



한림대학교
HALLYM UNIVERSITY



솔루션 설명

팀: HallymMMC

한림대학교: 허종욱, 신유승, 심보석
KAIST: 안원혁, 강지현

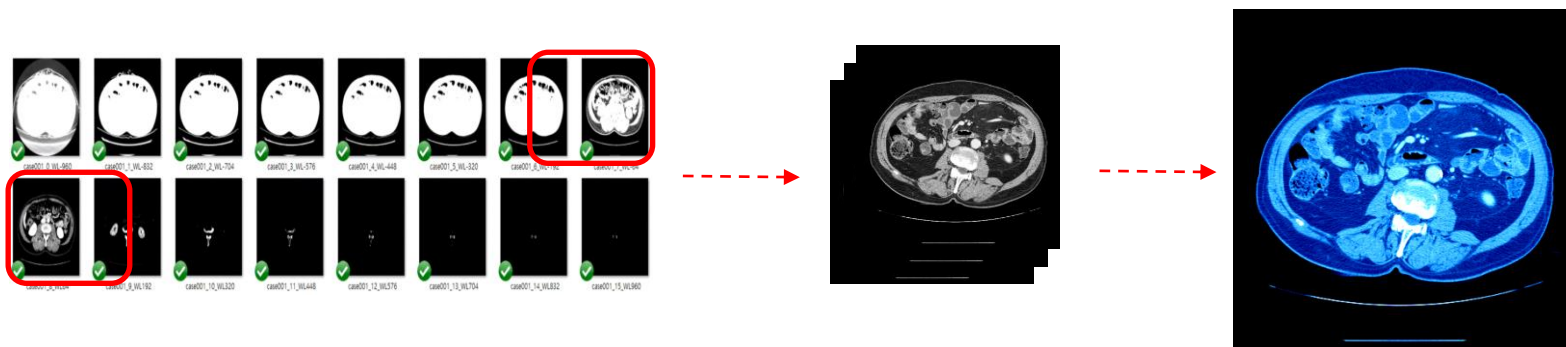
데이터 전처리 및 데이터셋 구성

■ DICOM 원 데이터의 픽셀 분포를 확인 (좌)

- -256~256 사이에 주로 의미있는 값이 있는것으로 확인

■ WL: -128, 0, 128, WW: 256을 이용하여 .png 3장 추출

- 3장의 추출 이미지는 color image의 각 R/G/B 채널로 이동 후 저장 (우)

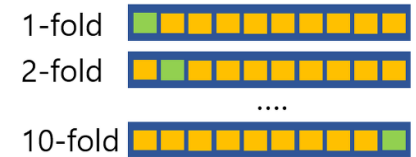


- (규정에 따라) TEST셋의 Psuedo-label 사용하지 않음
- 외부 데이터 사용하지 않음

학습 방법

■ 이용 모델 및 기타사항

- AlbUNet: U-Net with ResNet encoder
 - RTX 2070S 2대 사용, Pretrained 이용
- 이미지 사이즈는 1024로 학습 후 제출 전 512로 축소
 - 데이터는 10-fold cross validation



■ 실험 설정: 2종류 이용

- 1번: albunet1024fold10: 강한 image augmentation
- 2번: albunet1024fold10albJW: 보통수준의 image augmentation

■ 학습 단계:

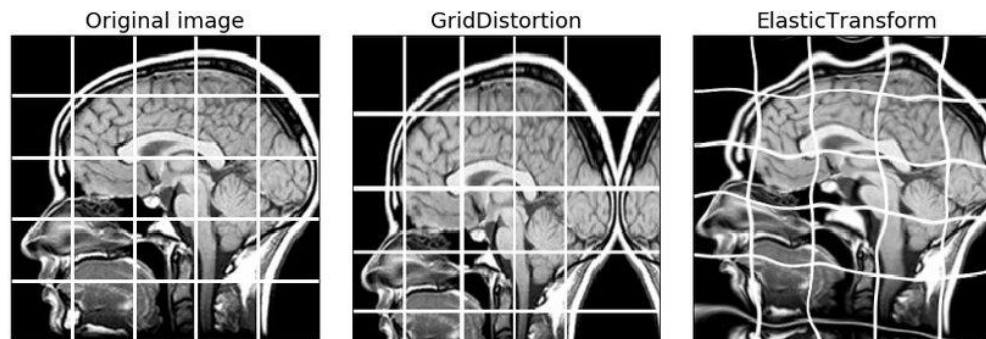
- 1단계: 비교적 큰 LR = 0.0001 (50epoch)
- 2단계:
 - 1단계의 best 모델 선택
 - 작은 LR = 0.00001 (50epoch, early stopping = 12)

데이터 augmentation

- train_transforms_complex_1024.json (강한 데이터 증강)
- train_transforms_hjw_1024.json (보통 데이터 증강)

■ 사용한 데이터 transform 목록

- HorizontalFlip
- RandomContrast, RandomGamma, RandomBrightness
- ElasticTransform, GridDistortion, OpticalDistortion
- ShiftScaleRotate, Resize, Normalize



평가 및 submission 생성

■ Inference and ensemble

- 2단계의 각 fold별 상위 3개의 결과를 평균(총 10종류의 fold * 3)
- 학습 종류(2종)별 앙상블
- Test time augmentation: Rotation, Scaling 사용 (최종 결과엔 미적용)
 - 총 $2 * 10 * 3 = 60$ 개의 weights를 사용

■ 앙상블 후 후처리

■ RLE 및 CSV 파일 작성 후 제출

앙상블 후 후처리 세부 사항

■ MIN_CONTOUR_AREA 수치로 작은 영역 필터링

- 작은 영역 선택 후, 다른 클래스 영역으로 segment 이동 (=1300)

■ 4개의 class중 인접한 영역의 확률로 segment 이동 설정

- step1) Small segmen에 팽창 연산을 적용 후, 타 채널과 중첩되는 부분의 확률 값을 모두 합하여 score로 저장.
- step2) score가 최대로 나온 class index로 segment를 이동

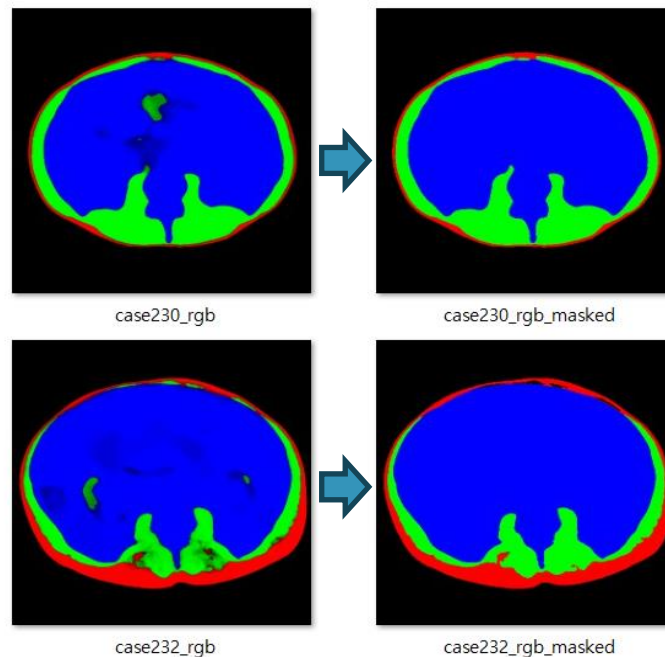
```
# 작은영역 boolean mask
mask_small_dilate = (mask_small_dilate>0)

# 큰 영역의 확률맵
prob_large_contour = mask * mask_larges_

# 확률이 제일 높은 영역의 채널 번호를 가져온다.
score = []
for c in range(0, num_class):
    score.append(((prob_large_contour[c, :, :] * mask_small_dilate).sum()))

# 최고 점수가 나온 채널 획득
idx = np.argmax(score)

# 높은 영역의 채널로 small contour를 편입시킨다.
mask_larges[idx[0], :, :] += mask_small
```



HallymMMC 팀 및 solution 설명

■ 멤버 (5명):

- 한림대학교 소프트웨어융합대학: 허종욱, 신유승, 심보석
- KAIST 전산학부: 안원혁, 강지현

■ 최고 leaderboard score

- 0.96277

■ 코드 및 weight 다운로드 링크

- git: <https://github.com/juhou/body-morp-segmentation>
- 케글 notebook: <https://www.kaggle.com/jongukhou/bodymorpseg-hou-master>
- 데이터셋: <https://www.kaggle.com/jongukhou/bodymorpsegmentationmaster>
- 데이터 weights:
 - <https://www.dropbox.com/sh/tspl5h5myx3423s/AACS5RqV59jGtGow6AiEjQoca?dl=0>

■ 감사합니다.

(appendix) 코드 구성 및 폴더구조 아웃라인

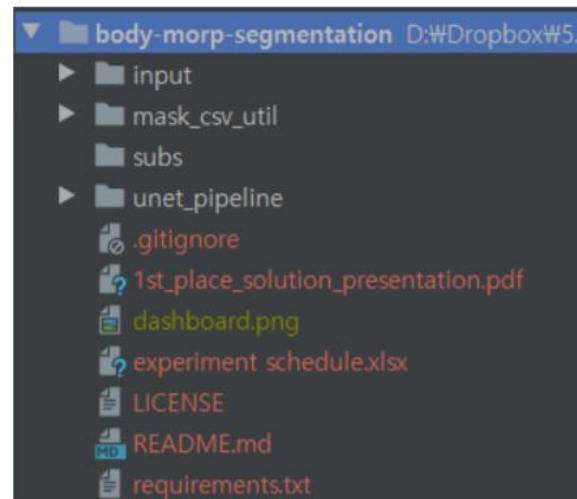
input: 학습/테스트용 데이터

mask_csv_util: 초기 raw 데이터 변환용 코드

subs : 제출용 csv와 prediction 저장 폴더

unet_pipeline: 실험 전체 스크립트

나머지 파일들은 참고자료



- 모든 데이터는 fold 인덱스를 미리 부여했음
- /unet_pipeline/folds/ *.csv 파일을 통해 관리됨.
- csv 부여하는 코드는 mask_csv_util 에 있음

(appendix) unet_pipeline (1)

■ ./ensemble_configs:

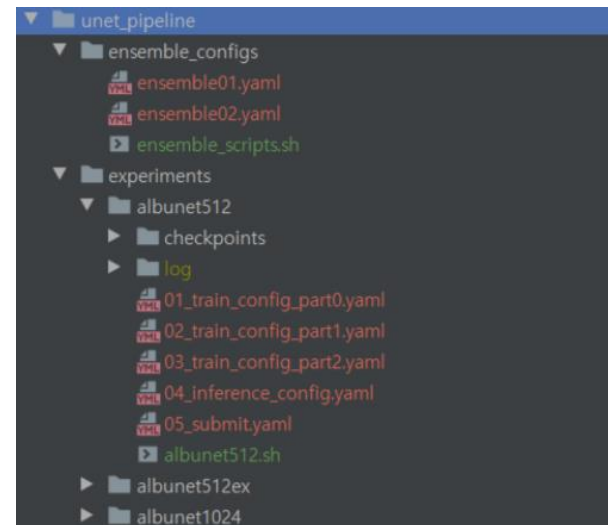
앙상블을 위한 yaml 설정파일과 예제 스크립트

■ ./experiments:

모델/세팅 별 학습 스크립트 모음집

■ ./*/checkpoints: fold별 best 모델 저장

■ yaml 파일을 수정해서 실험 설정한 후에 *.sh에 있는 스크립트 실행



(appendix) unet_pipeline (2)

unet_pipeline (2)

./folds: 학습실험 데이터 fold 관리용 csv

./models: 학습 가능한 모델 (일단 teranusnets만 준비됨)

./transforms: Albumentation 설정 파일

./utils: 각종 util (수정 필요없음)

```
1 fname, fold, exist_labels
2 case001.png, 0, 1
3 case002.png, 1, 1
4 case003.png, 2, 1
5 case004.png, 3, 1
6 case005.png, 4, 1
7 case006.png, 0, 1
8 case007.png, 1, 1
9 case008.png, 2, 1
10 case009.png, 3, 1
11 case010.png, 4, 1
12 case011.png, 0, 1
```

```
1 """__init__"""
2
3 """__version__"""
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5 """__class_fullname__"""
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7 """__author__"""
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9 """__license__"""
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(appendix) 실험 전체 결과

No.	Experiment name	Public 리더보드	Validation	설명
1	albunet512	0.95931	0.99006	원사이즈 데이터
2	albunet512PL	-	0.989998	슈도레이블(1번 pred) + 후처리 필요
3	albunet512fold10	-	0	
4	albunet512AL_JW	-	0	
5	albunet1024	0.9595	0.985848	
6	albunet1024fold10	0.96007	0.985742	
7	albunet1024fold10albJW	0.96056	0.986304	JW alumentation, 1024사이즈, 10fold
아래부터는 MIN)CONTOUR_AREA 1300 적용한것				
8	albunet1024fold10albJW_2	-	0.986428	JW alumentation, 학습 50epoch 더
9	net1024fold10albJWexpandedL	-	0	앨범JW, 경계제거DB
10	4fold10albJWexpandedLabel_fi	0.94794	0	앨범JW, 경계제거DB, tta scale 추가
11	albunet1024fold10albJW2	학습중	0	앨범JW2(중간복잡), 경계제거DB
12	albunet1024fold10albJW3	학습중	0	앨범JW3(scale강화), 오리지날DB, tta scale
13	albunet1024fold10alb_wh2			원형 2

No.	Ensemble	Public LB	앙상블내용	설명
1	ensemble567	0.9618	5+6+7	worst를 좀 없애줌
2	ensemble_567_with209	0.96249	6+7	MIN_CONTOUR_AREA 1200
3	ensemble01	0.96277	6+7	MIN_CONTOUR_AREA 1300
4	ensemble6-13	0.96192	6+7+9+11+12+13	
5	ensemble671213	0.96175	6+7+12+13	변형한 DB는 사용 안함