

# HW1

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2023-03-13

## Task 1

```
(base) xiyana@xiyanas-MacBook-Pro HW1 % mri_info ./T1.nii.gz
Volume information for ./T1.nii.gz
  type: nii
  dimensions: 176 x 256 x 256
  voxel sizes: 1.000000, 1.000000, 1.000000
  type: SHORT (4)
  fov: 176.000
  dof: 1
  xstart: -88.0, xend: 88.0
  ystart: -128.0, yend: 128.0
  zstart: -128.0, zend: 128.0
  TR: 1590.00 msec, TE: 0.00 msec, TI: 0.00 msec, flip angle: 0.00 degrees
  nframes: 1
  PhEncDir: UNKNOWN
  FieldStrength: 0.000000
ras xform present
  xform info: x_r = -1.0000, y_r = 0.0000, z_r = 0.0000, c_r = 88.8559
              : x_a = 0.0000, y_a = 1.0000, z_a = 0.0000, c_a = 72.1864
              : x_s = 0.0000, y_s = 0.0000, z_s = 1.0000, c_s = -20.6949
Orientation : LAS
Primary Slice Direction: axial

voxel to ras transform:
  -1.0000 0.0000 0.0000 88.8559
  0.0000 1.0000 0.0000 72.1864
  0.0000 0.0000 1.0000 -20.6949
  0.0000 0.0000 0.0000 1.0000

voxel-to-ras determinant -1

ras to voxel transform:
  -1.0000 -0.0000 -0.0000 88.8559
  -0.0000 1.0000 -0.0000 72.1864
  -0.0000 -0.0000 1.0000 -20.6949
  -0.0000 -0.0000 -0.0000 1.0000
```

## Task 2

```
(base) xiyana@xiyanas-MacBook-Pro HW1 % ls ./HW1/*
./HW1/label:
BA_exvivo.ctab          lh.perirhinal_exvivo.label
BA_exvivo.thresh.ctab   lh.perirhinal_exvivo.thresh.label
aparc.annot.DKTatlas.ctab rh.BA1_exvivo.label
aparc.annot.a2009s.ctab rh.BA1_exvivo.thresh.label
aparc.annot.ctab        rh.BA2_exvivo.label
lh.BA1_exvivo.label      rh.BA2_exvivo.thresh.label
lh.BA1_exvivo.thresh.label rh.BA3a_exvivo.label
lh.BA2_exvivo.label      rh.BA3a_exvivo.thresh.label
lh.BA2_exvivo.thresh.label rh.BA3b_exvivo.label
lh.BA3a_exvivo.label     rh.BA3b_exvivo.thresh.label
lh.BA3a_exvivo.thresh.label rh.BA44_exvivo.label
lh.BA3b_exvivo.label     rh.BA44_exvivo.thresh.label
lh.BA3b_exvivo.thresh.label rh.BA45_exvivo.label
lh.BA44_exvivo.label     rh.BA45_exvivo.thresh.label
lh.BA44_exvivo.thresh.label rh.BA4a_exvivo.label
lh.BA45_exvivo.label     rh.BA4a_exvivo.thresh.label
lh.BA45_exvivo.thresh.label rh.BA4p_exvivo.label
lh.BA4a_exvivo.label     rh.BA4p_exvivo.thresh.label
lh.BA4a_exvivo.thresh.label rh.BA6_exvivo.label
lh.BA4p_exvivo.label     rh.BA6_exvivo.thresh.label
lh.BA4p_exvivo.thresh.label rh.BA_exvivo.annot
lh.BA6_exvivo.label      rh.BA_exvivo.thresh.annot
lh.BA6_exvivo.thresh.label rh.FG1.mpm.vpn1.label
lh.BA_exvivo.annot       rh.FG2.mpm.vpn1.label
lh.BA_exvivo.thresh.annot rh.FG3.mpm.vpn1.label
lh.FG1.mpm.vpn1.label    rh.FG4.mpm.vpn1.label
lh.FG2.mpm.vpn1.label    rh.MT_exvivo.label
lh.FG3.mpm.vpn1.label    rh.MT_exvivo.thresh.label
lh.FG4.mpm.vpn1.label    rh.V1_exvivo.label
lh.MT_exvivo.label       rh.V1_exvivo.thresh.label
lh.MT_exvivo.thresh.label rh.V2_exvivo.label
lh.V1_exvivo.label       rh.V2_exvivo.thresh.label
lh.V1_exvivo.thresh.label rh.aparc.DKTatlas.annot
lh.V2_exvivo.label       rh.aparc.a2009s.annot
lh.V2_exvivo.thresh.label rh.aparc.annot
lh.aparc.DKTatlas.annot  rh.cortex+hipamyg.label
lh.aparc.a2009s.annot    rh.cortex.label
lh.aparc.annot           rh.entorhinal_exvivo.label
lh.cortex+hipamyg.label  rh.entorhinal_exvivo.thresh.label
lh.cortex.label          rh.hOc1.mpm.vpn1.label
lh.entorhinal_exvivo.label rh.hOc2.mpm.vpn1.label
lh.entorhinal_exvivo.thresh.label rh.hOc3v.mpm.vpn1.label
lh.hOc1.mpm.vpn1.label   rh.hOc4v.mpm.vpn1.label
lh.hOc2.mpm.vpn1.label   rh.mpm.vpn1.annot
lh.hOc3v.mpm.vpn1.label  rh.nofix.cortex.label
lh.hOc4v.mpm.vpn1.label  rh.perirhinal_exvivo.label
lh.mpm.vpn1.annot        rh.perirhinal_exvivo.thresh.label
lh.nofix.cortex.label
```

```

./HW1/mri:
T1.mgz                                mri_nu_correct.mni.log.bak
antsdn.brain.mgz                     norm.mgz
aparc+aseg.mgz                       nu.mgz
aparc.DKTatlas+aseg.mgz              orig
aparc.a2009s+aseg.mgz               orig.mgz
aseg.auto.mgz                        orig_nu.mgz
aseg.auto_noCCseg.label_intensities.txt rawavg.mgz
aseg.auto_noCCseg.mgz               rh.ribbon.mgz
aseg.mgz                             ribbon.mgz
aseg.presurf.hypos.mgz              segment.dat
aseg.presurf.mgz                    surface.defects.mgz
brain.finalsurfs.mgz               talairach.label_intensities.txt
brain.mgz                           talairach.log
brainmask.auto.mgz                 talairach_with_skull.log
brainmask.mgz                       transforms
ctrl_pts.mgz                        wm.asegedit.mgz
filled.auto.mgz                     wm.mgz
filled.mgz                           wm_seg.mgz
lh.ribbon.mgz                       wmparc.mgz
mri_nu_correct.mni.log

./HW1/scripts:
build-stamp.txt                      recon-all-status.log
defect2seg.log                      recon-all.cmd
lastcall.build-stamp.txt            recon-all.done
patchdir.txt                        recon-all.env
pctsurfcon.log                     recon-all.log
pctsurfcon.log.old                 recon-config.yaml
ponscc.cut.log                     unknown-args.txt

./HW1/stats:
aseg.stats                          rh.BA_exvivo.stats
brainvol.stats                     rh.BA_exvivo.thresh.stats
lh.BA_exvivo.stats                 rh.aparc.DKTatlas.stats
lh.BA_exvivo.thresh.stats          rh.aparc.a2009s.stats
lh.aparc.DKTatlas.stats            rh.aparc.pial.stats
lh.aparc.a2009s.stats              rh.aparc.stats
lh.aparc.pial.stats                rh.curv.stats
lh.aparc.stats                     rh.w-g.pct.stats
lh.curv.stats                      wmparc.stats
lh.w-g.pct.stats

./HW1/surf:
autodet.gw.stats.lh.dat            lh.smoothwm.K1.crv                rh.inflated.nofix
autodet.gw.stats.rh.dat            lh.smoothwm.K2.crv                rh.jacobian_white
lh.area                            lh.smoothwm.S.crv                rh.orig
lh.area.mid                        lh.smoothwm.nofix                rh.orig.nofix
lh.area.pial                       lh.sphere                        rh.orig.premesh
lh.avg_curv                        lh.sphere.reg                    rh.pial
lh.curv                             lh.sulc                           rh.pial.T1
lh.curv.pial                       lh.thickness                     rh.qsphere.nofix
lh.defect_borders                  lh.volume                         rh.smoothwm
lh.defect_chull                    lh.w-g.pct.mgh                   rh.smoothwm.BE.crv
lh.defect_labels                   lh.white                         rh.smoothwm.C.crv
lh.defects.pointset               lh.white.H                       rh.smoothwm.FI.crv
lh.fsaverage.sphere.reg            lh.white.K                       rh.smoothwm.H.crv
lh.inflated                        lh.white.preaparc                rh.smoothwm.K.crv
lh.inflated.H                     lh.white.preaparc.H              rh.smoothwm.K1.crv
lh.inflated.K                     lh.white.preaparc.K              rh.smoothwm.K2.crv
lh.inflated.nofix                 rh.area                          rh.smoothwm.S.crv
lh.jacobian_white                  rh.area.mid                      rh.smoothwm.nofix
lh.orig                            rh.area.pial                     rh.sphere
lh.orig.nofix                      rh.avg_curv                      rh.sphere.reg
lh.orig.premesh                    rh.curv                           rh.sulc
lh.pial                            rh.curv.pial                     rh.thickness
lh.pial.T1                         rh.defect_borders                rh.volume
lh.qsphere.nofix                  rh.defect_chull                  rh.w-g.pct.mgh
lh.smoothwm                        rh.defect_labels                 rh.white
lh.smoothwm.BE.crv                rh.defects.pointset              rh.white.H
lh.smoothwm.C.crv                 rh.fsaverage.sphere.reg          rh.white.K
lh.smoothwm.FI.crv                rh.inflated                      rh.white.preaparc
lh.smoothwm.H.crv                 rh.inflated.H                    rh.white.preaparc.H
lh.smoothwm.K.crv                 rh.inflated.K                    rh.white.preaparc.K

```

```
./HW1/tmp:

./HW1/touch:
apas2aseg.touch          lh.white.touch
asegmerge.touch          nu.touch
ca_label.touch           relabelhypos.touch
ca_normalize.touch       rh.aparc.touch
ca_register.touch        rh.aparc2.touch
conform.touch            rh.aparcstats.touch
cortical_ribbon.touch    rh.aparcstats2.touch
em_register.touch        rh.aparcstats3.touch
fill.touch               rh.autodet.gw.stats.touch
inorm1.touch             rh.avgcurv.touch
inorm2.touch             rh.cortex+hipamylg.touch
lh.aparc.touch           rh.cortex.touch
lh.aparc2.touch          rh.curvstats.touch
lh.aparcstats.touch      rh.inflate.H.K.touch
lh.aparcstats2.touch     rh.inflate1.touch
lh.aparcstats3.touch     rh.inflate2.touch
lh.autodet.gw.stats.touch rh.jacobian.white.touch
lh.avgcurv.touch         rh.pctsurfcon.touch
lh.cortex+hipamylg.touch rh.pial.touch
lh.cortex.touch          rh.qsphere.touch
lh.curvstats.touch       rh.smoothwm1.touch
lh.inflate.H.K.touch     rh.smoothwm2.touch
lh.inflate1.touch        rh.sphmorph.touch
lh.inflate2.touch        rh.sphreg.touch
lh.jacobian.white.touch  rh.tessellate.touch
lh.pctsurfcon.touch      rh.topofix.touch
lh.pial.touch            rh.white.H.K.touch
lh.qsphere.touch         rh.white.preaparc.touch
lh.smoothwm1.touch       rh.white.touch
lh.smoothwm2.touch       segstats.touch
lh.sphmorph.touch        skull.lta.touch
lh.sphreg.touch          skull.strip.touch
lh.tessellate.touch      talairach.touch
lh.topofix.touch         wmaparc.stats.touch
lh.white.H.K.touch       wmsegment.touch
lh.white.preaparc.touch
```

### Task 3

```
(base) xiyana@xiyanas-MacBook-Pro HW1 % mris_info ./HW1/surf/lh.white
SURFACE INFO =====
type      : MRIS_TRIANGULAR_SURFACE=MRIS_ICO_SURFACE
num vertices: 153105
num faces  : 306206
num strips : 0
surface area: 99128.6
vg.valid: 1
AvgFaceArea      0.323732
AvgVtxArea       0.647455
AvgVtxDist       0.877657
StdVtxDist       0.209032
ctr              : (-33.8437, -25.3369, 46.0568)
vertex locs : surfaceRAS
talairch.xfm:
  1.02716 -0.02573 -0.05252  2.07489;
 -0.01366  1.13161  0.18973 -65.56082;
  0.03303 -0.28975  1.12801 -0.20621;
  0.00000  0.00000  0.00000  1.00000;
surfaceRAS to talaraiched surfaceRAS:
  1.02716 -0.02573 -0.05252  2.18384;
 -0.01366  1.13161  0.18973  12.18787;
  0.03303 -0.28975  1.12801 -44.43799;
  0.00000  0.00000  0.00000  1.00000;
talairached surfaceRAS to surfaceRAS:
  0.97271  0.03232  0.03985 -0.74711;
  0.01584  0.84774 -0.14185 -16.67033;
 -0.02442  0.21681  0.84891  35.13479;
  0.00000  0.00000  0.00000  1.00000;
Volume Geometry (vg)
volume geometry:
extent : (256, 256, 256)
voxel  : ( 1.0000, 1.0000, 1.0000)
x_(ras) : (-1.0000, 0.0000, 0.0000)
y_(ras) : ( 0.0000, 0.0000, -1.0000)
z_(ras) : ( 0.0000, 1.0000, 0.0000)
c_(ras) : ( 0.8559, 72.1864, -20.6949)
file    : /Users/xiyana/Downloads/med-course/HW1/HW1/mri/wm.mgz
Volume Geometry vox2ras
-1.00000  0.00000  0.00000  128.85593;
 0.00000  0.00000  1.00000 -55.81357;
 0.00000 -1.00000  0.00000  107.30508;
 0.00000  0.00000  0.00000  1.00000;
Volume Geometry vox2ras-tnr
-1.00000  0.00000  0.00000  128.00000;
 0.00000  0.00000  1.00000 -128.00000;
 0.00000 -1.00000  0.00000  128.00000;
 0.00000  0.00000  0.00000  1.00000;
cmd[0]: ProgramName: mris_remove_intersection ProgramArguments: mris_remove_intersection ./surf/lh
.orig ./surf/lh.orig ProgramVersion: 7.3.2 TimeStamp: 2023/03/11-13:43:25-GMT BuildTime: Aug 4
2022 02:29:22 BuildStamp: freesurfer-darwin-macOS-7.3.2-20220804-6354275 User: xiyana Machine: xi
yanas-MacBook-Pro.local Platform: Darwin PlatformVersion: 22.3.0 CompilerName: Clang CompilerVer
sion: 12.0.0
mris_info
creationtime 2023/03/12-08:39:13-GMT
```

```

sysname Darwin
hostname xiyanas-MacBook-Pro.local
machine x86_64
surfacefile ./HW1/surf/lh.white
hemicode 0
talairach_flag 0
rescale 0.000000
nvertices 153105
nfaces 306206
total_area 99128.617188
group_avg_vtxarea_loaded 0
avgfacearea 0.323732
avgvtxarea 0.647455
avgvtxdist 0.877657
stdvtxdist 0.209032
vtx0xyz -11.632468 -106.146202 25.979338
num_intersecting_faces 0

```

(base) xiyana@xiyanas-MacBook-Pro HW1 % mris\_info ./HW1/surf/rh.white

```

SURFACE INFO =====
type      : MRIS_TRIANGULAR_SURFACE=MRIS_ICO_SURFACE
num vertices: 152772
num faces  : 305540
num strips  : 0
surface area: 99963.1
vg.valid: 1
AvgFaceArea    0.327168
AvgVtxArea     0.654328
AvgVtxDist     0.882638
StdVtxDist     0.213140
ctr            : (32.9752, -26.1255, 46.1807)
vertex locs : surfaceRAS
talairch.xfm:
  1.02716 -0.02573 -0.05252 2.07489;
 -0.01366 1.13161 0.18973 -65.56082;
  0.03303 -0.28975 1.12801 -0.20621;
  0.00000 0.00000 0.00000 1.00000;
surfaceRAS to talarached surfaceRAS:
  1.02716 -0.02573 -0.05252 2.18384;
 -0.01366 1.13161 0.18973 12.18787;
  0.03303 -0.28975 1.12801 -44.43799;
  0.00000 0.00000 0.00000 1.00000;
talairached surfaceRAS to surfaceRAS:
  0.97271 0.03232 0.03985 -0.74711;
  0.01584 0.84774 -0.14185 -16.67033;
 -0.02442 0.21681 0.84891 35.13479;
  0.00000 0.00000 0.00000 1.00000;
Volume Geometry (vg)
volume geometry:
extent : (256, 256, 256)
voxel  : ( 1.0000, 1.0000, 1.0000)
x_(ras) : (-1.0000, 0.0000, 0.0000)
y_(ras) : ( 0.0000, 0.0000, -1.0000)
z_(ras) : ( 0.0000, 1.0000, 0.0000)
c_(ras) : ( 0.8559, 72.1864, -20.6949)
file    : /Users/xiyana/Downloads/med-course/HW1/HW1/mri/wm.mgz
Volume Geometry vox2ras
-1.00000 0.00000 0.00000 128.85593;
 0.00000 0.00000 1.00000 -55.81357;
 0.00000 -1.00000 0.00000 107.30508;
 0.00000 0.00000 0.00000 1.00000;
Volume Geometry vox2ras-tnr
-1.00000 0.00000 0.00000 128.00000;
 0.00000 0.00000 1.00000 -128.00000;
 0.00000 -1.00000 0.00000 128.00000;
 0.00000 0.00000 0.00000 1.00000;
cmd[0]: ProgramName: mris_remove_intersection ProgramArguments: mris_remove_intersection ./surf/rh
.orig ./surf/rh.orig ProgramVersion: 7.3.2 TimeStamp: 2023/03/11-13:43:26-GMT BuildTime: Aug 4
2022 02:29:22 BuildStamp: freesurfer-darwin-macOS-7.3.2-20220804-6354275 User: xiyana Machine: xi
yanas-MacBook-Pro.local Platform: Darwin PlatformVersion: 22.3.0 CompilerName: Clang CompilerVer
sion: 12.0.0
mris_info
creationtime 2023/03/12-08:44:16-GMT

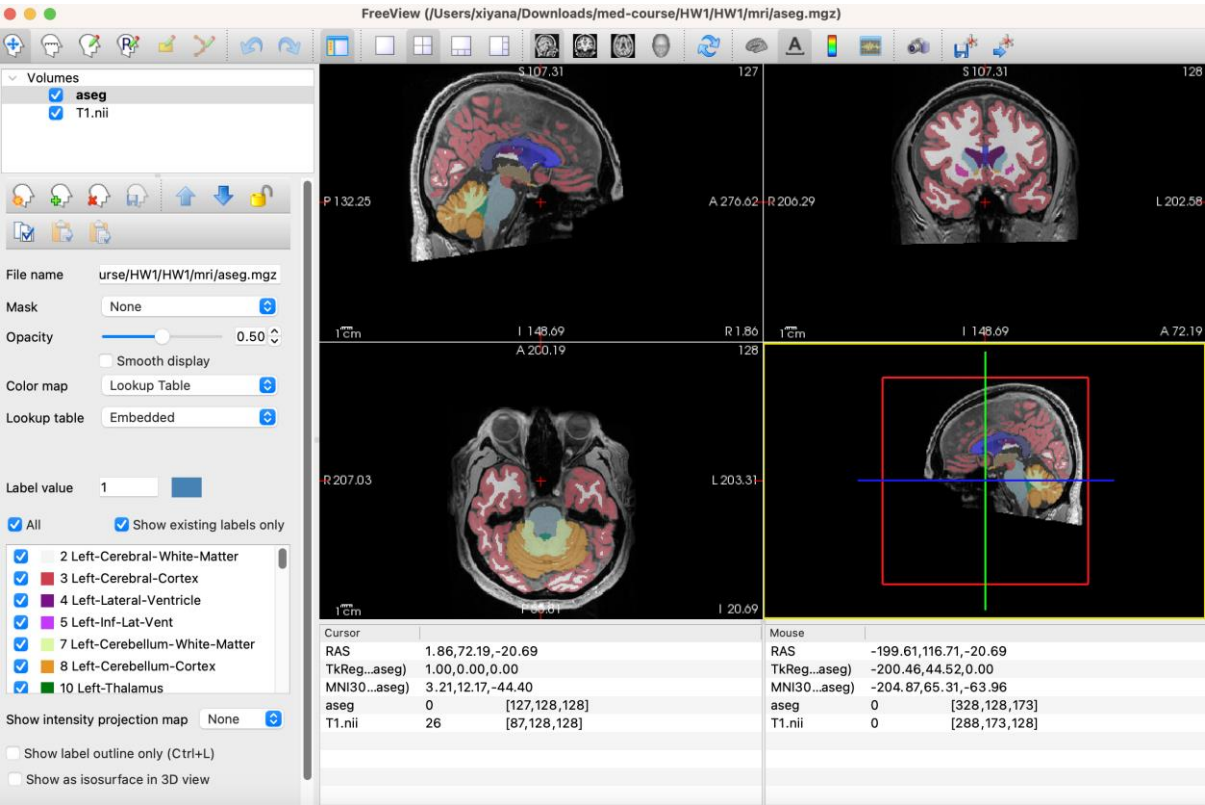
```

```

sysname Darwin
hostname xiyanas-MacBook-Pro.local
machine x86_64
surfacefile ./HW1/surf/rh.white
hemicode 1
talairach_flag 0
rescale 0.000000
nvertices 152772
nfaces 305540
total_area 99963.062500
group_avg_vtxarea_loaded 0
avgfacearea 0.327168
avgvtxarea 0.654328
avgvtxdist 0.882638
stdvtxdist 0.213140
vtx0xyz 8.456539 -107.228638 21.257692
num_intersecting_faces 0

```

Task 4





Task 5

