```
!pip -q install torch
```

```
import torch
print(torch.cuda.device_count())
```

```
0
```

Start coding or generate with AI.

```
!python /content/sample_data/ \
  --silencemap_path /content/sample_data/SilenceMap_final
  --save_figs \
  --fig_dir /content/sample_data/figs/
```

```
Device: cpu
Loading SilenceMap file: /content/sample_data/SilenceMap_final.mat
beta length: 1662
coords shape: (1662, 3)
|GT silence| (from MATLAB): 50
|det silence| (MATLAB SilenceMap): 2
mean(beta GT silent) : 0.6312295794487
mean(beta GT active) : 0.8614711165428162
beta min/max after norm: 0.0 1.0
Building k-NN graph...
k_silent (from GT) = 50

Laplacian baseline: P=0.540 R=0.540 F1=0.540
Laplacian cluster metrics:
  Jaccard      : 0.370
  ΔCOM (mm)    : 11.151
  size_gt      : 50
  size_pred    : 50
```

```
  size_rel_err : 0.000

Training GNN...
[0200] loss=0.21228 data=0.03225 smooth=0.01063 seed=0.25376
[0400] loss=0.19289 data=0.03104 smooth=0.01119 seed=0.21179
[0600] loss=0.18163 data=0.03334 smooth=0.01113 seed=0.18531
[0800] loss=0.17774 data=0.02622 smooth=0.01221 seed=0.18088
[1000] loss=0.17721 data=0.02861 smooth=0.01220 seed=0.17518
[1200] loss=0.17592 data=0.02921 smooth=0.01208 seed=0.17262
[1400] loss=0.17515 data=0.02821 smooth=0.01214 seed=0.17246

GNN: P=0.740 R=0.740 F1=0.740
GNN cluster metrics:
  Jaccard      : 0.587
  ΔCOM (mm)    : 1.612
  size_gt      : 50
  size_pred    : 50
  size_rel_err : 0.000
[saved figure → /content/sample_data/figs/1_gt.png]
[saved figure → /content/sample_data/figs/2_laplacian.png]
[saved figure → /content/sample_data/figs/3_gnn.png]
[saved figure → /content/sample_data/figs/4_curves.png]
```

```
!git clone https://github.com/DIKSHAAGARWAL2015/SilenceMap-Localization.git
%cd /content/SilenceMap-Localization
!git status
```

```
Cloning into 'SilenceMap-Localization'...
fatal: could not read Username for 'https://github.com': No such device or address
[Errno 2] No such file or directory: '/content/SilenceMap-Localization'
/content
fatal: not a git repository (or any of the parent directories): .git
```

```
!pwd
```

```
/content/SilenceMap-Localization
```

```
%cd /content/SilenceMap-Localization
```

```
/content/SilenceMap-Localization
```

```
!git status
```

```
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   __pycache__/beta.cpython-312.pyc
        modified:   __pycache__/clusters_ranking.cpython-312.pyc
        modified:   __pycache__/compute_eeg.cpython-312.pyc
        modified:   __pycache__/dataloader.cpython-312.pyc
        modified:   __pycache__/eval_silence_localization.cpython-312.pyc
        modified:   __pycache__/gnn.cpython-312.pyc
        modified:   __pycache__/graph.cpython-312.pyc
        modified:   __pycache__/plotting.cpython-312.pyc
        modified:   figs/1_gt.png
        modified:   figs/2_laplacian.png
        modified:   figs/3_gnn.png
        modified:   figs/4_curves.png
        modified:   figs/brain_rotate.gif
        modified:   figs/gnn_ranked_clusters.png
        modified:   figs/gt_gnn_clusters_3x5.png
        modified:   figs_ventral/ventral_clusters_2x2.png
        modified:   main.py

no changes added to commit (use "git add" and/or "git commit -a")
```

```
!git add .
```

```
!git commit -m "move to gpu"
```

```
[main cc9ded3] move to gpu
 17 files changed, 46 insertions(+), 2 deletions(-)
```

```
 rewrite figs/1_gt.png (72%)
 rewrite figs/2_laplacian.png (96%)
 rewrite figs/3_gnn.png (94%)
 rewrite figs/4_curves.png (98%)
 rewrite figs/brain_rotate.gif (76%)
 rewrite figs/gnn_ranked_clusters.png (72%)
 rewrite figs/gt_gnn_clusters_3x5.png (86%)
 rewrite figs_ventral/ventral_clusters_2x2.png (68%)
```

```
TOKEN = "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"
USER = "DIKSHAAGARWAL2015"
REPO = "SilenceMap-Localization"
!git remote set-url origin https://{TOKEN}@github.com/{USER}/{REPO}.git
```

```
!git branch -a
```

```
* main
  remotes/origin/HEAD -> origin/main
  remotes/origin/main
```

```
!git pull
```

```
Already up to date.
```

```
!git config pull.rebase false
```

```
!git push
```

```
Enumerating objects: 36, done.
Counting objects: 100% (36/36), done.
Delta compression using up to 2 threads
Compressing objects: 100% (22/22), done.
Writing objects: 100% (22/22), 3.97 MiB | 5.57 MiB/s, done.
Total 22 (delta 3), reused 0 (delta 0), pack-reused 0
```

```
remote: Resolving deltas: 100% (3/3), completed with 3 local objects.
To https://github.com/DIKSHAAGARWAL2015/SilenceMap-Localization.git
   6d23fa4..cc9ded3  main -> main
```

```
!pwd
!git status
!git remote -v
```

```
/content/SilenceMap-Localization
On branch main
Your branch is up to date with 'origin/main'.

Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   __pycache__/beta.cpython-312.pyc
        modified:   __pycache__/clusters_ranking.cpython-312.pyc
        modified:   __pycache__/compute_eeg.cpython-312.pyc
        modified:   __pycache__/dataloader.cpython-312.pyc
        modified:   __pycache__/eval_silence_localization.cpython-312.pyc
        modified:   __pycache__/gnn.cpython-312.pyc
        modified:   __pycache__/graph.cpython-312.pyc
        modified:   __pycache__/plotting.cpython-312.pyc
        modified:   figs/1_gt.png
        modified:   figs/2_laplacian.png
        modified:   figs/3_gnn.png
        modified:   figs/4_curves.png
        modified:   figs/brain_rotate.gif
        modified:   figs/gnn_ranked_clusters.png
        modified:   figs/gt_gnn_clusters_3x5.png
        modified:   figs_ventral/ventral_clusters_2x2.png
        modified:   main.py

origin  https://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@github.com/DIKSHAAGARWAL2015/SilenceMap-Localization.git (fetch
origin  https://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@github.com/DIKSHAAGARWAL2015/SilenceMap-Localization.git (push)
```

```
!git config --global user.email "dikshaagarwal738@gmail.com"
!git config --global user.name "DIKSHAAGARWAL2015!"
```

```
%matplotlib inline
```

```
from mpl_toolkits.mplot3d import Axes3D  # noqa: F401 (ensures 3D is registered)
import matplotlib.pyplot as plt
```

```
!pip -q install mat73
```

```
from IPython.display import Image, display
import glob
for fn in sorted(glob.glob("/content/sample_data/figs/*.png")):
    display(Image(fn))
```

```
!pip install h5py
```

```
Requirement already satisfied: h5py in /usr/local/lib/python3.12/dist-packages (3.15.1)
Requirement already satisfied: numpy>=1.21.2 in /usr/local/lib/python3.12/dist-packages (from h5py) (2.0.2)
```

```
import mat73, pprint
pprint.pprint(mat73.loadmat("/content/sample_data/OT_leadfield_symmetric_1662-128.mat").keys())
pprint.pprint(mat73.loadmat("/content/sample_data/OT_headmodel_symmetric_1662-128.mat").keys())
```

```
dict_keys(['L', 'sensor_locs'])
dict_keys(['Cortex', 'headmodel'])
```

```
!pip -q install mat73 torch tqdm scikit-learn scipy
```

```
import torch
print(torch.__version__)
```

```
2.9.0+cu126
```

```
!pip install torch torchvision torchaudio --index-url https://download.pytorch.org/whl/cu121
```

```
Looking in indexes: https://download.pytorch.org/whl/cu121
Requirement already satisfied: torch in /usr/local/lib/python3.12/dist-packages (2.9.0+cu126)
Requirement already satisfied: torchvision in /usr/local/lib/python3.12/dist-packages (0.24.0+cu126)
Requirement already satisfied: torchaudio in /usr/local/lib/python3.12/dist-packages (2.9.0+cu126)
Requirement already satisfied: filelock in /usr/local/lib/python3.12/dist-packages (from torch) (3.20.0)
Requirement already satisfied: typing-extensions>=4.10.0 in /usr/local/lib/python3.12/dist-packages (from torch) (4.15.0
Requirement already satisfied: setuptools in /usr/local/lib/python3.12/dist-packages (from torch) (75.2.0)
Requirement already satisfied: sympy>=1.13.3 in /usr/local/lib/python3.12/dist-packages (from torch) (1.14.0)
Requirement already satisfied: networkx>=2.5.1 in /usr/local/lib/python3.12/dist-packages (from torch) (3.6)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.12/dist-packages (from torch) (3.1.6)
Requirement already satisfied: fsspec>=0.8.5 in /usr/local/lib/python3.12/dist-packages (from torch) (2025.3.0)
Requirement already satisfied: nvidia-cuda-nvrtc-cu12==12.6.77 in /usr/local/lib/python3.12/dist-packages (from torch) (
Requirement already satisfied: nvidia-cuda-runtime-cu12==12.6.77 in /usr/local/lib/python3.12/dist-packages (from torch)
Requirement already satisfied: nvidia-cuda-cupti-cu12==12.6.80 in /usr/local/lib/python3.12/dist-packages (from torch) (
Requirement already satisfied: nvidia-cudnn-cu12==9.10.2.21 in /usr/local/lib/python3.12/dist-packages (from torch) (9.1
Requirement already satisfied: nvidia-cublas-cu12==12.6.4.1 in /usr/local/lib/python3.12/dist-packages (from torch) (12.
Requirement already satisfied: nvidia-cufft-cu12==11.3.0.4 in /usr/local/lib/python3.12/dist-packages (from torch) (11.3
Requirement already satisfied: nvidia-curand-cu12==10.3.7.77 in /usr/local/lib/python3.12/dist-packages (from torch) (10
Requirement already satisfied: nvidia-cusolver-cu12==11.7.1.2 in /usr/local/lib/python3.12/dist-packages (from torch) (1
Requirement already satisfied: nvidia-cusparse-cu12==12.5.4.2 in /usr/local/lib/python3.12/dist-packages (from torch) (1
Requirement already satisfied: nvidia-cusparselt-cu12==0.7.1 in /usr/local/lib/python3.12/dist-packages (from torch) (0.
Requirement already satisfied: nvidia-nccl-cu12==2.27.5 in /usr/local/lib/python3.12/dist-packages (from torch) (2.27.5)
Requirement already satisfied: nvidia-nvshmem-cu12==3.3.20 in /usr/local/lib/python3.12/dist-packages (from torch) (3.3.
Requirement already satisfied: nvidia-nvtx-cu12==12.6.77 in /usr/local/lib/python3.12/dist-packages (from torch) (12.6.7
Requirement already satisfied: nvidia-nvjitlink-cu12==12.6.85 in /usr/local/lib/python3.12/dist-packages (from torch) (1
Requirement already satisfied: nvidia-cufile-cu12==1.11.1.6 in /usr/local/lib/python3.12/dist-packages (from torch) (1.1
Requirement already satisfied: triton==3.5.0 in /usr/local/lib/python3.12/dist-packages (from torch) (3.5.0)
Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (from torchvision) (2.0.2)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in /usr/local/lib/python3.12/dist-packages (from torchvision) (11.3
Requirement already satisfied: mpmath<1.4,>=1.1.0 in /usr/local/lib/python3.12/dist-packages (from sympy>=1.13.3->torch)
```

```
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.12/dist-packages (from jinja2->torch) (3.0.3)
```

```
!pip install mat73
```

```
Collecting mat73
  Downloading mat73-0.65-py3-none-any.whl.metadata (3.6 kB)
Requirement already satisfied: h5py in /usr/local/lib/python3.12/dist-packages (from mat73) (3.15.1)
Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (from mat73) (2.0.2)
Downloading mat73-0.65-py3-none-any.whl (19 kB)
Installing collected packages: mat73
Successfully installed mat73-0.65
```

```
!pip install plotly --quiet  # "--quiet" hides installation logs
```

```
!python /content/sample_data/feature_gnn.py --save_figs -
  --leadfield_path /content/sample_data/OT_leadfield_symm
  --headmodel_path /content/sample_data/OT_headmodel_symm
```

```
Device: cpu
Loading .mat leadfield/headmodel...
ERROR:root:ERROR: not a MATLAB datatype: <HDF5 dataset "L": shape (128, 3004), type "<f4">, (float32)
ERROR:root:ERROR: not a MATLAB datatype: <HDF5 dataset "sensor_locs": shape (128, 3), type "<f4">, (float32)
ERROR:root:ERROR: not a MATLAB datatype: <HDF5 dataset "src_xyz": shape (3004, 3), type "<f4">, (float32)
Loaded leadfield: (128, 3004) vertices: (3004, 3)
Avg SNR ≈ 10.00 dB (target=10 dB)
[0.7873082  0.7899602  0.7936272  ... 0.82372224 0.7996216  0.8760529 ]
(3004,)
[auto] q_silent set to 1.60% for |S|=48/3004
[0200] loss=0.56683 cls=0.31011 smooth=0.05134
[0400] loss=0.42674 cls=0.19181 smooth=0.04699
[0600] loss=0.36795 cls=0.16633 smooth=0.04032
[0800] loss=0.34573 cls=0.14186 smooth=0.04077
[1000] loss=0.33861 cls=0.12629 smooth=0.04246
[1200] loss=0.32471 cls=0.11976 smooth=0.04099
[1400] loss=0.33612 cls=0.13654 smooth=0.03992
[1600] loss=0.31471 cls=0.11291 smooth=0.04036
```

```
[1800] loss=0.31531 cls=0.11612 smooth=0.03984
[2000] loss=0.30450 cls=0.10660 smooth=0.03958
GNN(BCE):  P=0.958 R=0.958 F1=0.958
Mean Jaccard: 0.9255952380951633
Mean COM error: 0.21963611245155334
Mean size error: 0.041666666666663195

✅ EVERYTHING SAVED SAFELY
📁 Folder: /content/sample_data/safe_save_run1
➡️ You can now move to MONKEY (NHP) data using these weights.
[saved figure → /content/sample_data/figs/1_gt.png]
[saved figure → /content/sample_data/figs/3_gnn.png]
[saved figure → /content/sample_data/figs/1_gt_overlay.png]
[saved figure → /content/sample_data/figs/3_gnn_overlay.png]
```

```
!python /content/sample_data/train_test_sim2real.py \
  --leadfield_path /content/sample_data/OT_leadfield_symm
  --headmodel_path /content/sample_data/OT_headmodel_symm
  --t 800 --n_train_sims 10 --n_test_sims 5 --steps 400 -
```

```
Device: cpu
Loading leadfield/headmodel...
ERROR:root:ERROR: not a MATLAB datatype: <HDF5 dataset "L": shape (128, 3004), type "<f4">, (float32)
ERROR:root:ERROR: not a MATLAB datatype: <HDF5 dataset "sensor_locs": shape (128, 3), type "<f4">, (float32)
ERROR:root:ERROR: not a MATLAB datatype: <HDF5 dataset "src_xyz": shape (3004, 3), type "<f4">, (float32)
Loaded L: (128, 3004) src_xyz: (3004, 3)

Training on cached TRAIN set (fast)...
[0050] loss=1.34249 cls=1.33842 smooth=0.00081
[0100] loss=1.35124 cls=1.35001 smooth=0.00025
[0150] loss=1.38258 cls=1.38085 smooth=0.00035
[0200] loss=1.34472 cls=1.34204 smooth=0.00054
[0250] loss=1.37257 cls=1.37015 smooth=0.00048
[0300] loss=1.28739 cls=1.28483 smooth=0.00051
[0350] loss=1.28486 cls=1.27327 smooth=0.00232
[0400] loss=1.39797 cls=1.38547 smooth=0.00250

Evaluating (no train=test leakage):

=== TRAIN (in-sample sanity) ===
```

```
F1@k: 0.04999999999969896
mean_jaccard: 0.020257953426309587
mean_com_error: 19.52365231712659
mean_size_error: 1.1388888888887954

=== TEST (held-out simulations) ===
F1@k: 0.008333333333233158
mean_jaccard: 0.0074074074074069966
mean_com_error: 19.691233491897584
mean_size_error: 1.0361111111110273
```

```
!python /content/sample_data/gnn_silencemap.gnn.py \
  --use_mat \
  --headmodel_path /content/sample_data/cortex_downsample
  --save_figs \
  --fig_dir /content/sample_data/figs_monkey/
```

```
Device: cpu
Loading cortex vertices from .mat using smart_loadmat ...
[smart_loadmat] Loading /content/sample_data/cortex_downsampled_v73.mat ...
[smart_loadmat] SciPy cannot read this file (likely v7.3): Please use HDF reader for matlab v7.3 files, e.g. h5py
[smart_loadmat] mat73 is not installed; skipping mat73.
[smart_loadmat] Falling back to raw h5py read ...
[smart_loadmat] Loaded keys (first 10): ['#refs#/a', 'DownsampledCortex/F', 'DownsampledCortex/V', 'DownsampledCortex/
Loaded vertices: (3004, 3)
Simulating 3 silent regions on cortex
Total silent nodes ≈ 30 (1.00% of 3004)
Target per-region size ≈ 10
Region 0: center index = 268
Region 0: picked 10 vertices
Region 1: center index = 2327
Region 1: picked 10 vertices
Region 2: center index = 1963
Region 2: picked 10 vertices
Final |S| = 30 silent nodes (1.00% of cortex)
mean(beta silent): 0.0
mean(beta active): 1.0
beta shape: (3004,)
beta min/max: 0.0 1.0
```

```
Building kNN graph ...
Solving Laplacian smoother ...
[auto] q_silent set to 1.00% for |S|=30/3004
Laplacian: P=0.967 R=0.967 F1=0.967
Building GNN ...
Training supervised GNN ...
[0200] loss=0.02213 cls=0.01723 smooth=0.00490
[0400] loss=0.02055 cls=0.01669 smooth=0.00386
[0600] loss=0.02025 cls=0.01596 smooth=0.00430
[0800] loss=0.02019 cls=0.01607 smooth=0.00412
[1000] loss=0.02022 cls=0.01606 smooth=0.00417
[1200] loss=0.02028 cls=0.01666 smooth=0.00362
[1400] loss=0.02009 cls=0.01561 smooth=0.00448
[1600] loss=0.02008 cls=0.01597 smooth=0.00411
[1800] loss=0.02059 cls=0.01651 smooth=0.00408
[2000] loss=0.02005 cls=0.01583 smooth=0.00422
GNN:       P=0.800 R=0.800 F1=0.800

[beta]
  mean(silent): 0.0
  mean(active): 1.0
  corr with X_act: -1.0

[g_lap]
  mean(silent): 0.23411522805690765
  mean(active): 0.9662275910377502
  corr with X_act: -0.7584455203423163

[g_gnn_prob]
  mean(silent): 0.2554951310157776
  mean(active): 0.001517578843049705
  corr with X_act: 0.8234944564547522
[saved figure → /content/sample_data/figs_monkey/1_gt.png]
[saved figure → /content/sample_data/figs_monkey/2_laplacian.png]
[saved figure → /content/sample_data/figs_monkey/3_gnn.png]
```

Start coding or generate with AI.