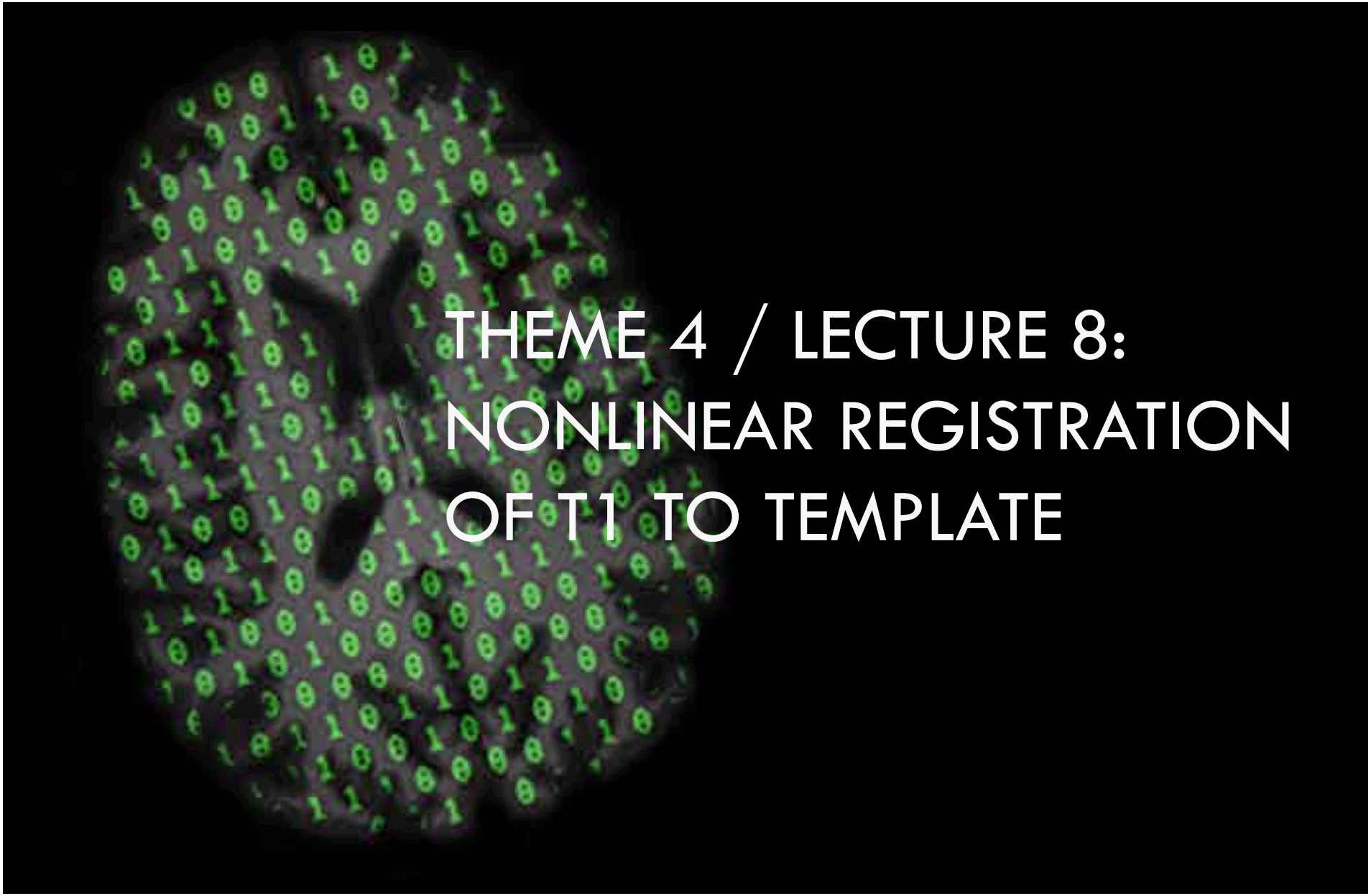
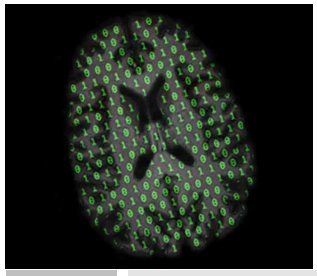
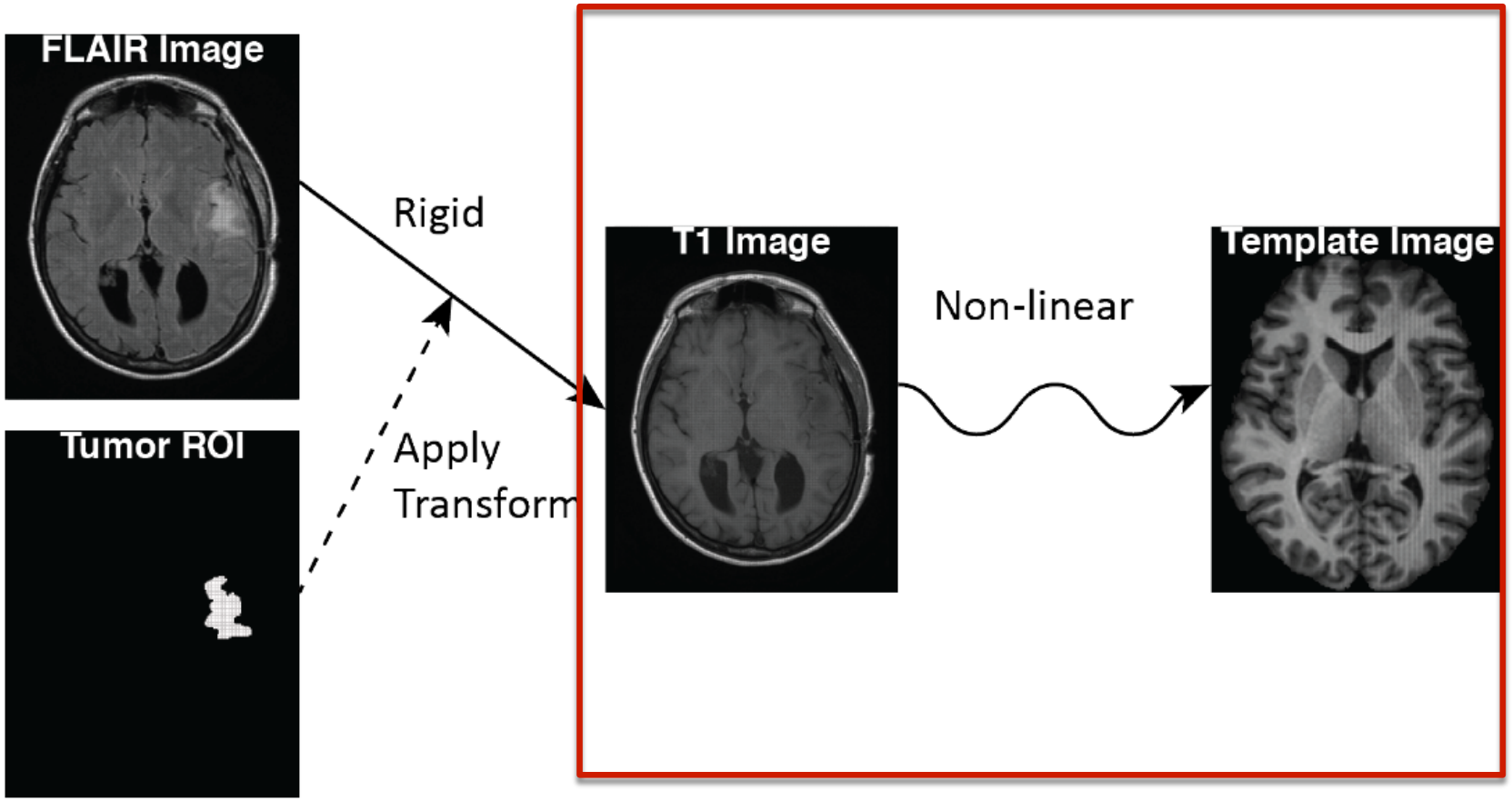
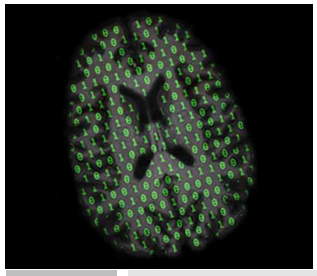


THEME 4 / LECTURE 8: NONLINEAR REGISTRATION OF T1 TO TEMPLATE



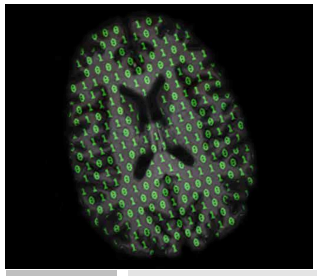
Nonlinear Registration of T1 to Template





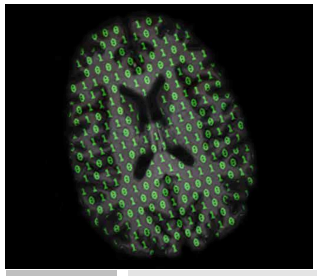
Non-linear Registration: SyN

- Using symmetric image normalization (SyN) (Avants, 2008)
  - A symmetric diffeomorphic registration technique
  - Registration is non-linear and matches the image to the template well
- SyN performs an affine registration first
  - We will use the skull-stripped image to the MNI T1 Brain template



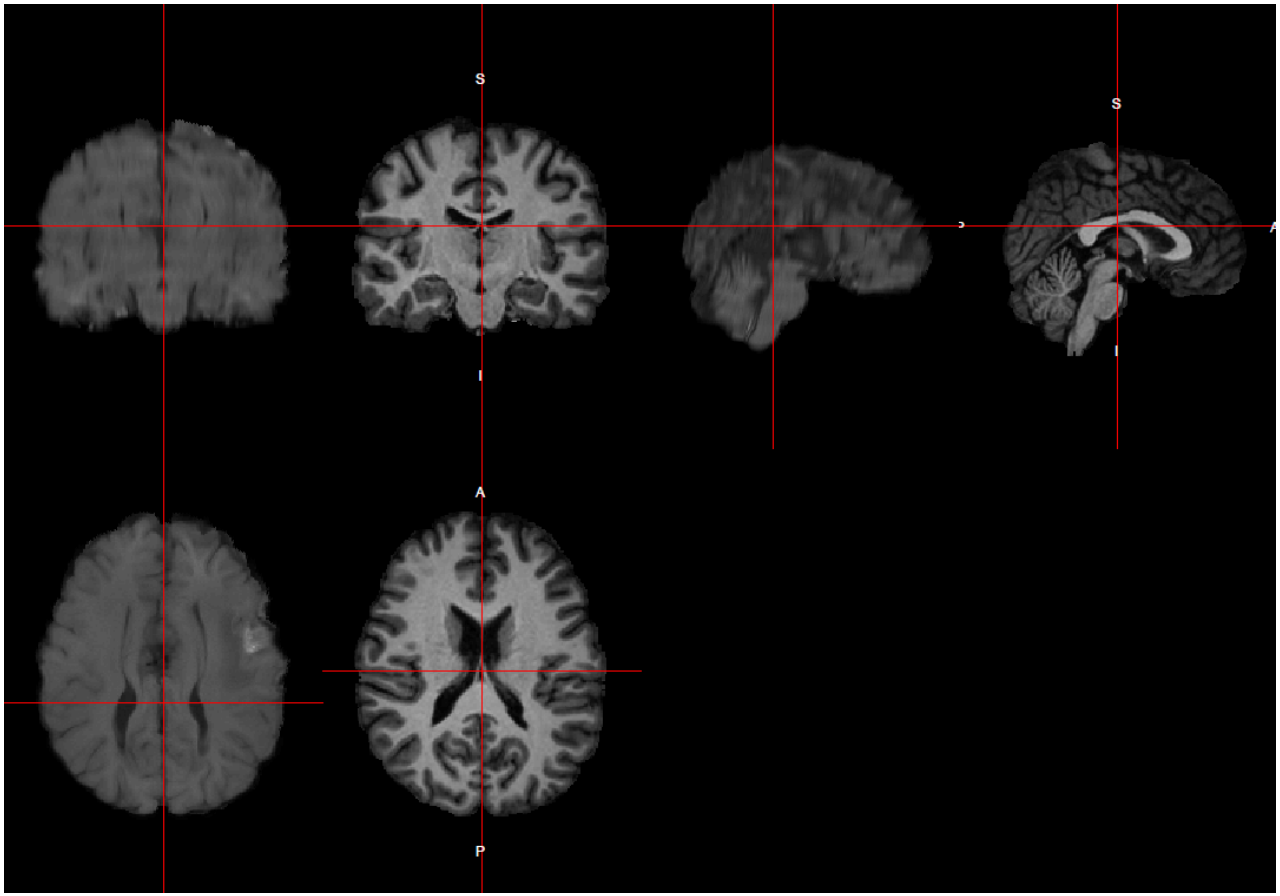
SyN T1 Registration to Template

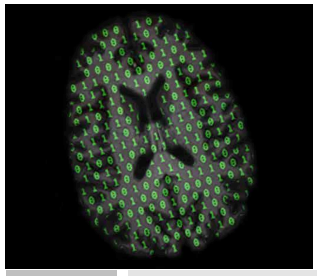
```
template.file = file.path(neurodir,
"Template","JHU_MNI_SS_T1_brain.nii.gz")
syn_t1_outfile = file.path(mridir,"T1_SyntoEve.nii.gz")
syn_roi_outfile = file.path(mridir,
"ROI_regToT1_SyntoEve.nii.gz")

syn_brain = ants_regwrite(filename = brain,
                          outfile = syn_t1_outfile,
                          other.files = reg_roi,
                          other.outfiles = syn_roi_outfile,
                          template.file = template.file,
                          typeofTransform = "SyN",
                          verbose = FALSE)

syn_roi = readNIfTI(aff_roi_outfile, reorient = FALSE)
```



SyN T1 Registration to Template Results

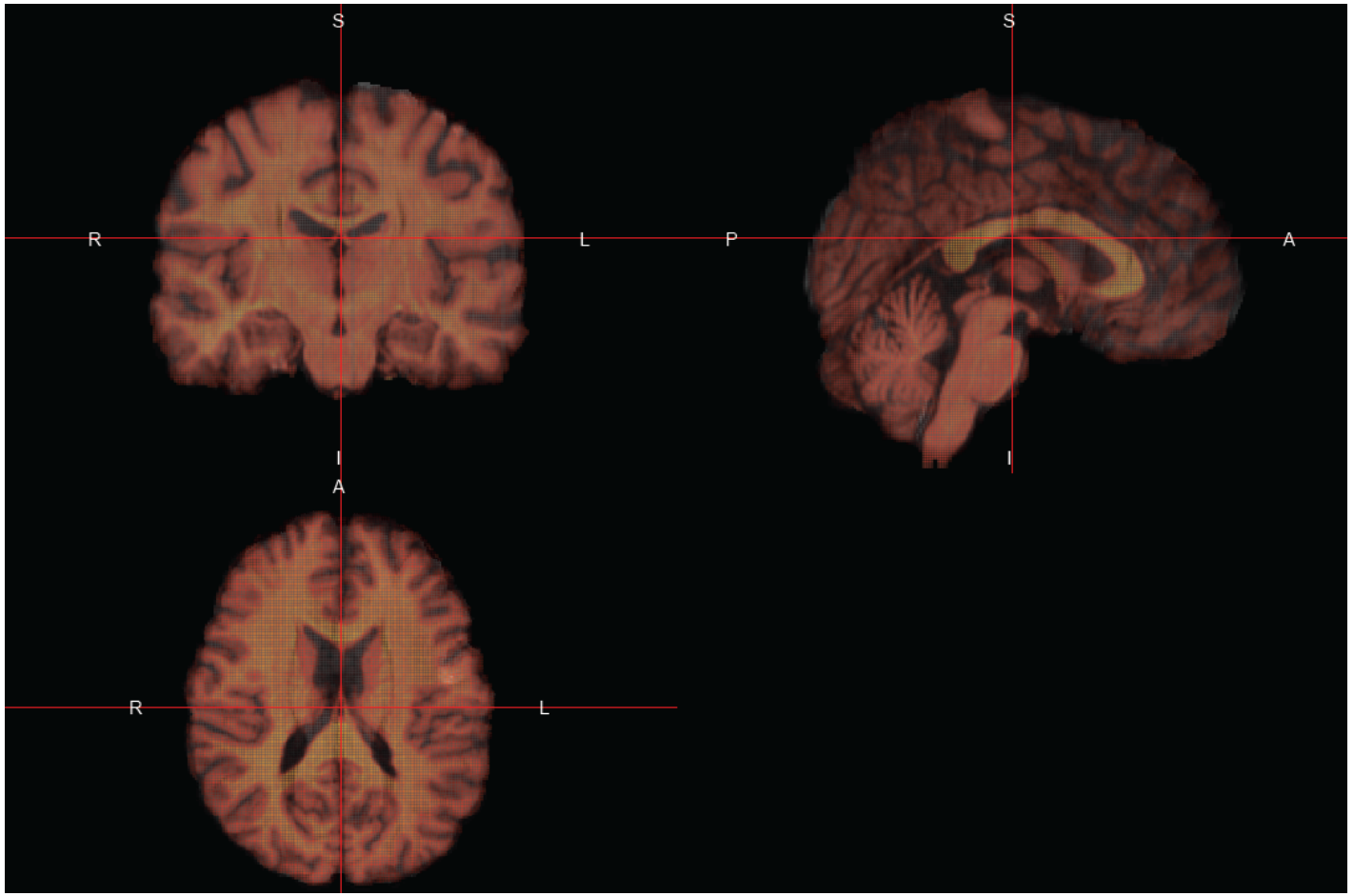
```
double_ortho(syn_brain, template)
```

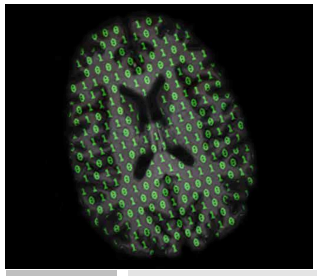




Syn T1 Registration to Template Results: Overlay

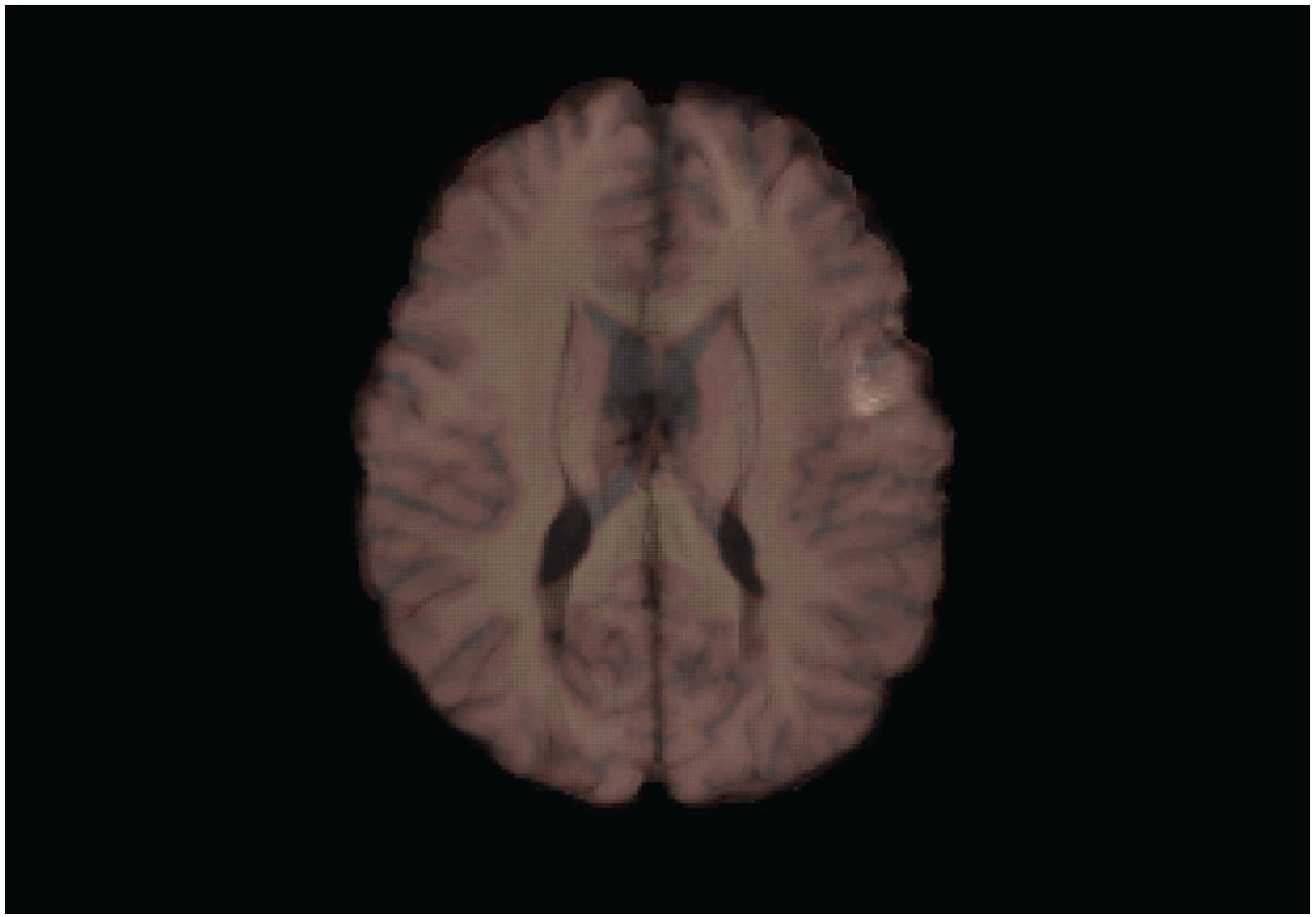
```
ortho2(syn_brain, template, col.y=alpha(hotmetal(),0.35))
```

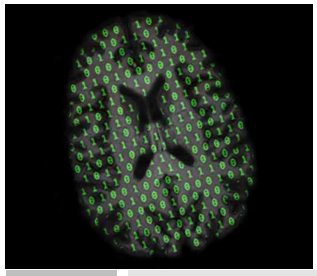




SyN T1 Registration to Template Results: Overlay One Slice

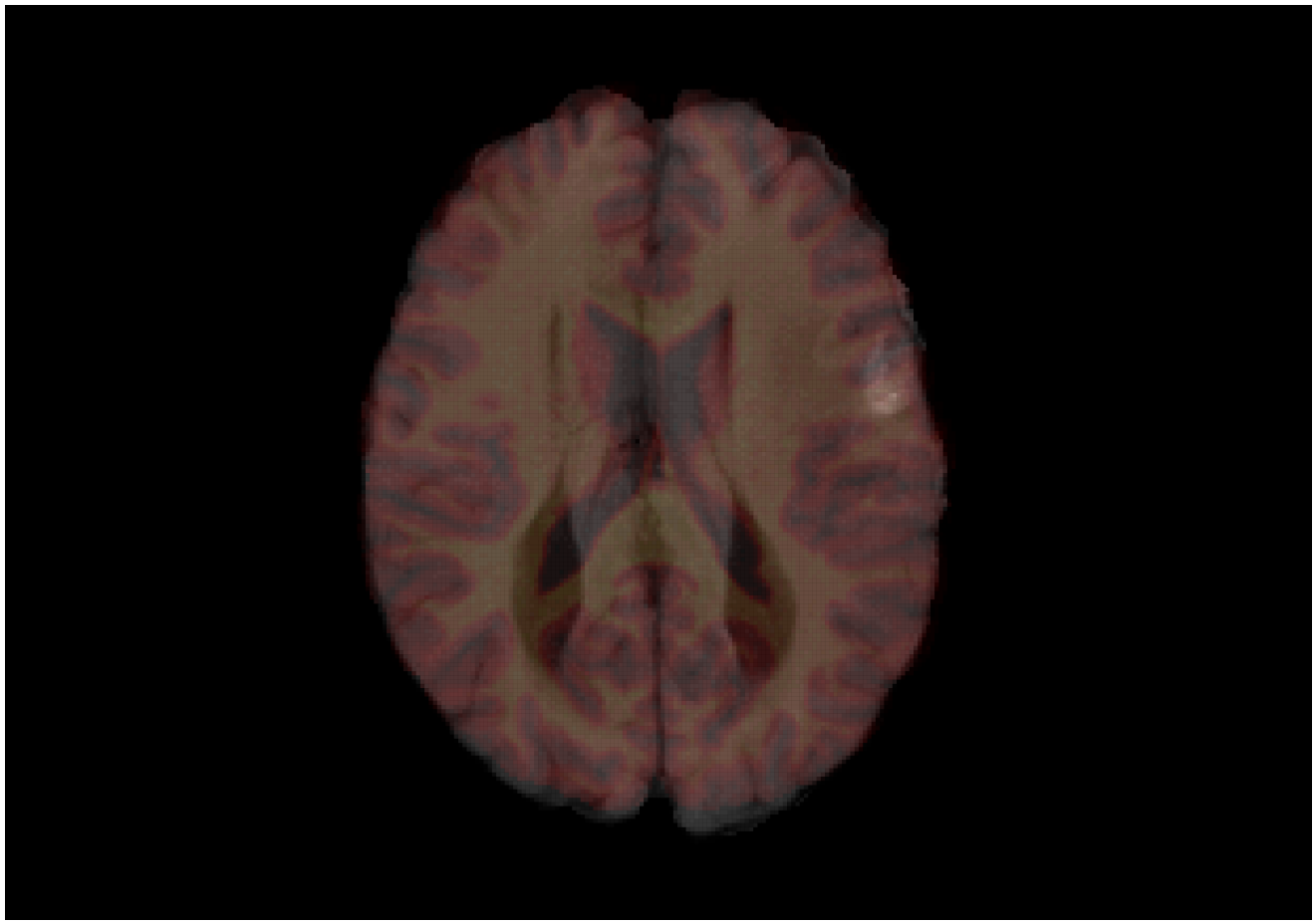
```
ortho2(syn_brain, template,z=ceiling(dim(template)[3]/2),
plot.type= "single",col.y=alpha(hotmetal(),0.35))
```

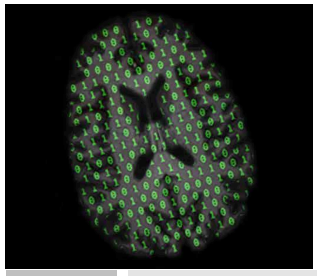




Affine T1 Registration to Template Results: Overlay One Slice

```
ortho2(aff_brain, template,z=ceiling(dim(template)[3]/2),
plot.type= "single",col.y=alpha(hotmetal(),0.35))
```





Affine T1 Registration to Template Results: ROI Overlay

```
ortho2(syn_brain, syn_roi, col.y=alpha(hotmetal(),0.35),
xyz=xyz(syn_roi))
```