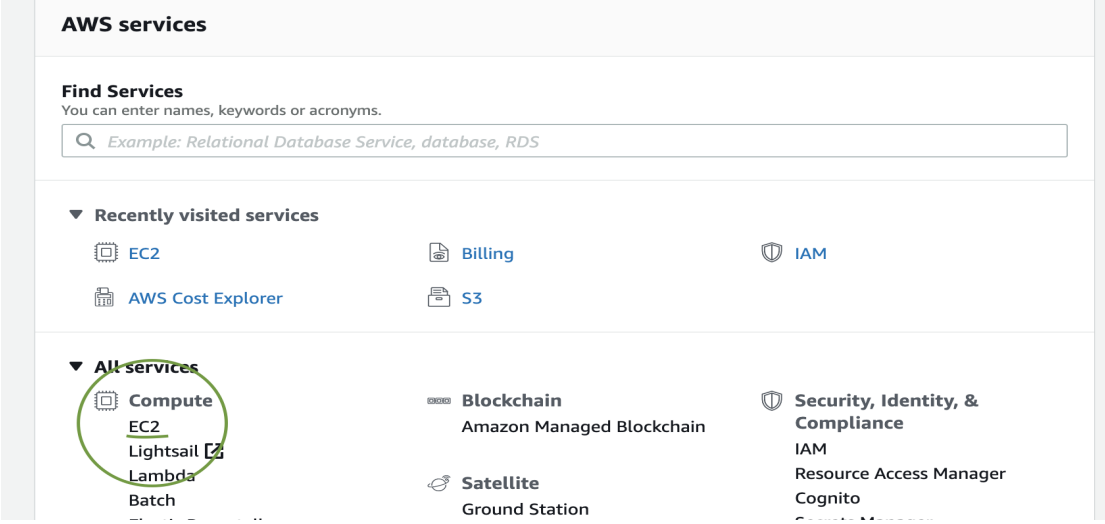
How to create an EC2 instance ?

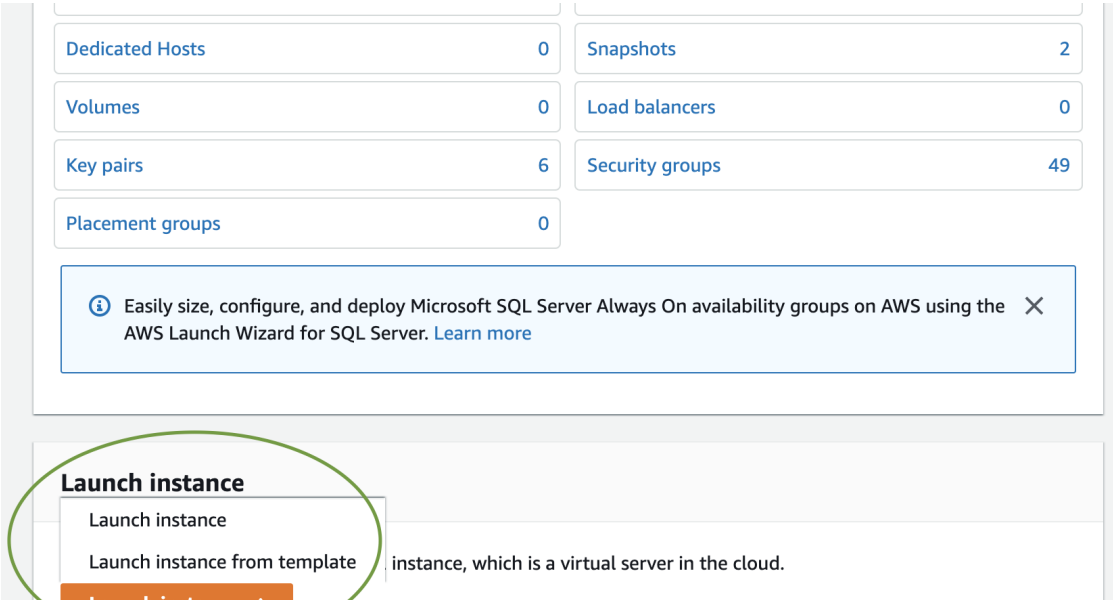
Go to https://aws.amazon.com/console/

Use your AWS username and password to login

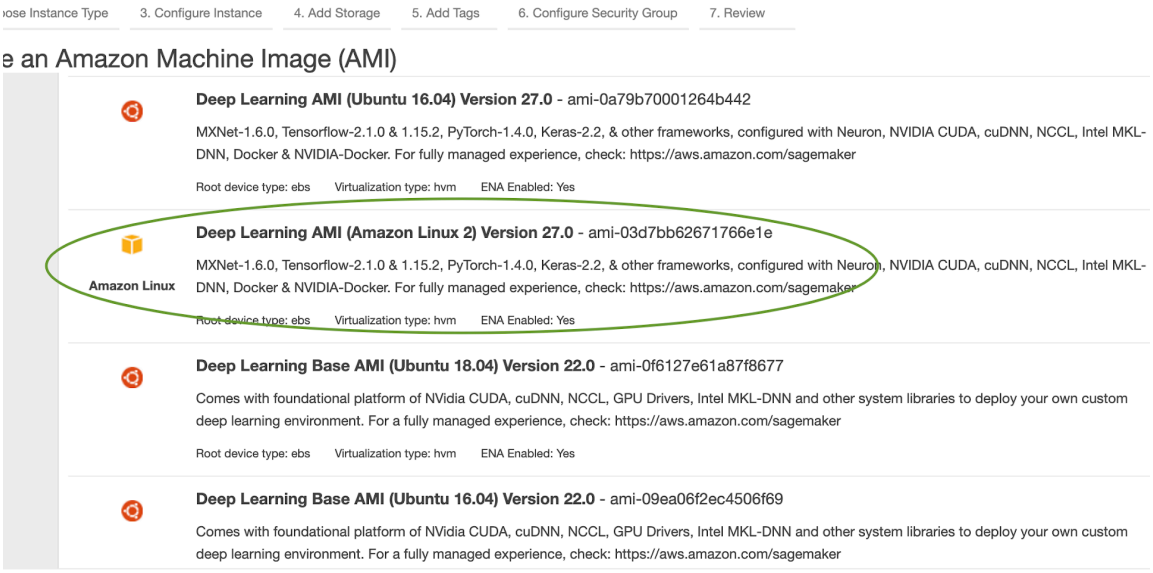
Select EC2



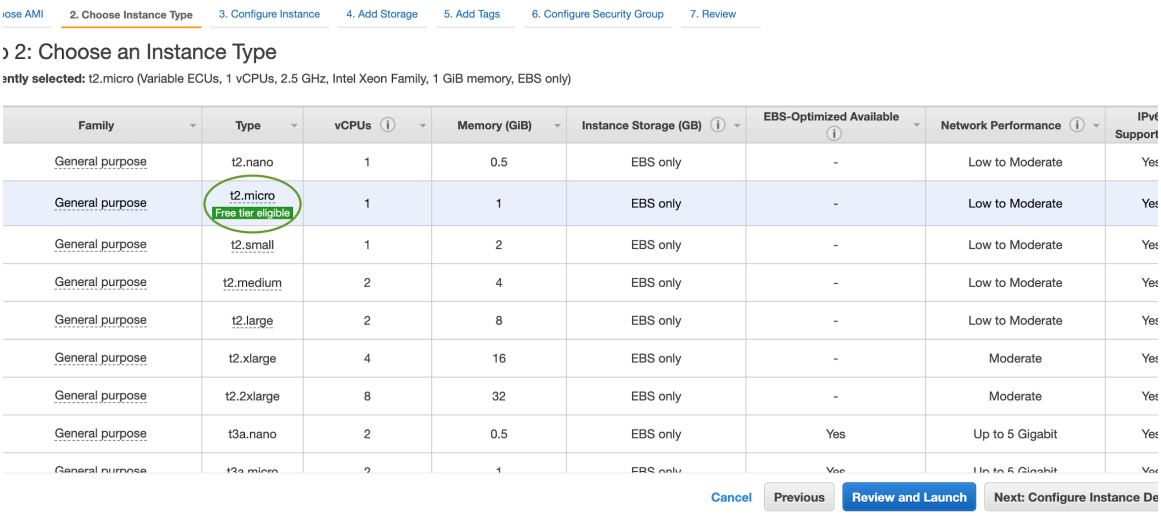
Select launch instance



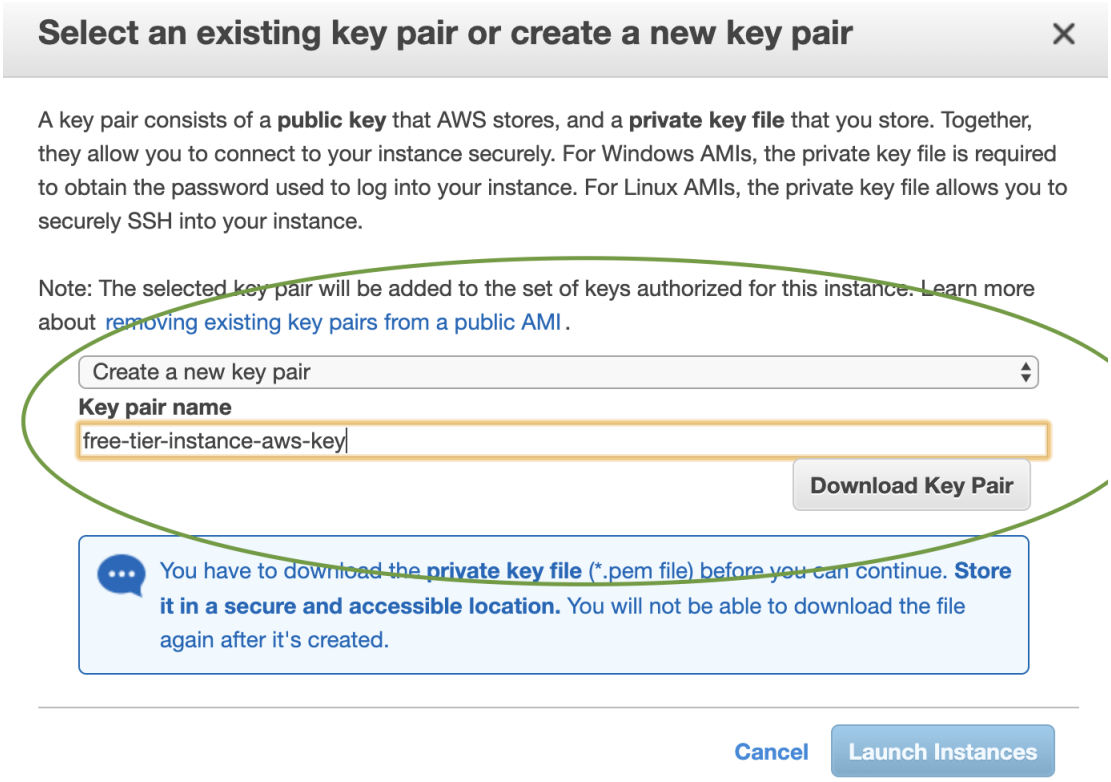
Select Deep Learning AMI (Amazon Linux 2) Version 27.0 instance



Select General purpose free tier eligible instance and click Review and Launch

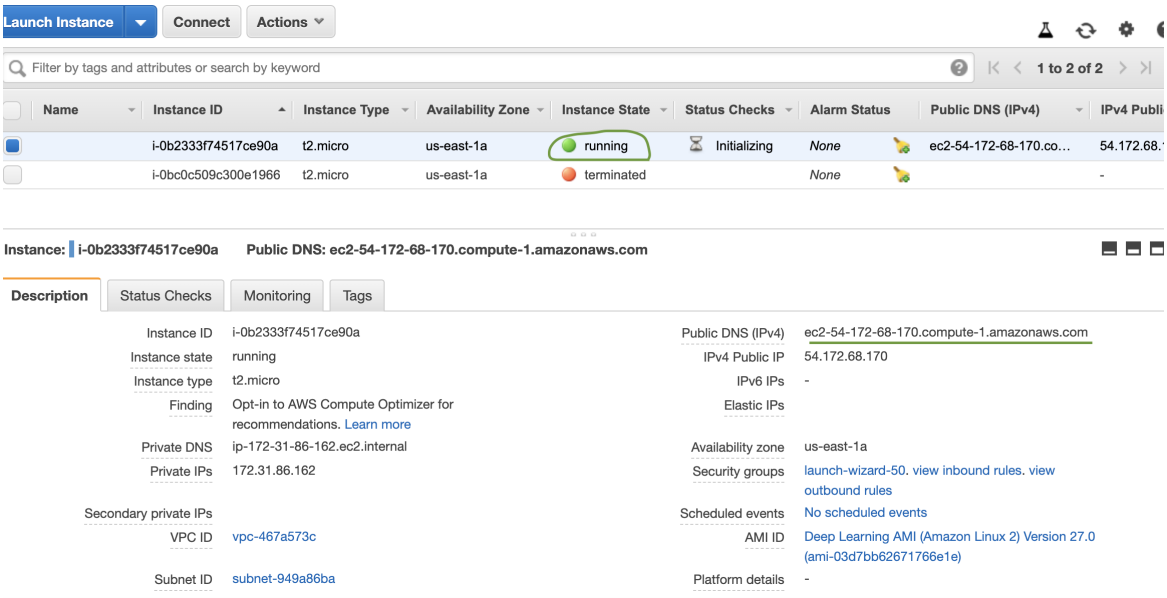


In the next screen, choose Create a new key pair and give a name to the key “free-tier-instance-aws-key” . Select Download Key Pair and save it in your local drive. Later you will need this key to connect to EC2 instance.



Click Launch instance

Copy the Public DNS (IPv4)



11) Set key permission

chmod 400 free-tier-instance-aws-key.pem

12) Connect to EC2 instance

scp -i free-tier-instance-aws-key.pem ec2-user@ec2-54-172-68-170.compute-1.amazonaws.com

13) Copy files from local drive to EC2 instance

scp -i free-tier-instance-aws-key.pem test.txt ec2-user@ec2-54-172-68-170.compute-1.amazonaws.com:

14) Copy folders from local drive to EC2 instance

scp -i free-tier-instance-aws-key.pem -r model_folder ec2-user@ec2-54-172-68-170.compute-1.amazonaws.com:

15) Click on the below link . The link has instructions for installing the brain masking pipeline in linux machines.

https://github.com/pnlbwh/CNN-Diffusion-MRIBrain-Segmentation

If you face issues during automated installation, please consider manual installation

- conda create -n cnn_gpu python=3.6
- source activate cnn_gpu
- conda install tensorflow-gpu==1.12.0
- conda install numpy==1.16.4
- conda install keras==2.2.4
- conda install -c pnlbwh ants
- pip install nibabel
- pip install gputil
- pip install git+https://github.com/pnlbwh/conversion.git
- export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/home/ec2-user/anaconda3/envs/cnn_gpu/lib
- export ANTSPATH=/home/ec2-user/anaconda3/envs/cnn_gpu/bin

Please edit your .bashrc file and add the following 3 lines.

- export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/home/ec2-user/anaconda3/envs/cnn_gpu/lib
- export ANTSPATH=/home/ec2-user/anaconda3/envs/cnn_gpu/bin
- source activate ~/anaconda3/envs/cnn_gpu

Running 4 brain masking scripts

---

python extractb0.py -i /home/ec2-user/aws_cases/cases.txt
python antsRegistration.py -i /home/ec2-user/aws_cases/cases.txt -f /home/ec2-user/model_folder
python maskprocessing.py -i /home/ec2-user/aws_cases/cases.txt -f /home/ec2-user/model_folder
python postprocessing.py -i /home/ec2-user/aws_cases/cases.txt

Mount s3 bucket to aws ec2 instance:

1) Follow the below tutorial until step 8

   https://cloudkul.com/blog/mounting-s3-bucket-linux-ec2-instance/

2) For step 9 use the following command on ec2 instance to mount s3 bucket

   s3fs nda-enclave-c3371 /home/ec2-user/mys3bucket -o use_cache=/tmp -o allow_other -o uid=1001 -o mp_umask=002 -o multireq_max=5 -o use_path_request_style -o url=https://s3-us-east-1.amazonaws.com

3) Run df -Th command in your ec2 terminal

```
(cnn_gpu) [ec2-user@ip-172-31-64-62 .aws]$ df -Th
Filesystem      Type       Size  Used Avail Use% Mounted on
devtmpfs        devtmpfs   7.7G     0  7.7G   0% /dev
tmpfs           tmpfs      7.7G     0  7.7G   0% /dev/shm
tmpfs           tmpfs      7.7G  452K  7.7G   1% /run
tmpfs           tmpfs      7.7G     0  7.7G   0% /sys/fs/cgroup
/dev/nvme0n1p1 xfs         90G   75G   16G  83% /
tmpfs           tmpfs      1.6G     0  1.6G   0% /run/user/1000
s3fs            fuse.s3fs   90G   75G   16G  83% /home/ec2-user/mys3bucket
```

4) Check for any error message under
   less /var/log/messages

```
(cnn_gpu) [ec2-user@ip-172-31-64-62 ~]$ sudo s3fs nda-enclave-c3371 /home/ec2-user/mys3bucket -o use_cache=/tmp -o allow_other -o
uid=1001 -o mp_umask=002 -o multireq_max=5 -o use_path_request_style -o url=https://s3-us-east-1.amazonaws.com   s3fs mount command
(cnn_gpu) [ec2-user@ip-172-31-64-62 ~]$ df -Th
Filesystem      Type       Size  Used Avail Use% Mounted on
devtmpfs        devtmpfs   7.7G     0  7.7G   0% /dev
tmpfs           tmpfs      7.7G     0  7.7G   0% /dev/shm
tmpfs           tmpfs      7.7G  452K  7.7G   1% /run
tmpfs           tmpfs      7.7G     0  7.7G   0% /sys/fs/cgroup
/dev/nvme0n1p1 xfs         90G   75G   16G  83% /
tmpfs           tmpfs      1.6G     0  1.6G   0% /run/user/1000
s3fs            fuse.s3fs   90G   75G   16G  83% /home/ec2-user/mys3bucket   s3 bucket mounted in ec2 instance drive
(cnn_gpu) [ec2-user@ip-172-31-64-62 ~]$ df -Th
Filesystem      Type       Size  Used Avail Use% Mounted on
devtmpfs        devtmpfs   7.7G     0  7.7G   0% /dev
tmpfs           tmpfs      7.7G     0  7.7G   0% /dev/shm
tmpfs           tmpfs      7.7G  452K  7.7G   1% /run
tmpfs           tmpfs      7.7G     0  7.7G   0% /sys/fs/cgroup
/dev/nvme0n1p1 xfs         90G   75G   16G  83% /
tmpfs           tmpfs      1.6G     0  1.6G   0% /run/user/1000                mount disappeared
(cnn_gpu) [ec2-user@ip-172-31-64-62 ~]$ sudo cat /var/log/messages | tail -5
Mar 26 15:30:01 ip-172-31-64-62 systemd: Removed slice User Slice of root.
Mar 26 15:30:01 ip-172-31-64-62 systemd: Stopping User Slice of root.
Mar 26 15:31:19 ip-172-31-64-62 dhclient[3567]: XMT: Solicit on eth0, interval 121500ms.      error message
Mar 26 15:32:40 ip-172-31-64-62 s3fs[4920]: init v1.86(commit:fe2b269) with OpenSSL
Mar 26 15:32:51 ip-172-31-64-62 s3fs[4920]: s3fs.cpp:s3fs_check_service(3905): unable to connect(host=https://s3-us-east-1.amazona
ws.com) - result of checking service.
(cnn_gpu) [ec2-user@ip-172-31-64-62 ~]$
```

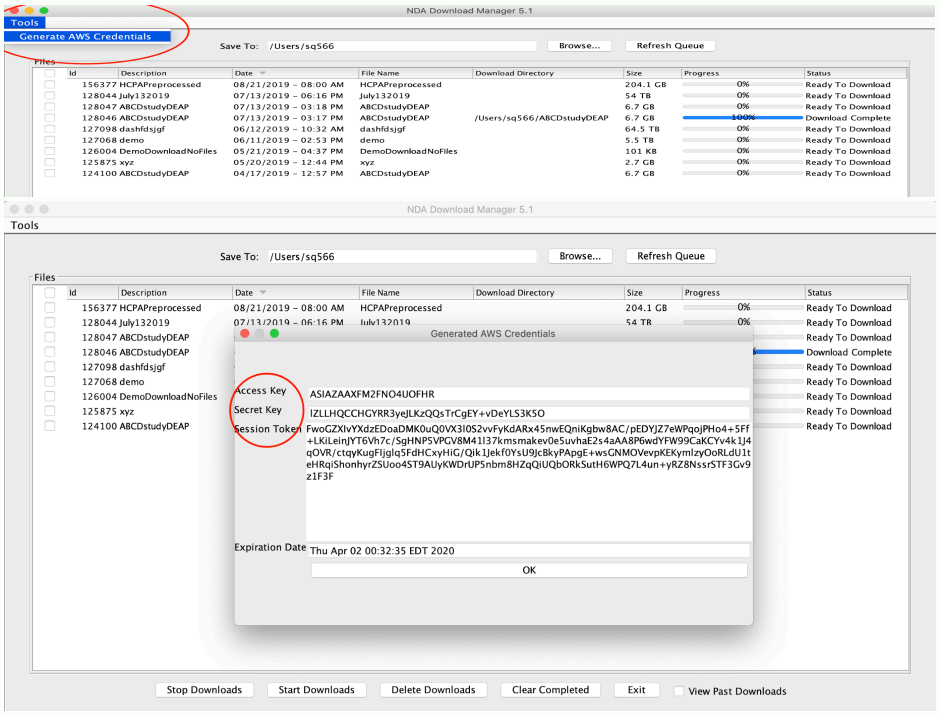
Manage aws credentials:

Instead of keeping credentials in environment variables, you can now put credentials into a single file that's in a central location. The default location is this: `~/.aws/credentials` (Linux/Mac)

```
(base) sq566@PHS010667:~/.aws$ pwd
/Users/sq566/.aws
(base) sq566@PHS010667:~/.aws$ ls
config       credentials
(base) sq566@PHS010667:~/.aws$ cat credentials
[default]
aws_access_key_id = ASIAZAAXFM2FB5OTJUQW
aws_secret_access_key = Oy67aLcwg20QXghFhBsEta6zzIo/fHQZKMbEOnXe
aws_session_token = FwoGZXIvYXdzEDoaDMZwBalqoVYsms8U0iKdAfqrSmvzgZJ94LNkrSaTOfUa6tChi3eMIam6CXnyFYQZBYP6TyWWif2Tm9qW+Erk7MfpFuzv5e
o2U0gA3rh4Z1wKBdPpEml5p3N27Z9ALlD9LPlP81i4jZXXnwSISbKKsFhpuDQAo0sfrMu+7Te/vE4w7IykGiR20GEIDwmkm+zxtQwiQDBUYwCd4b2osaEPCBda73yCtFKY
RBevzQgorf+S9AUyKdD+QP8rOibtk7nzkXWyRqIhFB+fOldTbvdUTCLQhl0LSYGQH8H2umb1

[c3371]
aws_access_key_id = ASIAZAAXFM2FP5TFCN6X
aws_secret_access_key = lhSpD+YXM4KgM0yNFz/HzeZc00DYTv1OoFlJJsdh
aws_session_token = FwoGZXIvYXdzEDoaDPLcuMkMVXlbfY5QBSKdAUdtC7m/GcEk2lwfaL/QUX6xafBomL/yDOLINe7GzjnbfH4qMkhOjm23QV8aFaGndR3hSqStFB
m5T20eyrFod9Qzl8aveSDVQ1nXZ7l6z2l/Zycnn0lhfUuinMKFZ/MMkrY5UHAFVjjafNk5KTwIpvEdELkM+NmSzrsQaJenhAkgZnL1IkbDNrR2YlQ/xXQguk3zesrPv0Im
uoxBsR8ogICT9AUyKZY70ijnk5XYQ+rUJKU4cnQGDeYmkSOazXMYwLQkmwiLZTE8Mgk3MOWt
(base) sq566@PHS010667:~/.aws$ _
```

- You can get key_id, access_key and session_token from NDA Download Manager (**Note:** You should generate aws credentials 2 times, one for the [default] profile and another for[c3371] profile)



AWS S3 Commands

---

1) Copy folder from local to s3 bucket

```
aws s3 cp site01 s3://nda-enclave-c3371/ --recursive
```

2) Copy file from local to s3 bucket

```
aws s3 cp files.txt s3://nda-enclave-c3371/
```

3) Move file from s3 bucket to s3 bucket folder

```
aws s3 mv s3://nda-enclave-c3371/files.txt s3://nda-enclave-c3371/site01
```

4) Remove files in s3 bucket

```
aws s3 rm s3://nda-enclave-c3371/files.txt
```

5) Recursively copy new and updated files from the source directory to the destination

```
aws s3 sync s3://nda-enclave-c3371/home/ec2-user/mys3bucket
```

6) List files inside bucket

```
aws s3 ls s3://nda-enclave-c3371 --profile c3771
```

7) Sync local folder with s3 bucket

```
aws s3 sync test_abcd s3://nda-enclave-c3371
```

8) Sync s3 bucket folder with local folder

```
aws s3 sync s3://nda-enclave-c3371/test_abcd .
```

How did I run the brain masking pipeline in an ec2 gpu instance for 70 abcd subjects ?

1) Connect to the GPU EC2 instance
2) Install the brain masking pipeline conda modules
3) Set up the aws credentials
4) mkdir /home/ec2-user/test_abcd
5) cd /home/ec2-user/test_abcd
6) https://github.com/SenthilCaesar/CNN-Sematic-Segmentation/blob/master/aws/copy.sh
7) ./copy.sh
8) ls -l | *.tgz | awk '{print $NF}' > tar_cases.txt
9) https://github.com/SenthilCaesar/CNN-Sematic-Segmentation/blob/master/aws/unzip.sh
10) ./unzip.sh
11) The next step is to create the dwi input case list
12) ll -d sub-NDARINV*/*/*/*.nii | awk '{print $NF}' > abcd_tmp.txt
13) sed 's/^/\/home\/ec2-user\/test_abcd/' abcd_tmp.txt > abcd.txt
14) **python** extractb0.py -i /home/ec2-user/test_abcd/abcd.txt
15) **python** antsRegistration.py -i /home/ec2-user/test_abcd/abcd.txt -f /home/ec2-user/model_folder/
16) **python** maskprocessing.py -i /home/ec2-user/test_abcd/abcd.txt -f /home/ec2-user/model_folder/
17) **python** postprocessing.py -i /home/ec2-user/test_abcd/abcd.txt
18) copy the results back to the s3 bucket.
19) I removed the original dwi volume because it takes a lot of space, I only need b0 and b0_maks for qcing
20) zip -r abcd_ec2.zip test_abcd/
21) **aws** s3 cp abcd_ec2.zip s3://nda-enclave-c3371/
22) Now connect to pnl-maxwell where you have slicesdir module
23) Again set up the aws credentials in pnl-maxwell machine
24) Copy the result from s3 bucket to pnl-maxwell machine
25) **aws** s3 cp s3://nda-enclave-c3371/abcd_ec2.zip .
26) unzip abcd_ec2.zip
27) Create b0 caselist and b0 masks for slicesdir qc'ing
28) ll -d sub-NDARINV*/*/*/*_bse.nii.gz | awk '{print $NF}' > b0.txt
29) ll -d sub-NDARINV*/*/*/*_BrainMask.nii.gz | awk '{print $NF}' > b0_masks.txt
30) https://github.com/SenthilCaesar/CNN-Sematic-Segmentation/blob/master/aws/read.sh
31) ./read.sh > qc.txt
32) sed 's/^/slicesdir -o /' qc.txt > slicesdir.sh
33) chmod 755 slicesdir.sh
34) ./slicesdir.sh

Python code to create site text files from dwiTable excel sheet

```
# The code will create site1.txt, site2.txt, site3.txt…….site39.txt
-----------------------------------------------------------------------------------------------------------

import pandas as pd
from pandas import ExcelWriter
from pandas import ExcelFile

df = pd.read_excel('dwiTable.xlsx')

print("Column headings:")
print(df.columns)

abcd_sub = df['derived_files'].tolist()
abcd_site = df['new_site_id'].tolist()

d = dict()
for i in range(len(abcd_sub)):

    site_no = abcd_site[i]
    site_sub = abcd_sub[i]

    if site_no not in d:
        d[site_no] = []
    else:
        d[site_no].append(site_sub)

for key, value in list(d.items()):
    name = 'site_' + str(key) + '.txt'
    with open(name, 'w') as f:
        for item in value:
            f.write("%s\n" % item)
-----------------------------------------------------------------------------------------------------------
```

Other Useful scripts:

Dice Coefficient:
https://github.com/SenthilCaesar/CNN-Sematic-Segmentation/blob/master/data-preprocessing/dice_coeff.py

Convert nifti volume to *.png images
https://github.com/SenthilCaesar/CNN-Sematic-Segmentation/blob/master/data-preprocessing/Raunak_cv2.py