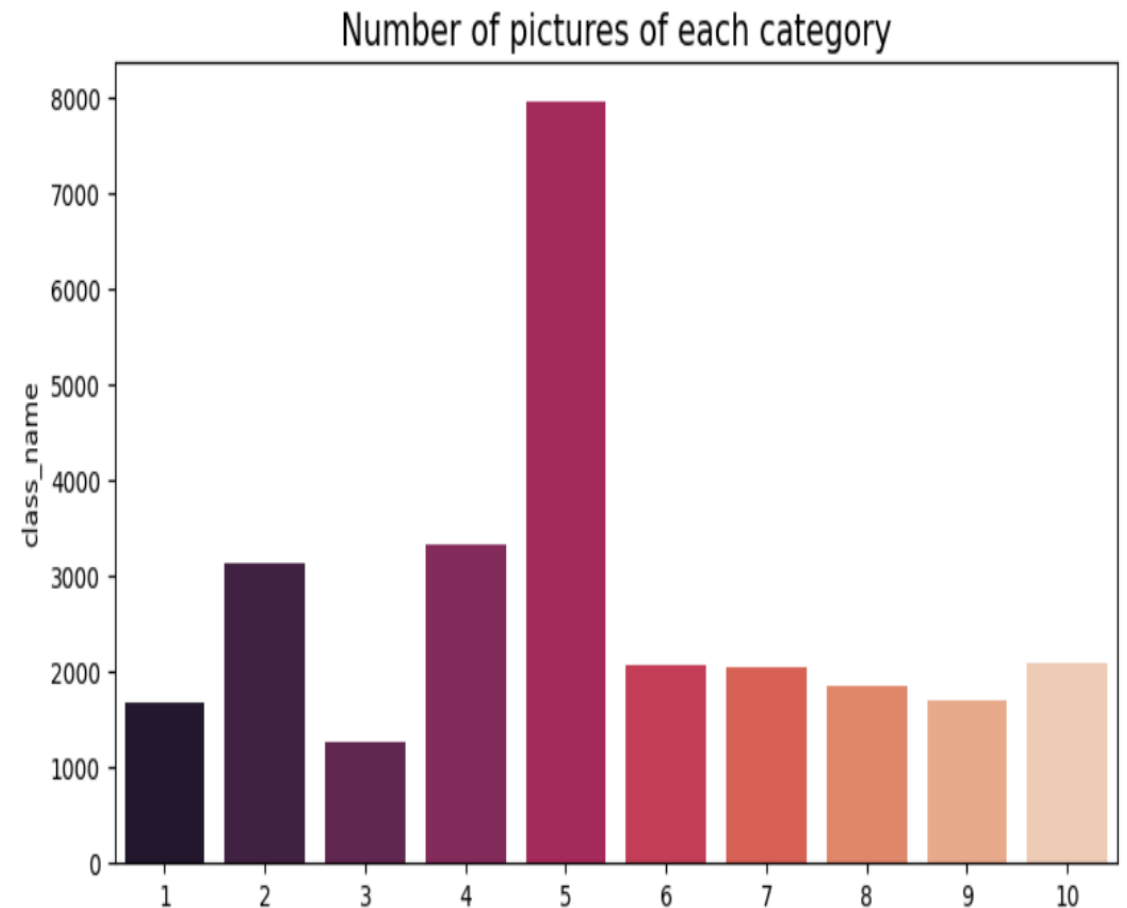
- Kaggle 데이터 (피부 종양)
- Class : 10
- 용량 : 총 5GB (27,153장)

클래스별 데이터 랜덤 추출

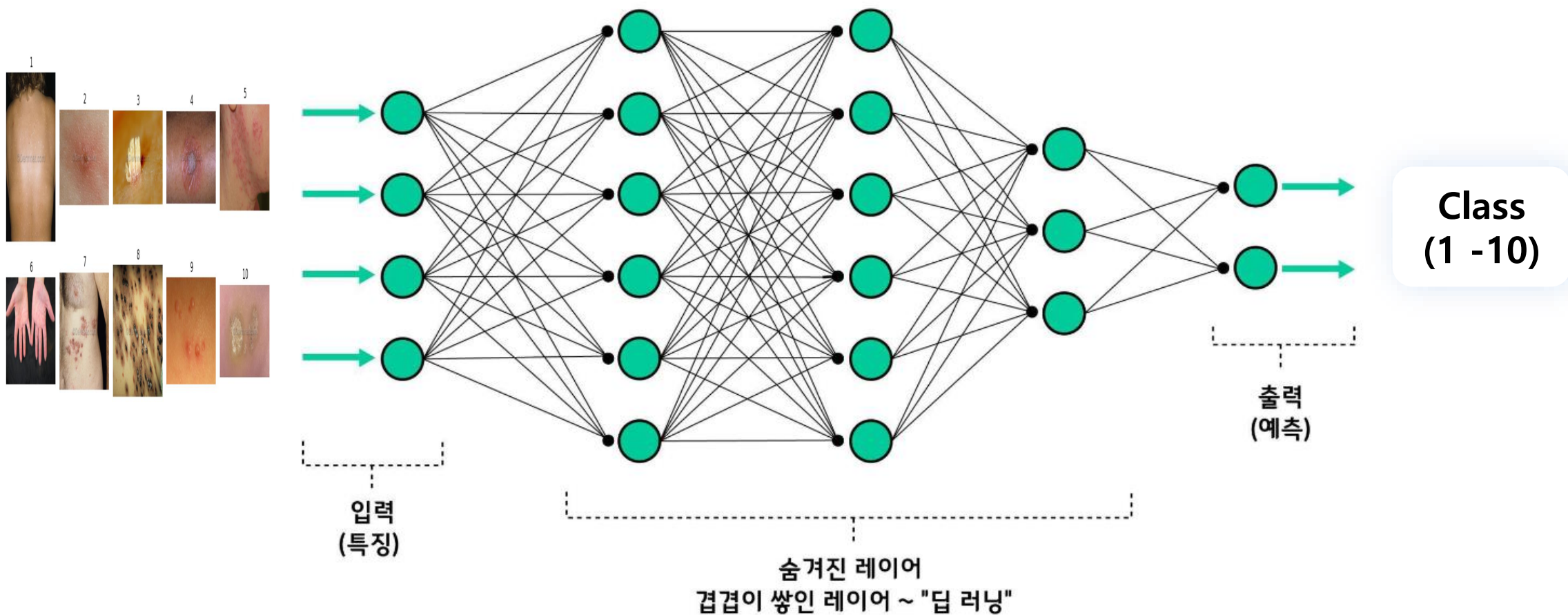


EDA

	class	class_count
1	Eczema	1677
2	Melanoma	1575
3	Atopic Dermatitis	1250
4	Basal Cell Carcinoma (BCC)	3323
5	Melanocytic Nevi (NV)	7970
6	Benign Keratosis-like Lesions (BKL)	2624
7	Psoriasis pictures Lichen Planus and related diseases	2000
8	Seborrheic Keratoses and other Benign Tumors	1800
9	Tinea Ringworm Candidiasis and other Fungal Infections	1700
10	Warts Molluscum and other Viral Infections	2103



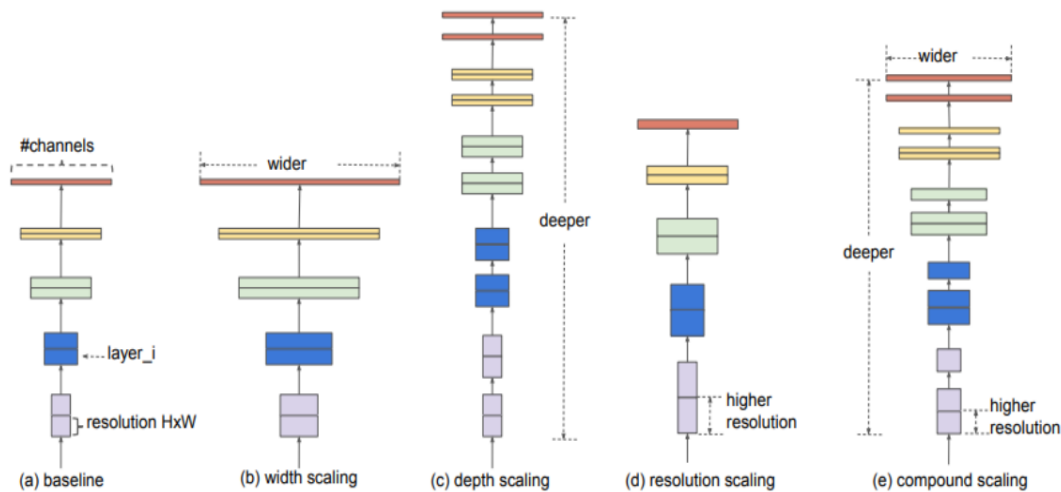
딥 러닝 (Deep Learning) - 인공 신경망의 구조



Model

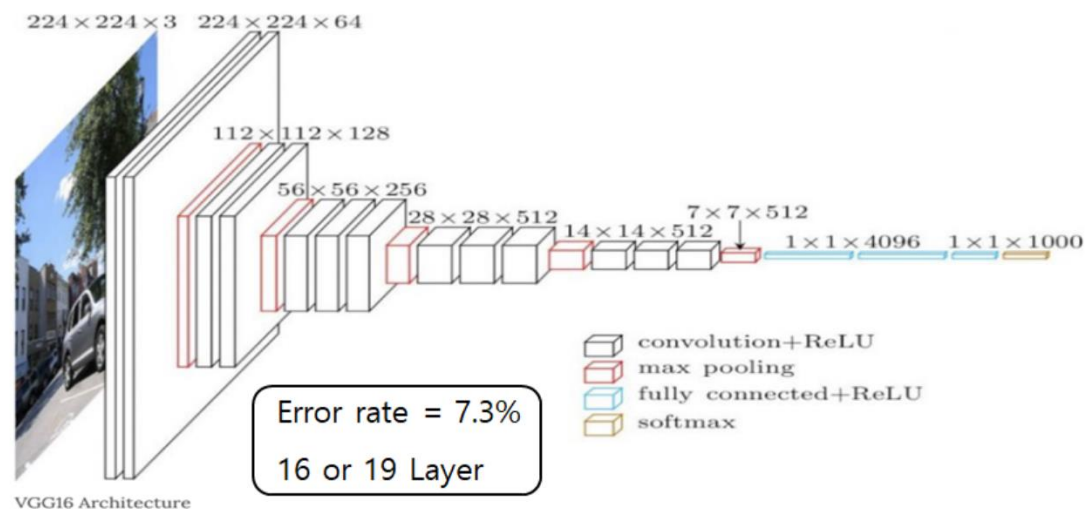
EfficientNet

- 모델 깊이, 너비, 크기를 효율적으로 조절할 수 있는 compound scaling 방법을 제안



Vgg

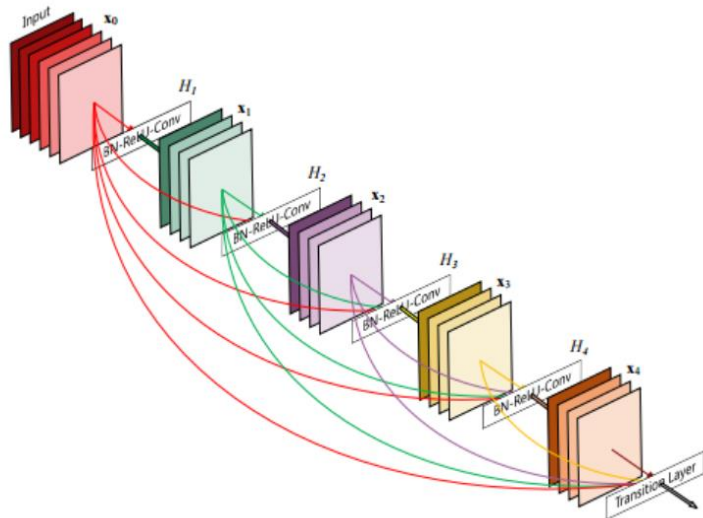
- 메모리 사용량과 연산량 많음
- AlexNet과 비슷한 구조이지만 필터는 더 작게, 계층 더 깊게한 모델



Model

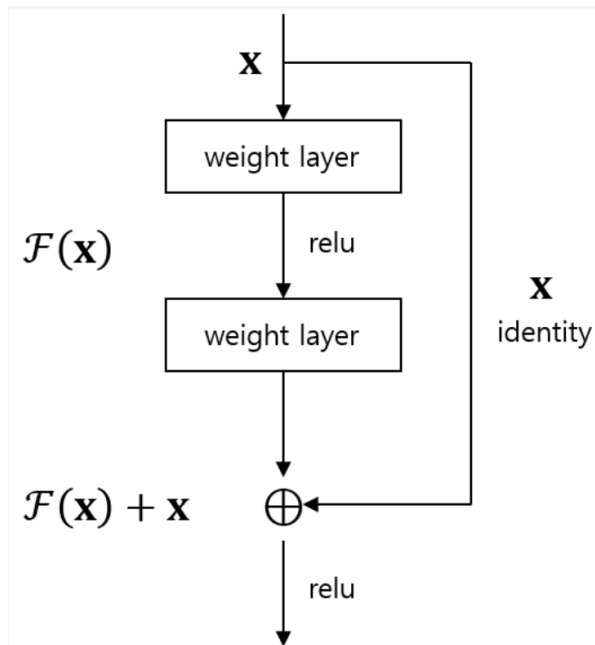
DenseNet

- 모든 레이어의 피쳐맵을 연결
- 이전 레이어의 피쳐맵을 그 이후의 모든 레이어의 피쳐맵에 연결
- 각 레이어의 피쳐맵 채널 수는 굉장히 작은 값을 사용



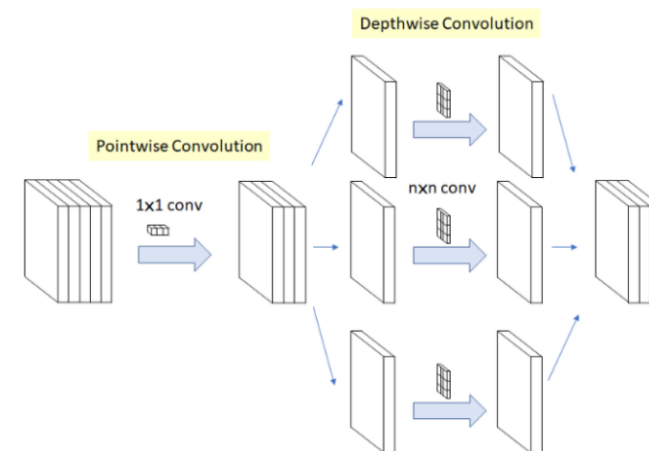
ResNet

- 입력 값 : x
- 출력 값 : 가중치를 거친 값 $F(x)$ 와 identity mapping을 거쳐 만들어진 x 더한 $F(x)+x$



Xception

- cross-channel correlations와 spatial correlations를 독립적으로 계산하기 위해 고안된 모델



`ImageDataGenerator(rotation_range=30, width_shift_range=0.1,
height_shift_range=0.1, shear_range=0.15,
horizontal_flip=True, fill_mode="nearest")`



Data
Augmentation

Augmentation with rotation



Augmentation with width_shift



Augmentation with height_shift



Augmentation with shear



Augmentation with horizontal_flip



Augmentation with fill_mode



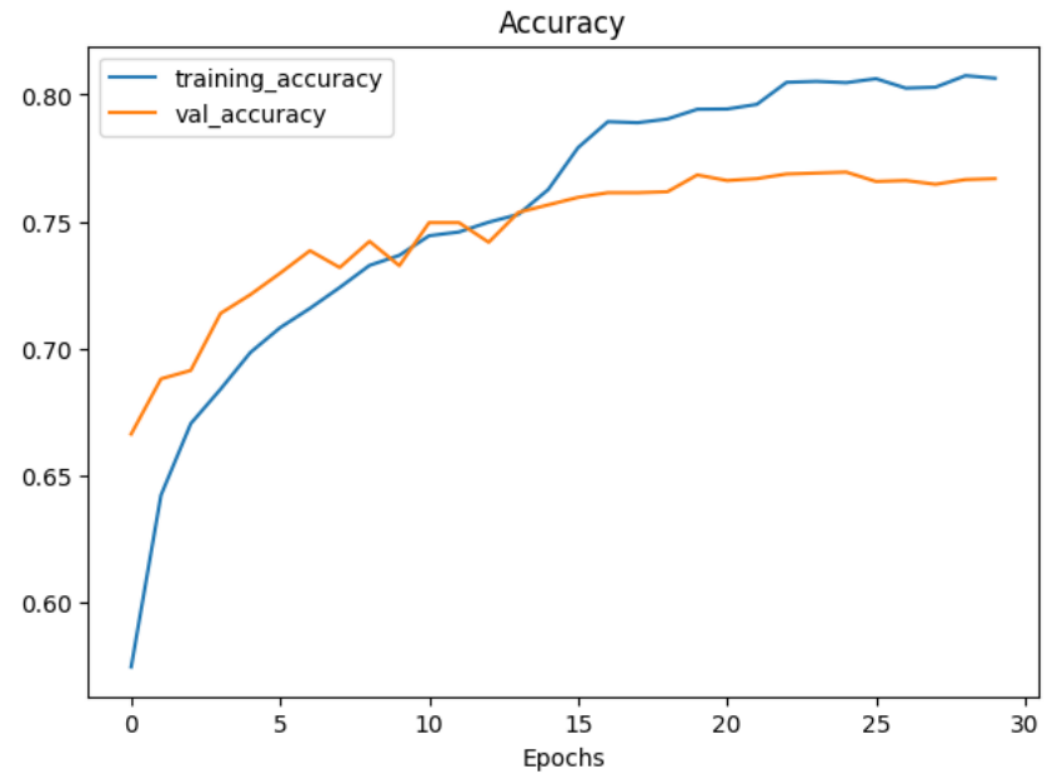
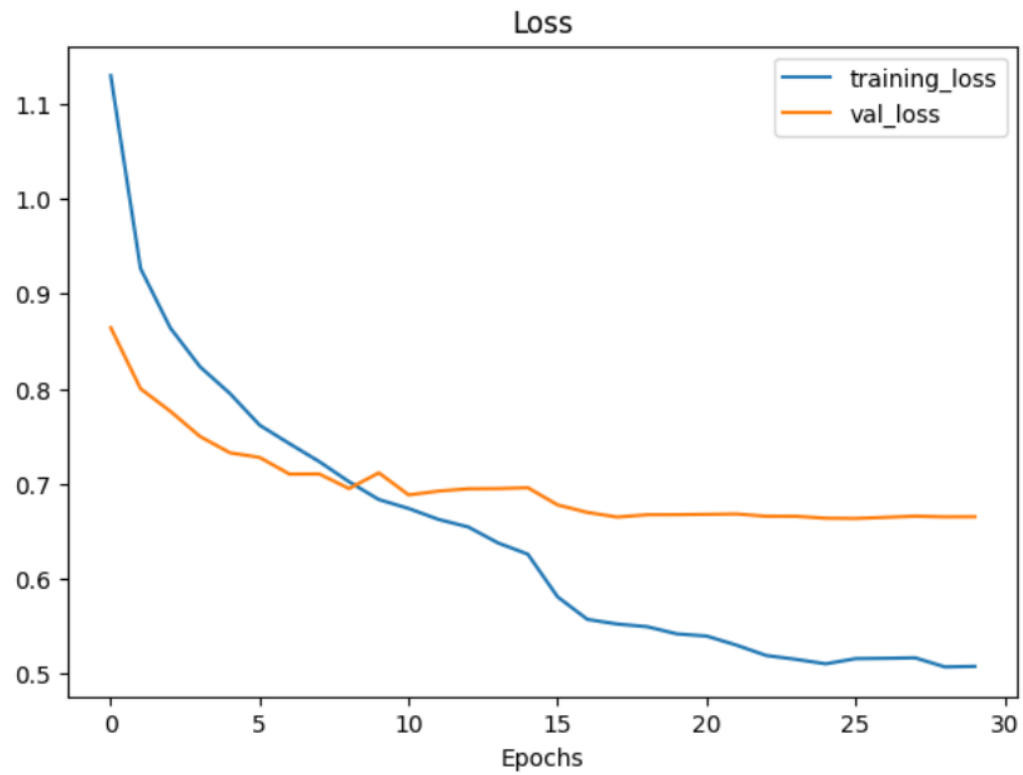
데이터 증강 전

	DenseNet201	EfficientNet	Vgg	Xception	ResNet50v2	ResNet152v2
Acc	0.68	0.80	0.81	0.89	0.85	0.79
Val_Acc	0.64	0.76	0.62	0.63	0.66	0.45
Test_Acc	0.64	0.76	0.64	0.64	0.66	0.45

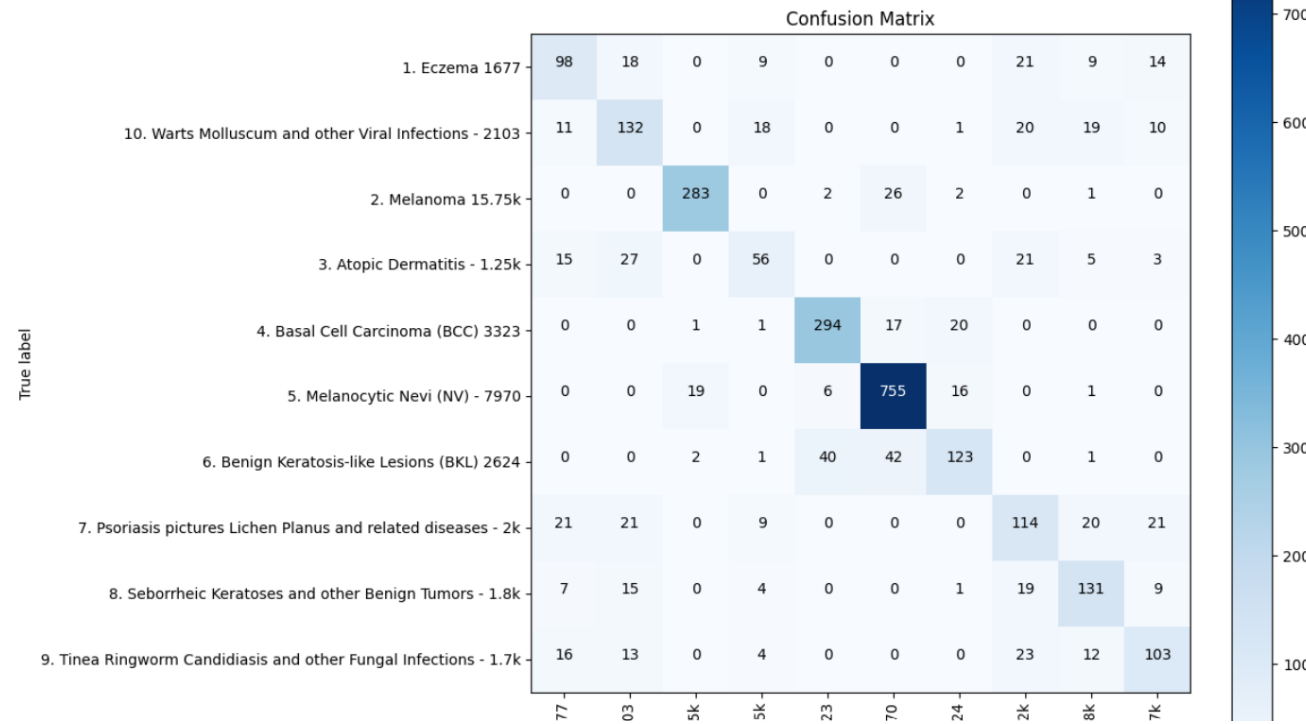
증강 후

Acc	0.69	0.72	0.77	0.75	0.64	0.72
Val_Acc	0.69	0.73	0.65	0.64	0.54	0.67
Test_Acc	0.69	0.72	0.63	0.63	0.55	0.61

EfficientNetB5



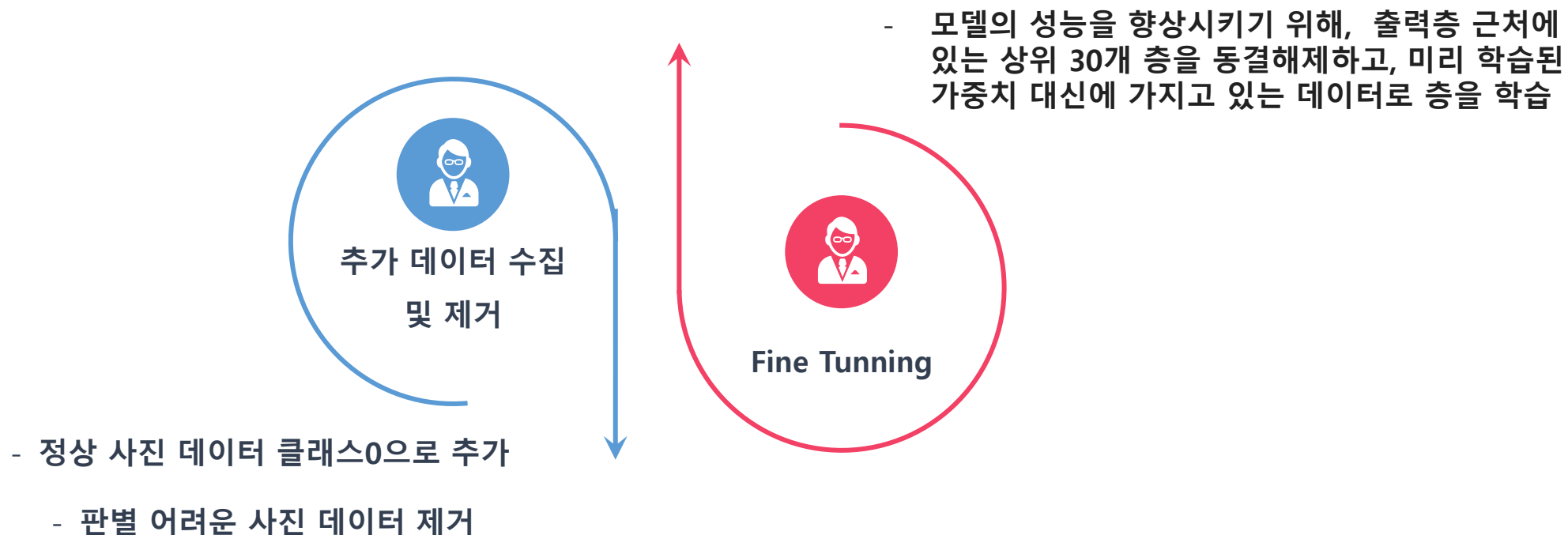
EfficientNetB5



Classification report

	precision	recall	f1-score	support
0	0.58	0.58	0.58	169
1	0.58	0.63	0.60	211
2	0.93	0.90	0.91	314
3	0.55	0.44	0.49	127
4	0.86	0.88	0.87	333
5	0.90	0.95	0.92	797
6	0.75	0.59	0.66	209
7	0.52	0.55	0.54	206
8	0.66	0.70	0.68	186
9	0.64	0.60	0.62	171
accuracy			0.77	2723
macro avg	0.70	0.68	0.69	2723
weighted avg	0.77	0.77	0.76	2723

성능 개선



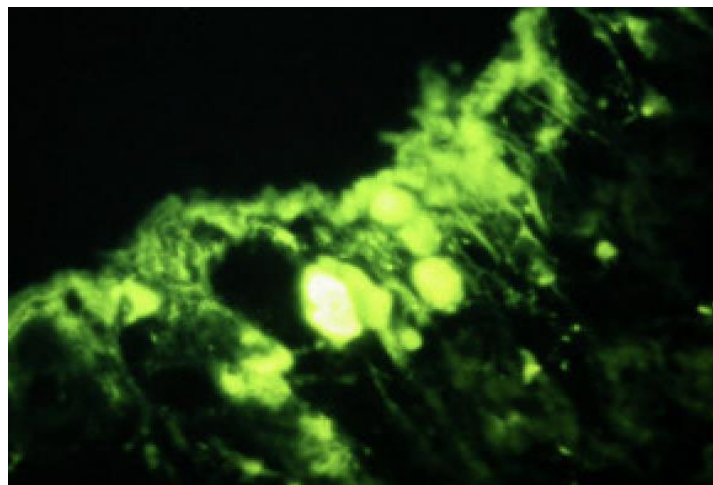
1. 정상 데이터 수집

정상 데이터 랜덤 추출



2. 이미지 제거

- 판별 불가능한 사진 제거

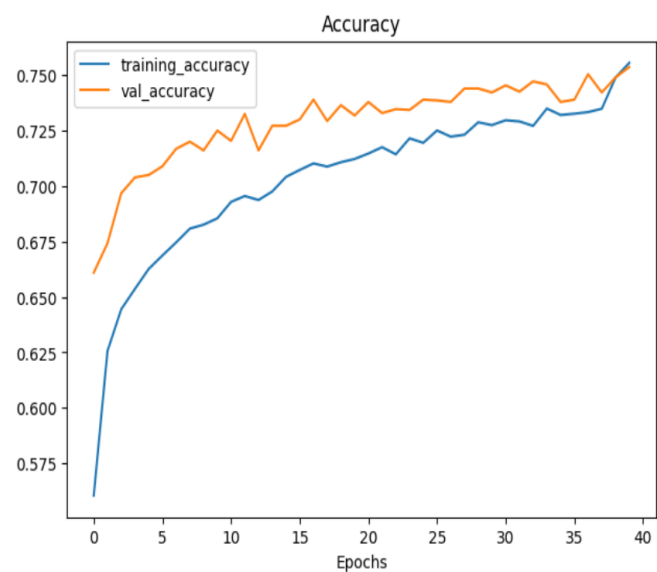
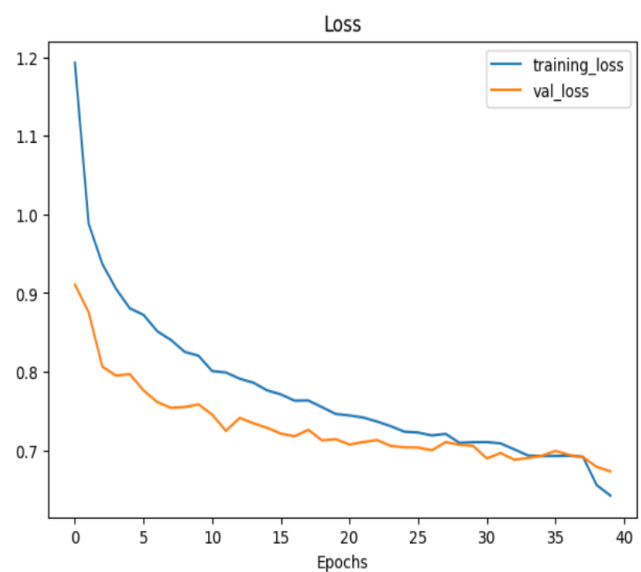


판별 불가능한 사진 예시



EfficientNetB5

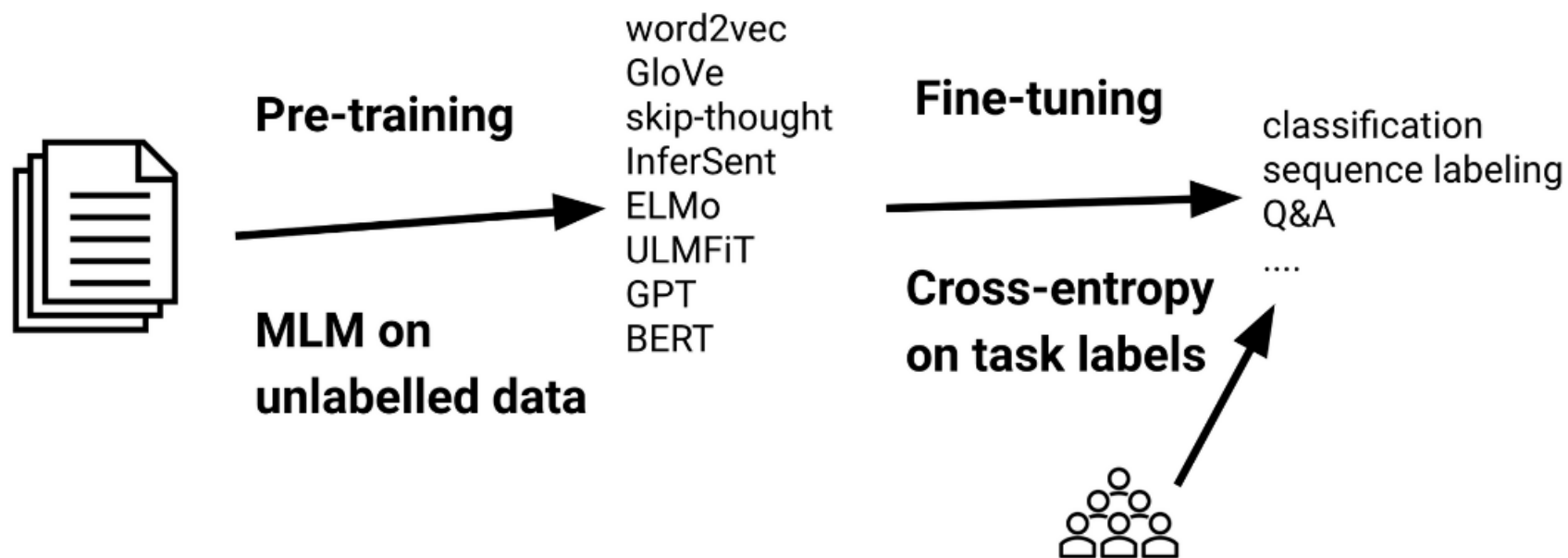
- Acc : 0.76_(+0.03), Val_acc : 0.75_(+0.02), Test_acc : 0.755_(+0.03)



Classification report

	precision	recall	f1-score	support
0	0.99	0.96	0.97	100
1	0.51	0.61	0.56	168
2	0.65	0.63	0.64	211
3	0.93	0.81	0.86	314
4	0.49	0.43	0.46	126
5	0.83	0.86	0.85	333
6	0.88	0.94	0.91	797
7	0.71	0.63	0.67	209
8	0.51	0.51	0.51	203
9	0.67	0.67	0.67	183
10	0.55	0.53	0.54	163
accuracy			0.76	2807
macro avg	0.70	0.69	0.69	2807
weighted avg	0.76	0.76	0.75	2807

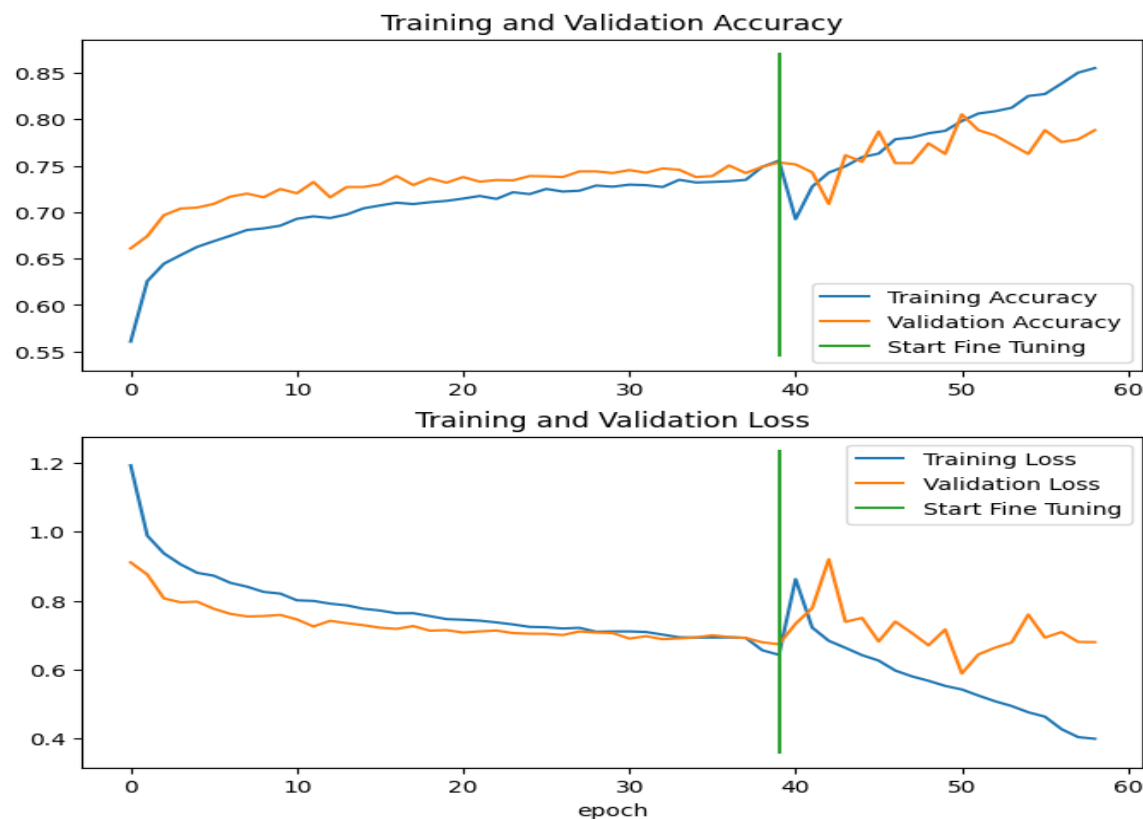
3. Fine Tunning



표준 사전 훈련 - 미세 조정 설정 (Ruder et al., 2019) 에서 채택)

EfficientNetB5

- Acc : 0.8552(+0.13), Val_acc : 0.7884(+0.05), Test_acc : 0.7973(+0.07)



Classification report				
	precision	recall	f1-score	support
0	0.99	0.97	0.98	100
1	0.58	0.65	0.61	168
2	0.65	0.77	0.70	211
3	0.92	0.89	0.90	314
4	0.54	0.48	0.51	126
5	0.88	0.92	0.90	333
6	0.92	0.93	0.93	797
7	0.75	0.71	0.73	209
8	0.59	0.54	0.56	203
9	0.74	0.75	0.74	183
10	0.68	0.54	0.60	163
accuracy			0.80	2807
macro avg	0.75	0.74	0.74	2807
weighted avg	0.80	0.80	0.80	2807

검증

True: 8
Predicted: 8



True: 6
Predicted: 6



True: 4
Predicted: 4



True: 5
Predicted: 5



결론

➤ EfficientNetB5

Train_accuracy	0.72
val_accuracy	0.73
Test_accuracy	0.72



0.86
0.79
0.80

➤ 원격진료 정확도 상승

➤ 피부 질환 비대면으로 자가진단 가능

출처

- <https://www.freshworks.com/ko/freshdesk/kblogs/deep-learning/>
- <https://hayate1212.tistory.com/12>
- <https://www.donga.com/news/It/article/all/20230210/117819659/1>
- <http://m.dongascience.com/news.php?idx=58406>
- <https://www.ruder.io/recent-advances-lm-fine-tuning/>

감사합니다

딤러닝 1팀 - 고지현, 윤정옥, 황지우