BeatGAN (github)
colab으로 실행 및 결과발표

ecg full experiment & ecg demo & motion experiment

임에딘

Overview

This is the implementation for the BeatGAN model architecture described in the paper:

"BeatGAN: Anomalous Rhythm Detection using Adversarially Generated Time Series".

Usage

- For ecg full experiemnt (need to download full dataset)

```
sh run_ecg.sh
```

- For ecg demo (there are demo data in experiments/ecg/dataset/demo, the output dir is in experiments/ecg/output/beatgan/ecg/demo)

```
sh run_ecg_demo.sh
```

- For motion experiment

```
sh run_mocap.sh
```

colab에서 sh파일 실행하기

```
[2]  from google.colab import drive
     drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
[3]  cd /content/drive/MyDrive/Colab Notebooks/BeatGAN-master
```

```
/content/drive/MyDrive/Colab Notebooks/BeatGAN-master
```

```
[ ]  !sh run_ecg_demo.sh
```

1. Google Colab에서 Google Drive와 연동
2. cd 명령어로 해당 폴더에 경로변경
3. !sh 명령어로 sh파일을 실행

https://stackoverflow.com/questions/54604995/how-to-run-a-script-shell-in-google-colab
https://stackoverflow.com/questions/54269091/google-colab-cant-access-drive-content/55675184

sh run_ecg_demo.sh

실행→ output 폴더에 저장된 abnormal과 normal 데이터 확인

!sh run_ecg_demo.sh

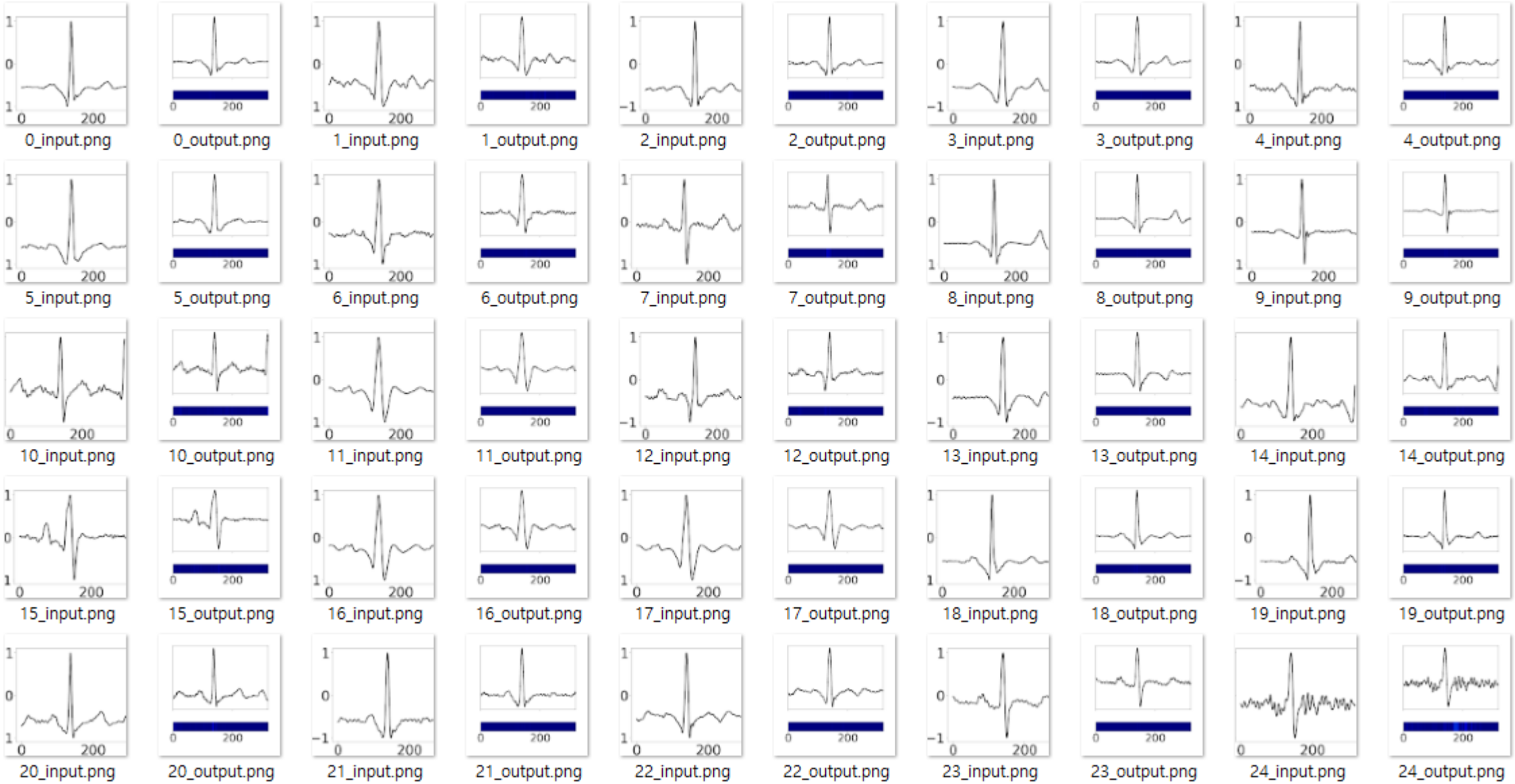
```
!sh run_ecg_demo.sh
```

```
(64, 1, 320)
(64, 1, 320)
findfont: Font family ['Times New Roman'] not found. Falling back to DejaVu Sans.
demo.py:148: RuntimeWarning: More than 20 figures have been opened. Figures created through the pyplot interface (`matplotlib.pyplot.figure`) are retained until explicitly closed a
  fig, ax = plt.subplots(2, 1, sharex=True, figsize=(6, 6), gridspec_kw={'height_ratios': [7, 1],
demo.py:178: RuntimeWarning: More than 20 figures have been opened. Figures created through the pyplot interface (`matplotlib.pyplot.figure`) are retained until explicitly closed a
  fig2, ax2 = plt.subplots(1, 1)
demo.py:148: RuntimeWarning: More than 20 figures have been opened. Figures created through the pyplot interface (`matplotlib.pyplot.figure`) are retained until explicitly closed a
  fig, ax = plt.subplots(2, 1, sharex=True, figsize=(6, 6), gridspec_kw={'height_ratios': [7, 1],
demo.py:178: RuntimeWarning: More than 20 figures have been opened. Figures created through the pyplot interface (`matplotlib.pyplot.figure`) are retained until explicitly closed a
  fig2, ax2 = plt.subplots(1, 1)
demo.py:148: RuntimeWarning: More than 20 figures have been opened. Figures created through the pyplot interface (`matplotlib.pyplot.figure`) are retained until explicitly closed a
  fig, ax = plt.subplots(2, 1, sharex=True, figsize=(6, 6), gridspec_kw={'height_ratios': [7, 1],
```

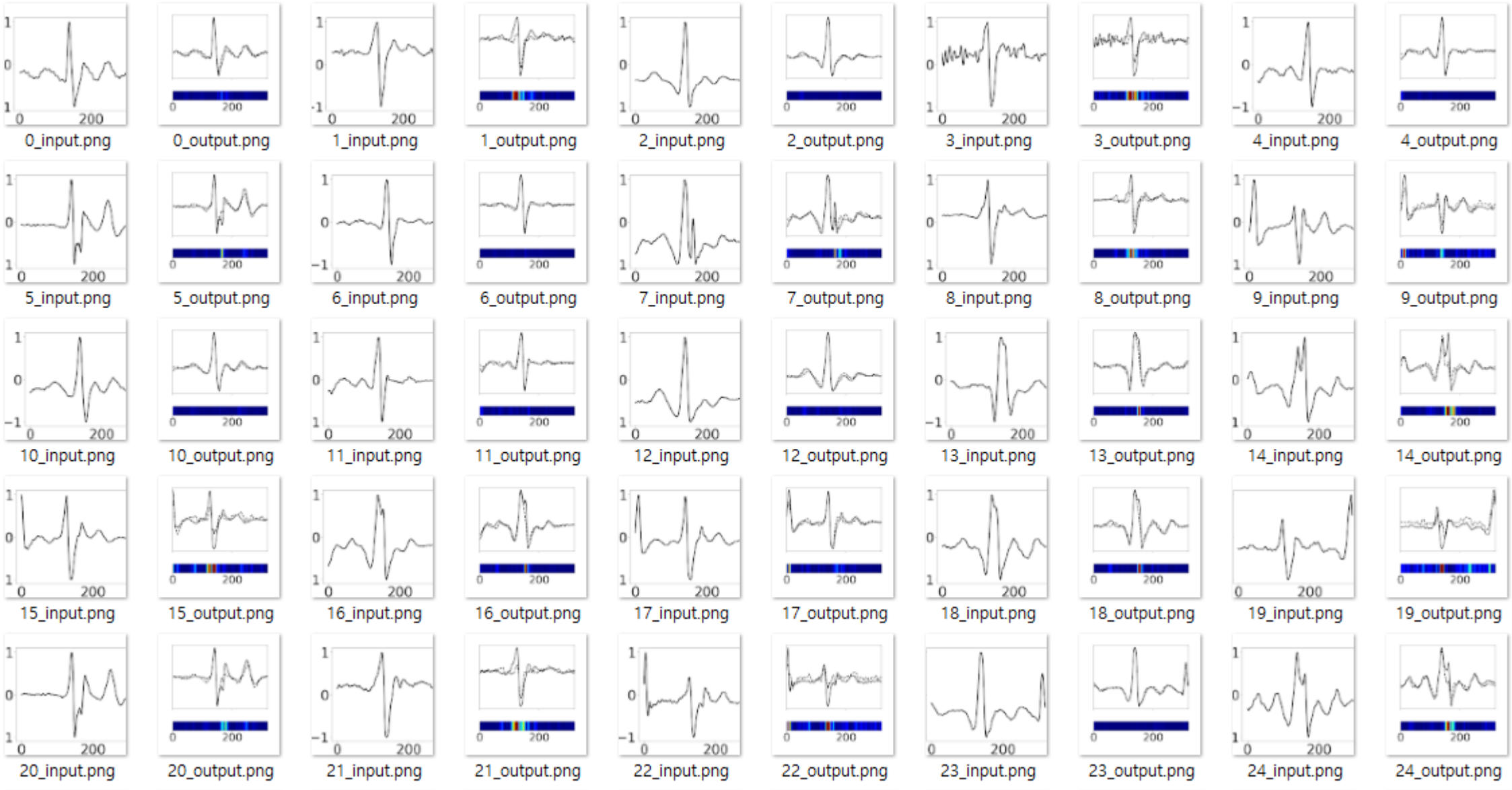
✓ 56초 오후 8:18에 완료됨

https://github.com/hi-bingo/BeatGAN

내 PC › Google Drive (G:) › 내 드라이브 › Colab Notebooks › BeatGAN-master › experiments › ecg › output › demo › normal

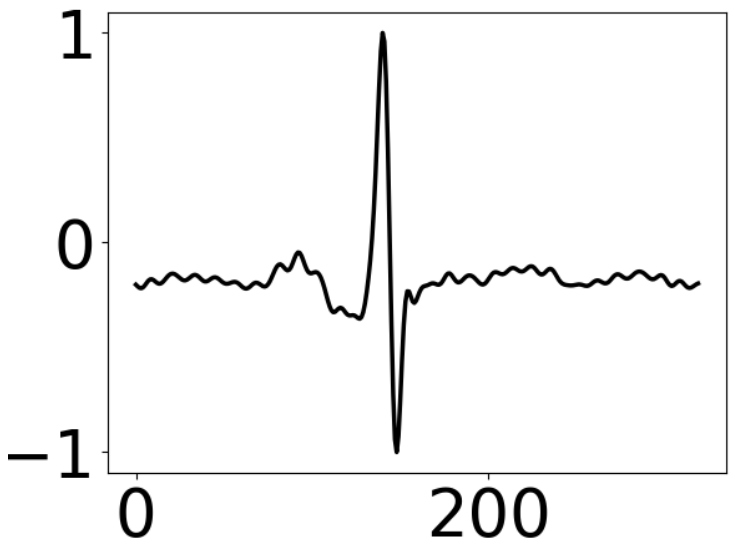


내 PC › Google Drive (G:) › 내 드라이브 › Colab Notebooks › BeatGAN-master › experiments › ecg › output › demo › abnormal

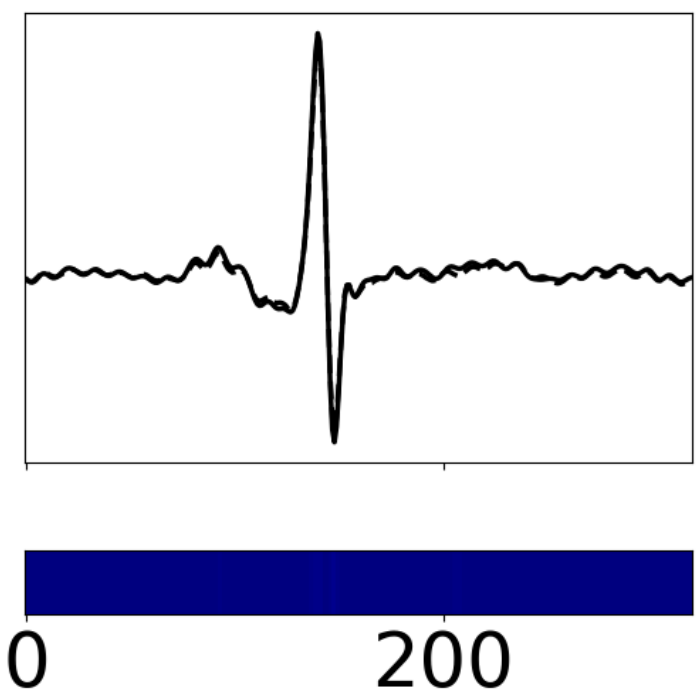


normal 폴더

46_input.png

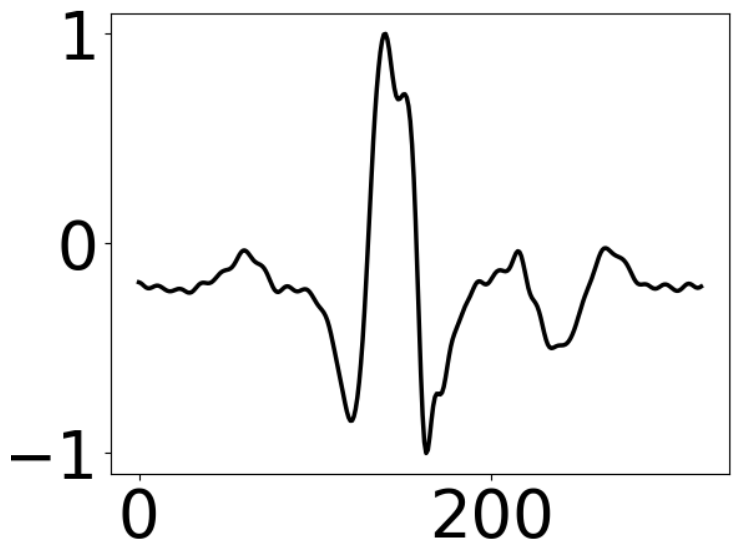


46_output.png

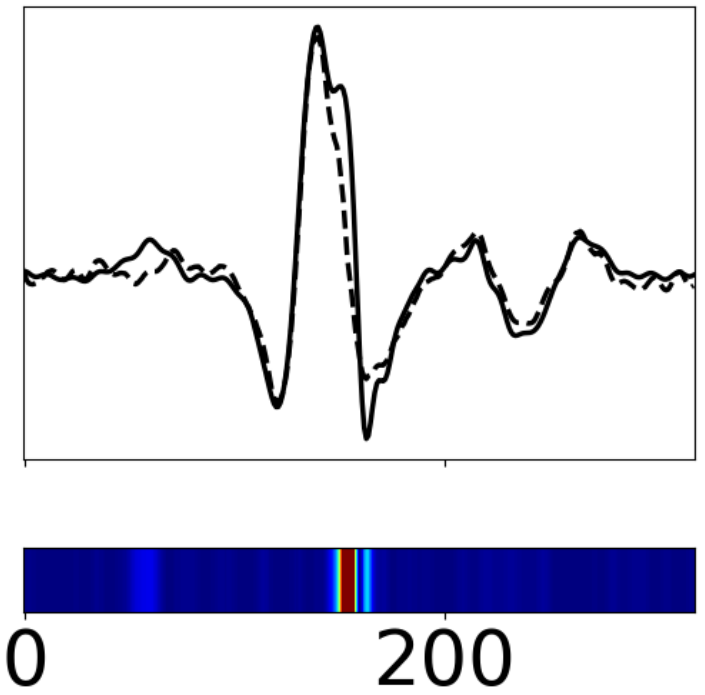


abnormal 폴더

49_input.png



49_output.png



sh run_mocap.sh

실행 → best threshold

!sh run_mocap.sh

```
!sh run_mocap.sh

(980, 4, 64)
(749, 4, 64)
load data success!!!
/content/mount/MyDrive/Colab Notebooks/BeatGAN-master/experiments/mocap/model.py:42: UserWarning: nn.init.xavier_uniform is now deprecated in favor of nn.init.xavier_uniform_.
  torch.nn.init.xavier_uniform(mod.weight)
findfont: Font family ['Times New Roman'] not found. Falling back to DejaVu Sans.
ap:1.0
auc:1.0
best threshold:0.09418227523565292  ==> F1:1.0
```

best threshold:0.09418228268623352 ==> F1:1.0

sh run_ecg.sh

1. Syntax Error: Bad for loop variable
2. RuntimeError: No CUDA GPUs are available
3. FileNotFoundError : pkl파일 경로 문제
4. RuntimeError : set_sizes_contiguous is not allowed on a Tensor created from .data or .detach()

에러→해결

!sh run_ecg.sh

```
[26]  !sh run_ecg.sh

      run_ecg.sh: 19: run_ecg.sh: Syntax error: Bad for loop variable
```

Syntax error: Bad for loop variable

10 Because sh isn't bash. `for (( … ))` is not available in sh. – kojiro May 20 '15 at 18:53

21

The `for (( expr ; expr ; expr ))` syntax is not available in `sh`. Switch to bash or ksh93 if you want to use that syntax. Otherwise, the equivalent for sh is:

```
#!/bin/sh

i=80
while [ "$i" -le 101 ]; do
    amixer cset numid=1 "$i%"
    sleep 60
    i=$(( i + 1 ))
done
```

answered May 20 '15 at 18:54
geirha
4,925 ● 1 ● 26 ● 35

3 FYI, to change to bash, change your hashbang (the first line of your script) to `#!/bin/bash` – Rob May 20 '15 at 19:50

[질문] Syntax error: Bad for loop variable
https://stackoverflow.com/questions/30358065/syntax-error-bad-for-loop-variable

run_ecg.sh 코드

45 lines (37 sloc) | 884 Bytes

```
#!/bin/bash

cd experiments/ecg

test=1    # 0 means train the model, 1 means evaluate the model
threshold=0.02
fold_cnt=1

dataroot="./dataset/preprocessed/ano0/"
model="beatgan"

w_adv=1
niter=100
lr=0.0001
n_aug=0

outf="./output"

for (( i=0; i<$fold_cnt; i+=1))
do
    echo "################################"
    echo "########  Folder $i  ############"
    if [ $test = 0 ]; then
            python -u main.py  \
            --dataroot $dataroot \
            --model $model \
            --niter $niter \
            --lr $lr \
            --outf  $outf \
            --folder $i

        else
            python -u main.py  \
            --dataroot $dataroot \
            --model $model \
            --niter $niter \
            --lr $lr \
            --outf  $outf \
            --folder $i  \
            --outf  $outf \
            --istest  \
            --threshold $threshold
    fi

done
```

[해결] sh→bash로 명령어 수정

```
!sh run_ecg.sh
```

```
!bash run_ecg.sh
```

!bash run_ecg.sh

7초

```
!bash run_ecg.sh
```

```
###################################
########  Folder 0  #############
Traceback (most recent call last):
  File "main.py", line 19, in <module>
    opt = Options().parse()
  File "/content/mount/My Drive/Colab Notebooks/BeatGAN-master/experiments/ecg/options.py", line 69, in parse
    torch.cuda.set_device(self.opt.gpu_ids[0])
  File "/usr/local/lib/python3.7/dist-packages/torch/cuda/__init__.py", line 264, in set_device
    torch._C._cuda_setDevice(device)
  File "/usr/local/lib/python3.7/dist-packages/torch/cuda/__init__.py", line 172, in _lazy_init
    torch._C._cuda_init()
RuntimeError: No CUDA GPUs are available
```

RuntimeError: No CUDA GPUs are available

In Colaboratory, CUDA cannot be used for the torch

Asked 2 years, 6 months ago Active 12 months ago Viewed 18k times

asked Mar 27 '19 at 2:33
biao_biao
141 ● 1 ● 1 ● 3

44

Click on ***Runtime*** and select ***Change runtime type***.

Now in ***Hardware Acceleration***, select ***GPU*** and hit Save.

Share Improve this answer Follow

edited Sep 25 '20 at 22:07
Peter Mortensen
28.9k ● 21 ● 96 ● 123

answered Apr 17 '19 at 8:25
BlankSpace
481 ● 1 ● 4 ● 5

[해결] main.py 에서 CUDA_VISIBLE_DEVICES 관련 line을 주석처리

```
1
2
3   import os
4   #os.environ["CUDA_VISIBLE_DEVICES"] = "1"
5   import torch
6   from options import Options
7
8   from data import load_data
9
10  # from dcgan import DCGAN as myModel
11
12
13  device = torch.device("cuda:0" if
14  torch.cuda.is_available() else "cpu")
15
16
17
18
```

노트 설정→하드웨어 가속기가 GPU로 되어있고,
CUDA가 설치되어 있음에도 (버전 확인됨)
CUDA가 not available하다고 하여
4번째 line을 주석처리

```
19  opt = Options().parse()
20  print(opt)
21  dataloader=load_data(opt)
22  print("load data success!!!")
23
24  if opt.model == "beatgan":
25      from model import BeatGAN as MyModel
26
27  else:
28      raise Exception("no this model :{}".format(opt.model))
29
30
31  model=MyModel(opt,dataloader,device)
32
33  if not opt.istest:
34      print("################  Train  #################")
35      model.train()
36  else:
37      print("################  Eval  #################")
38      model.load()
39      model.test_type()
40      # model.test_time()
41      # model.plotTestFig()
42      # print("threshold:{}\tf1-score:{}\tauc:{}".format( th, f1, auc))
```

FileNotFoundError

```
!bash run_ecg.sh
```

```
##################################
########  Folder 0  ############
Namespace(batchsize=64, beta1=0.5, dataroot='./dataset/preprocessed/ano0/', dataset='ecg', device='gpu', folder=0, gpu_ids=[0],
train data size:(62436, 1, 320)
val data size:(8025, 1, 320)
test N data size:(17343, 1, 320)
test S data size:(2723, 1, 320)
test V data size:(6307, 1, 320)
test F data size:(721, 1, 320)
test Q data size:(13, 1, 320)
load data success!!!
################  Eval  ##################
Traceback (most recent call last):
  File "main.py", line 38, in <module>
    model.load()
  File "/content/drive/My Drive/Colab Notebooks/BeatGAN-master/experiments/ecg/network.py", line 177, in load
    self.G.load_state_dict(torch.load(os.path.join(save_dir, self.model+"_folder_"+str(self.opt.folder) + '_G.pkl')))
  File "/usr/local/lib/python3.7/dist-packages/torch/serialization.py", line 594, in load
    with _open_file_like(f, 'rb') as opened_file:
  File "/usr/local/lib/python3.7/dist-packages/torch/serialization.py", line 230, in _open_file_like
    return _open_file(name_or_buffer, mode)
  File "/usr/local/lib/python3.7/dist-packages/torch/serialization.py", line 211, in __init__
    super(_open_file, self).__init__(open(name, mode))
FileNotFoundError: [Errno 2] No such file or directory: './output/beatgan/ecg/model/beatgan_folder_0_G.pkl'
```

beatgan_folder_0_G.pkl 파일을 찾을 수 없다고 함. **network.py** 코드에서 지정된 경로에 문제가 있는 걸로 판단
output 폴더가 코드 실행되면서 만들어졌는데 그 빈 폴더에서 파일을 찾으려는 것이 확인됨!

run_ecg_demo.sh 그리고 demo.py

앞서 판단한 것에 대해 확신을 갖기 위해
demo의 경우에는 샘플 데이터가 어떤 경로로 **load** 되는지 확인

```
1
2   cd experiments/ecg
3   python demo.py
```

run_ecg_demo.sh

```
18  SAVE_DIR="output/demo/"
19
20
21
22
23  def load_case(normal=True):
24      if normal:
25          test_samples = np.load(os.path.join("dataset/demo/", "normal_samples.npy"))
26      else:
27          test_samples = np.load(os.path.join("dataset/demo/", "abnormal_samples.npy"))
```

demo.py

load할 때는 **output** 폴더 안에서 파일을 찾지 않고
dataset에서 찾는 것을 확인!

run_ecg.sh

```
#!/bin/bash

cd experiments/ecg

test=1    # 0 means train the model, 1 means evaluate the model
threshold=0.02
fold_cnt=1

dataroot="./dataset/preprocessed/ano0/"
model="beatgan"

w_adv=1
niter=100
lr=0.0001
n_aug=0

outf="./output"

```

```
for (( i=0; i<$fold_cnt; i+=1))
do
    echo "###################################"
    echo "########  Folder $i  ############"
    if [ $test = 0 ]; then
        python -u main.py  \
            --dataroot $dataroot \
            --model $model \
            --niter $niter \
            --lr $lr \
            --outf  $outf \
            --folder $i

    else
        python -u main.py  \
            --dataroot $dataroot \
            --model $model \
            --niter $niter \
            --lr $lr \
            --outf  $outf \
            --folder $i  \
            --outf  $outf \
            --istest  \
            --threshold $threshold
    fi

done
```

해당 pkl파일은 experiments/ecg/model 폴더 안에 있다.
현재 경로에서 os.path.join()으로 “model”만 붙이면 된다.

[해결] network.py 수정하여 경로 변경

```
174     def load(self):
175         save_dir = os.path.join(self.outf, self.model, self.dataset,"model")
176 
177         self.G.load_state_dict(torch.load(os.path.join(save_dir, self.model+"_folder_"+str(self.opt.folder) + '_G.pkl')))
178         self.D.load_state_dict(torch.load(os.path.join(save_dir, self.model+"_folder_"+str(self.opt.folder) + '_D.pkl')))
```

```
174     def load(self):
175         #save_dir = os.path.join("model")
176 
177         self.G.load_state_dict(torch.load(os.path.join("model", self.model+"_folder_"+str(self.opt.folder) + '_G.pkl')))
178         self.D.load_state_dict(torch.load(os.path.join("model", self.model+"_folder_"+str(self.opt.folder) + '_D.pkl')))
```

해당 pkl파일은 experiments/ecg/model 폴더 안에 있다.
현재 경로에서 os.path.join()으로 “model”만 붙이면 된다.

RuntimeError: set_sizes_contiquous is not allowed on a Tensor created from .data or .detach().

```
################  Eval  ##################
Traceback (most recent call last):
  File "main.py", line 39, in <module>
    model.test_type()
  File "/content/drive/My Drive/Colab Notebooks/BeatGAN-master/experiments/ecg/model.py", line 394, in test_type
    y_N, y_pred_N=self.predict(self.dataloader["test_N"],scale=False)
  File "/content/drive/My Drive/Colab Notebooks/BeatGAN-master/experiments/ecg/model.py", line 309, in predict
    self.set_input(data)
  File "/content/drive/My Drive/Colab Notebooks/BeatGAN-master/experiments/ecg/model.py", line 197, in set_input
    self.gt.data.resize_(input[1].size()).copy_(input[1])
RuntimeError: set_sizes_contiguous is not allowed on a Tensor created from .data or .detach().
If your intent is to change the metadata of a Tensor (such as sizes / strides / storage / storage_offset)
without autograd tracking the change, remove the .data / .detach() call and wrap the change in a `with torch.no_grad():` block.
For example, change:
    x.data.set_(y)
to:
    with torch.no_grad():
        x.set_(y)
```

[해결] model.py 코드 수정 (old→new)

```
195     def set_input(self, input):
196         self.input.data.resize_(input[0].size()).copy_(input[0])
197         self.gt.data.resize_(input[1].size()).copy_(input[1])
```

```
def set_input(self, input):
    #[old/error!] self.input.data.resize_(input[0].size()).copy_(input[0])
    with torch.no_grad():
        self.input.resize_(input[0].size()).copy_(input[0])
    #[old/error!]self.gt.data.resize_(input[1].size()).copy_(input[1])
    with torch.no_grad():
        self.gt.resize_(input[1].size()).copy_(input[1])
```

https://study.marearts.com/2020/08/runtimeerror-setsizescontiguous-is-not.html

!bash run_ecg.sh 결과

```
!bash run_ecg.sh
```

```
################################
########  Folder 0  ############
Namespace(batchsize=64, beta1=0.5, dataroot='./dataset/preprocessed/ano0/', dataset='ecg',
train data size:(62436, 1, 320)
val data size:(8025, 1, 320)
test N data size:(17343, 1, 320)
test S data size:(2723, 1, 320)
test V data size:(6307, 1, 320)
test F data size:(721, 1, 320)
test Q data size:(13, 1, 320)
load data success!!!
```

!bash run_ecg.sh 결과

```
################  Eval  ##################
############   Analysis   #############
############   Threshold:0.02   #############
*********  Type:S  **************
TP:696
FP:745
TN:16598
FN:2027
Accuracy:0.8618558756104854
Precision/ppv:0.4829791811242193
sensitivity/Recall:0.255600440690415
specificity:0.9570431874531511
F1:0.33429394812680113
*********  Type:V  **************
TP:5504
FP:745
TN:16598
FN:803
Accuracy:0.9345454545454546
Precision/ppv:0.880780924947917
sensitivity/Recall:0.8726811479308705
specificity:0.9570431874531511
F1:0.8767123287671232
*********  Type:F  **************
TP:284
FP:745
TN:16598
FN:437
Accuracy:0.9345659875996457
Precision/ppv:0.2759961127308066
sensitivity/Recall:0.39389736477115117
specificity:0.9570431874531511
F1:0.32457142857142857
*********  Type:Q  **************
TP:12
FP:745
TN:16598
FN:1
Accuracy:0.9570177460244296
Precision/ppv:0.015852047556142668
sensitivity/Recall:0.9230769230769231
specificity:0.9570431874531511
F1:0.03116883116883117
```

Result

```
################################          ✓ 2분 50초   오전 1:11에 완료됨
########  Result  ###########
ap:0.9040209091432492
auc:0.9380469934010662
best th:0.006629877258092165 --> best f1:0.8045258299836235
```

```
################################          ✓ 2분 55초   오전 2:03에 완료됨
########  Result  ###########
ap:0.9040209067530198
auc:0.9380469874956839
best th:0.006629876792430878 --> best f1:0.8045258299836235
```

BeatGAN AUC, AP

Method	AUC	AP
BeatGAN	0.93804699…	0.904020909…
BeatGAN(reproduce)	0.93804698…	0.904020906…

Method	AUC	AP
PCA	0.8164 ± 0.0037	0.6522 ± 0.0061
OCSVM	0.7917 ± 0.0018	0.7588 ± 0.0027
AE	0.8944 ± 0.0128	0.8415 ± 0.0163
VAE	0.8316 ± 0.0025	0.7882 ± 0.0024
AnoGAN	0.8642 ± 0.0100	0.8035 ± 0.0069
Ganomaly	0.9083 ± 0.0122	0.8701 ± 0.0141
BeatGAN	0.9447 ± 0.0053	0.9108 ± 0.0049
BeatGAN_{aug}	$\mathbf{0.9475 \pm 0.0037}$	$\mathbf{0.9143 \pm 0.0047}$
$\text{BeatGAN}_{aug}^{0.1\%}$	0.9425 ± 0.0022	0.8973 ± 0.0042

References

About

BeatGAN: Anomalous Rhythm Detection using Adversarially Generated Time Series

https://github.com/hi-bingo/BeatGAN

@inproceedings{zhou2019beatgan,
    title={BeatGAN: Anomalous Rhythm Detection using Adversarially Generated Time Series},
    author={Zhou, Bin and Liu, Shenghua and Bryan Hooi and Cheng, Xueqi and Ye, Jing },
    booktitle={International Joint Conference on Artificial Intelligence},
    year={2019},
}