Modeling Life-span Brain Age from Large-scale Dataset based on Multi-level Information Fusion

This is a PyTorch implementation of the paper "Modeling Life-span Brain Age from Large-scale Dataset based on Multi-level Information Fusion", June, 2023.

1. Installation

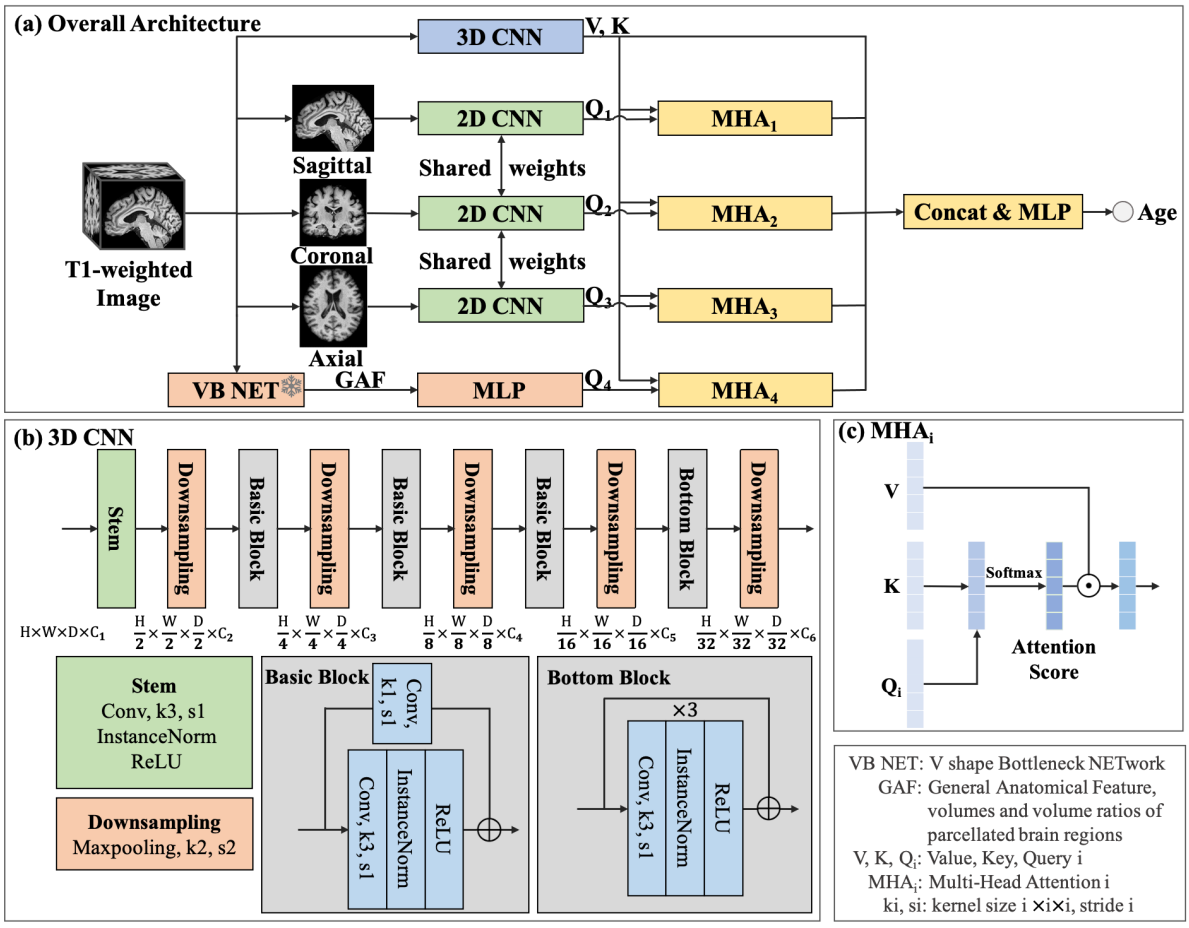
(1) Create conda env and install pytorch

```
conda create -n brain python=3.9
conda install pytorch torchvision torchaudio pytorch-cuda=11.7 -c pytorch -c
nvidia
```

(2) Install relevant libraries

```
pip install -r requirements.txt
```

2. Network Architecture

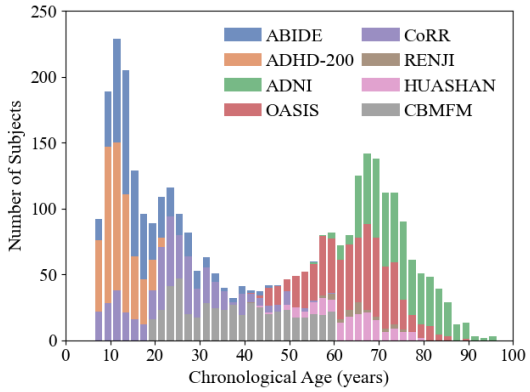


3. Data Distribution

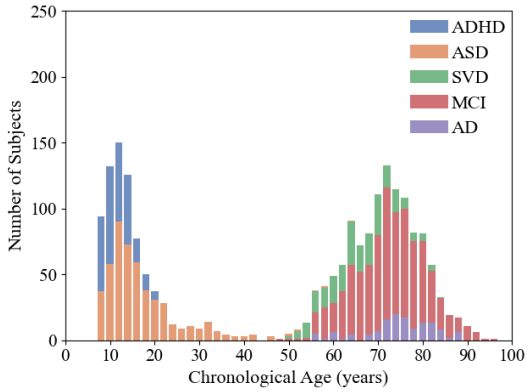
Demographic information of 8 cohorts

Cohort	Category	Total	HCs	BDs	Range	Mean ± SD	Male/Female
ABIDE	HC, ASD	1010	511	499	6-64	17.4 ± 8.1	870/140
ADHD-200	HC, ADHD	767	487	280	7-22	12.0 ± 3.2	478/289
ADNI	HC, MCI, AD	1348	565	783	55-96	73.9 ± 7.4	652/696
OASIS	HC, AD	716	634	82	42-89	65.2 ± 8.8	321/395
CoRR	HC	474	474	0	6-60	24.1 ± 10.5	258/216
RENJI	HC, SVD	297	37	260	41-84	65.3 ± 7.2	228/69
HUASHAN	HC, MCI, AD	266	166	100	43-80	64.4 ± 7.3	103/163
CBMFM	HC	498	498	0	20-60	38.0 ± 11.9	228/270
Total	HC, ADHD, ASD, SVD, MCI, AD	5376	3372	2004	6-96	42.7 ± 25.3	3138/2238

Age Distribution on Healthy Controls

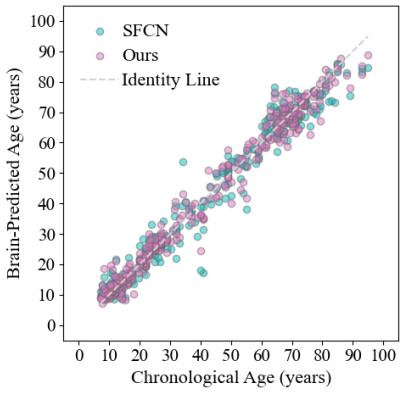


Age Distribution on Brain Disorders

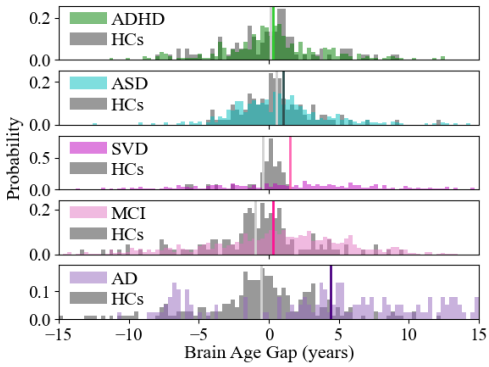


4. Prediction Performance

Predictions on Healthy Controls



Predictions on Brain Disorders



5. Train the Model

To train the model, run `train_threedim_3view_GAF.py` file provided in the repository.

```
batch_size=8
learning_rate=0.001
weight_decay=0.0001
n_epochs=200
```

```
n_exps=1 # num of independent experiments

# ============= Training and Parameter Configuration ==============
python train_threedim_3view_GAF.py                          \
--batch_size        $batch_size                             \
--lr_s              $learning_rate                          \
--wd_s              $weight_decay                           \
--n_epochs          $n_epochs                               \
--n_exps            $n_exps                                 \
```

6. Test on Brain Disorders

To test the model on brain disorders, run `test_BDs.py`.

```
python test_BDs.py
```