## R Notebook

In this little experiment, I wanted to double check that the ROIs at least matched up in the same way. To do so. I asked a pretty simple question, is the thickness from this ROI more correlated (measured with package A), more correlated with the thickness from this ROI (measured with package B), than it is with the thickness of any other ROI (measured with package B). So I created tables that report 3 values:

- 1. **rho**: the correlation of ROI (package A vs package B)
- 2. **popZ**: The Z-score of this correlation values within the pools of all correlations between all ROIs of the other package
- 3. rankZ: The Percent Rank of this ROI compared to all other ROI's from package B (1 is the best)

```
library(dplyr)
library(tidyr)
library(knitr)
```

## Step 1 Read in the Data

```
fs5.1 = read.csv('../data/cortical_fs5.1_measuresenigma_thickavg.csv', header = T)
fs5.3 = read.csv('../data/ABIDE_fs5.3_thickness.csv', header = T)
ants = read.csv('../data/ABIDE_ants_thickness_data_r.csv', header = T)
pheno = read.csv('../data/ABIDE_Phenotype.csv', header = T)
```

## Compare Freesurfer 5.1 to Freesurfer 5.3

```
## merge and generate correlation matrixes for sanity check
fs5.1and5.3 = merge(fs5.1, fs5.3, by = "SubjID", suffixes = c('_fs5.1','_fs5.3'))
ants_fs5.1 = merge(ants, fs5.1, by.x = 'Code', by.y = 'SubjID', suffixes = c('ants','_fs5.1'))
cor5.1to5.3 <- cor(select(fs5.1and5.3, ends with(' fs5.1')), select(fs5.1and5.3, ends with(' fs5.3')))
fsdf <- as.data.frame(cor5.1to5.3)</pre>
fsdf$fs5.1_var <- row.names(fsdf)</pre>
fs_g <- gather(fsdf, fs5.3_var, rho, -fs5.1_var)
df <- fs g %>%
  separate(fs5.1_var, c("hemi1","stuff"), sep = '_', extra = "merge", fill = "left") %>%
 separate(stuff, c("region1", "version1"), sep = '_', extra = "merge", fill = "right") %>%
  separate(fs5.3_var, c("hemi3","stuff"), sep = '_', extra = "merge", fill = "left") %>%
  separate(stuff, c("region3","version3"), sep = '_', extra = "merge", fill = "right")
df$roipair <- NA
df$roipair[df$hemi1==df$hemi3 & df$region1==df$region3] <- "same"
df$roipair[df$hemi1!=df$hemi3 & df$region1==df$region3] <- "contralateral"
df$roipair[df$region1!=df$region3] <- "cross"</pre>
df$Z <- atanh(df$rho)</pre>
checks fs5.35.1 <- df %>%
 filter(hemi1 %in% c('L','R'), hemi3 %in% c('L','R')) %>%
```

Table 1: Comparison of Free surfer 5.1 to Freesurfer 5.3

| region1         hemi1         rho         popZ         rank           bankssts         L         0.9101637         4.462307           caudalanteriorcingulate         L         0.8976968         5.895770           caudalmiddlefrontal         L         0.9076634         3.571863           cuneus         L         0.9100416         4.428787           entorhinal         L         0.8358041         5.085939           fusiform         L         0.8550177         3.845962           inferiorparietal         L         0.9213235         3.692470           inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.8993873         6.226981           parsorbitalis         L               | kΖ |
|---|----|
| caudalanteriorcingulate         L         0.8976968         5.895770           caudalmiddlefrontal         L         0.9076634         3.571863           cuneus         L         0.9100416         4.428787           entorhinal         L         0.8358041         5.085939           fusiform         L         0.8550177         3.845962           inferiorparietal         L         0.9213235         3.692470           inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.89387039         4.255522           parsopercularis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L  |    |
| caudalmiddlefrontal         L         0.9076634         3.571863           cuneus         L         0.9100416         4.428787           entorhinal         L         0.8358041         5.085939           fusiform         L         0.8550177         3.845962           inferiorparietal         L         0.9213235         3.692470           inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.9881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.893873         6.226981           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9021783         4.725235           postcentral         L         0.8889 | 1  |
| entorhinal         L         0.8358041         5.085939           fusiform         L         0.8550177         3.845962           inferiorparietal         L         0.9213235         3.692470           inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.888987         5.327658           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0 | 1  |
| fusiform         L         0.8550177         3.845962           inferiorparietal         L         0.9213235         3.692470           inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9021783         4.725235           postcentral         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| fusiform         L         0.8550177         3.845962           inferiorparietal         L         0.9213235         3.692470           inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9921783         4.725235           posteentral         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173  | 1  |
| inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.88992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| inferiortemporal         L         0.8347722         3.676527           isthmuscingulate         L         0.8226277         5.131821           lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.88992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| lateraloccipital         L         0.9068552         4.030595           lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9921783         4.725235           postcentral         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| lateralorbitofrontal         L         0.8881424         4.873926           lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| lingual         L         0.9340700         4.768019           medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| medialorbitofrontal         L         0.8619501         5.117489           middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.88992677         3.842972           posteriorcingulate         L         0.9217095         3.735173   | 1  |
| middletemporal         L         0.8845981         3.940024           parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8889867         3.842972           posteriorcingulate         L         0.9217095         3.735173   | 1  |
| parahippocampal         L         0.8933873         6.226981           paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.88992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173  | 1  |
| paracentral         L         0.9387039         4.255522           parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.88992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| parsopercularis         L         0.8990182         3.762795           parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| parsorbitalis         L         0.8674510         3.969854           parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173  | 1  |
| parstriangularis         L         0.9058958         3.809230           pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| pericalcarine         L         0.9021783         4.725235           postcentral         L         0.8992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| postcentral         L         0.8992677         3.842972           posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173  | 1  |
| posteriorcingulate         L         0.8889897         5.327658           precentral         L         0.9217095         3.735173   | 1  |
| precentral L 0.9217095 3.735173   | 1  |
|   | 1  |
| _   | 1  |
| precuneus L 0.9307007 4.033053  | 1  |
| rostralanteriorcingulate L 0.8525916 5.651098   | 1  |
| $rostralmiddle frontal \qquad \qquad 0.9162167  3.629975$   | 1  |
| superiorfrontal L 0.9088718 3.342941  | 1  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$  | 1  |
| superiortemporal L $0.9021422$ $4.207461$   | 1  |
| supramarginal L 0.9286493 3.688751  | 1  |
| frontalpole L 0.8374953 4.303174  | 1  |
| temporal<br>pole L $0.7999935 	ext{ } 4.530110$   | 1  |
| $transverse temporal \qquad \qquad L \qquad \qquad 0.8880359  4.908515$   | 1  |
| insula L $0.8344587 	ext{ } 4.588590$   | 1  |
| bankssts R 0.8987761 4.513439   | 1  |
| caudalanteriorcingulate R 0.8830956 6.006308  | 1  |
| caudalmiddlefrontal R $0.8677847$ $3.296685$  | 1  |
| cuneus R 0.8889727 4.299529   | 1  |
| entorhinal R 0.8139154 4.888636   | 1  |
| fusiform R $0.8292580 3.907469$   | 1  |

| region1                  | hemi1        | rho       | popZ     | rankZ |
|--------------------------|--------------|-----------|----------|-------|
| inferiorparietal         | R            | 0.8758163 | 3.205971 | 1     |
| inferiortemporal         | $\mathbf{R}$ | 0.8305211 | 3.747643 | 1     |
| isthmuscingulate         | $\mathbf{R}$ | 0.8473810 | 5.140973 | 1     |
| lateraloccipital         | R            | 0.8600589 | 3.761061 | 1     |
| lateralorbitofrontal     | R            | 0.8501931 | 4.270455 | 1     |
| lingual                  | R            | 0.8829017 | 4.233124 | 1     |
| medialorbitofrontal      | R            | 0.8576170 | 4.840557 | 1     |
| middletemporal           | R            | 0.8345367 | 3.359281 | 1     |
| parahippocampal          | R            | 0.8701588 | 5.652727 | 1     |
| paracentral              | R            | 0.9105918 | 3.805904 | 1     |
| parsopercularis          | R            | 0.8547224 | 3.818404 | 1     |
| parsorbitalis            | R            | 0.8666728 | 4.044331 | 1     |
| parstriangularis         | R            | 0.8833655 | 3.767170 | 1     |
| pericalcarine            | R            | 0.8508993 | 4.374921 | 1     |
| postcentral              | $\mathbf{R}$ | 0.8416930 | 3.613994 | 1     |
| posteriorcingulate       | $\mathbf{R}$ | 0.7783980 | 4.607568 | 1     |
| precentral               | $\mathbf{R}$ | 0.8674248 | 3.335701 | 1     |
| precuneus                | $\mathbf{R}$ | 0.8977546 | 3.679029 | 1     |
| rostralanteriorcingulate | $\mathbf{R}$ | 0.8473520 | 6.163205 | 1     |
| rostralmiddle frontal    | $\mathbf{R}$ | 0.9032436 | 3.763007 | 1     |
| superiorfrontal          | $\mathbf{R}$ | 0.8861852 | 3.242727 | 1     |
| superiorparietal         | $\mathbf{R}$ | 0.8610255 | 3.387476 | 1     |
| superiortemporal         | $\mathbf{R}$ | 0.8590687 | 3.805432 | 1     |
| supramarginal            | $\mathbf{R}$ | 0.8791039 | 3.157655 | 1     |
| frontalpole              | $\mathbf{R}$ | 0.8237885 | 4.530520 | 1     |
| temporalpole             | $\mathbf{R}$ | 0.7710270 | 4.168297 | 1     |
| transversetemporal       | $\mathbf{R}$ | 0.8489185 | 4.524920 | 1     |
| insula                   | R            | 0.7646380 | 3.949668 | 1     |

Table 2: Summary of Freesurfer 5.3 to Freesurfer 5.1

| Mean      | Min      | Max       |
|-----------|----------|-----------|
| 0.8719496 | 0.764638 | 0.9387039 |

```
ants_fs5.1 = merge(ants, fs5.1, by.x = 'Code', by.y = 'SubjID', suffixes = c('ants','_fs5.1'))
cor5.1toants <- cor(select(ants_fs5.1, starts_with('left'), starts_with('right')),select(ants_fs5.1, st
fsdf <- as.data.frame(cor5.1toants)
fsdf$ants_var <- row.names(fsdf)
fs_g <- gather(fsdf, fs5.1_var, rho, -ants_var)</pre>
```

```
df <- fs_g %>%
  separate(fs5.1_var, c("hemi1","stuff"), sep = '_', extra = "merge", fill = "left") %>%
separate(stuff, c("region1","version1"), sep = '_', extra = "merge", fill = "right") %>%
  separate(ants_var, c("hemi_a","stuff"), sep = '\\.', extra = "merge", fill = "left")
df$region_ants <- gsub('\\.','',df$stuff)</pre>
df$hemi ants <- NA
df$hemi ants[df$hemi a == "left"] <- "L"</pre>
df$hemi_ants[df$hemi_a == "right"] <- "R"</pre>
df$roipair <- NA
df$roipair[df$hemi1==df$hemi_ants & df$region1==df$region_ants] <- "same"
df$roipair[df$hemi1!=df$hemi_ants & df$region1==df$region_ants] <- "contralateral"
df$roipair[df$region1!=df$region_ants] <- "cross"</pre>
df$Z <- atanh(df$rho)</pre>
checks_fs5.1ants <- df %>%
  filter(hemi1 %in% c('L','R'), hemi_ants %in% c('L','R'), !is.na(rho)) %>%
  group_by(region1, hemi1) %>%
  mutate(popZ = as.numeric(scale(Z)),
          rankZ = as.numeric(rank(Z), ties.method = "first")/n())
kable(select(filter(checks_fs5.1ants,roipair=="same"), region1, hemi1, rho, popZ, rankZ),
        caption = "Comparison of Freesurfer 5.1 to ANTS")
```

Table 3: Comparison of Freesurfer 5.1 to ANTS

| region1                 | hemi1 | rho       | popZ      | $\overline{\text{rankZ}}$ |
|-------------------------|-------|-----------|-----------|---------------------------|
| caudalanteriorcingulate | L     | 0.2206556 | 1.7630325 | 0.9213483                 |
| caudalmiddlefrontal     | L     | 0.4906335 | 2.3595936 | 1.0000000                 |
| cuneus                  | L     | 0.5463324 | 3.0095424 | 1.0000000                 |
| entorhinal              | L     | 0.4045428 | 1.5179926 | 0.9438202                 |
| fusiform                | L     | 0.3084918 | 0.6553863 | 0.6966292                 |
| inferiorparietal        | L     | 0.4465800 | 1.8858205 | 0.9887640                 |
| inferiortemporal        | L     | 0.2925661 | 0.5930738 | 0.6629213                 |
| isthmuscingulate        | L     | 0.2967954 | 1.9175746 | 0.9213483                 |
| lateraloccipital        | L     | 0.3451861 | 1.4731690 | 0.8876404                 |
| lateralorbitofrontal    | L     | 0.3960388 | 1.8150361 | 0.9775281                 |
| lingual                 | L     | 0.4258987 | 2.1153033 | 0.9550562                 |
| medialorbitofrontal     | L     | 0.2308479 | 0.9969921 | 0.8426966                 |
| middletemporal          | L     | 0.4544403 | 1.9640244 | 0.9550562                 |
| parahippocampal         | L     | 0.5436401 | 3.2566959 | 1.0000000                 |
| paracentral             | L     | 0.5383150 | 2.7370719 | 1.0000000                 |
| parsopercularis         | L     | 0.4944040 | 2.1464887 | 0.9887640                 |
| parsorbitalis           | L     | 0.4642459 | 2.1616881 | 0.9887640                 |
| parstriangularis        | L     | 0.5638157 | 2.7880961 | 1.0000000                 |
| pericalcarine           | L     | 0.4774892 | 2.8921937 | 1.0000000                 |
| postcentral             | L     | 0.3532792 | 1.5544255 | 0.9213483                 |
| posteriorcingulate      | L     | 0.3063975 | 1.7694669 | 0.9213483                 |
| precentral              | L     | 0.5335484 | 2.7419821 | 1.0000000                 |
| precuneus               | L     | 0.5628855 | 2.6768453 | 1.0000000                 |

| region1                        | hemi1        | rho       | popZ      | rankZ     |
|--------------------------------|--------------|-----------|-----------|-----------|
| rostralanteriorcingulate       | L            | 0.1945296 | 0.5382100 | 0.6741573 |
| rostralmiddlefrontal           | L            | 0.5356709 | 2.4963512 | 1.0000000 |
| superiorfrontal                | L            | 0.5081856 | 2.2963256 | 1.0000000 |
| superiorparietal               | L            | 0.4598919 | 2.0380076 | 0.9662921 |
| superiortemporal               | L            | 0.5757812 | 2.2903647 | 0.9887640 |
| supramarginal                  | L            | 0.5255745 | 2.4769122 | 1.0000000 |
| transversetemporal             | L            | 0.4471937 | 2.1547279 | 1.0000000 |
| insula                         | L            | 0.4668492 | 2.3846272 | 1.0000000 |
| caudalanteriorcingulate        | R            | 0.2060639 | 1.6743501 | 0.9213483 |
| caudalmiddlefrontal            | R            | 0.3789715 | 1.8686034 | 0.9775281 |
| cuneus                         | R            | 0.4850643 | 2.8124339 | 1.0000000 |
| entorhinal                     | R            | 0.4257005 | 1.6665923 | 0.9662921 |
| fusiform                       | R            | 0.3953332 | 1.3759438 | 0.8988764 |
| inferiorparietal               | R            | 0.3980692 | 1.7426973 | 0.9775281 |
| inferiortemporal               | $\mathbf{R}$ | 0.3819686 | 1.3154670 | 0.8988764 |
| isthmuscingulate               | $\mathbf{R}$ | 0.3102490 | 2.0140841 | 0.9213483 |
| lateraloccipital               | $\mathbf{R}$ | 0.3564507 | 1.7522285 | 0.9438202 |
| lateralorbitofrontal           | $\mathbf{R}$ | 0.4894783 | 2.5277600 | 1.0000000 |
| lingual                        | $\mathbf{R}$ | 0.4092232 | 2.2411420 | 0.9887640 |
| medialorbitofrontal            | R            | 0.2733026 | 1.3959259 | 0.9213483 |
| middletemporal                 | R            | 0.5375897 | 2.6366711 | 1.0000000 |
| parahippocampal                | R            | 0.5260459 | 2.6289900 | 1.0000000 |
| paracentral                    | $\mathbf{R}$ | 0.5472166 | 2.9189604 | 1.0000000 |
| parsopercularis                | $\mathbf{R}$ | 0.4625236 | 2.2593819 | 1.0000000 |
| parsorbitalis                  | $\mathbf{R}$ | 0.4621071 | 2.2160709 | 0.9775281 |
| parstriangularis               | $\mathbf{R}$ | 0.5443982 | 2.6794978 | 1.0000000 |
| pericalcarine                  | $\mathbf{R}$ | 0.3963888 | 2.7722974 | 1.0000000 |
| postcentral                    | $\mathbf{R}$ | 0.3530563 | 1.8968649 | 1.0000000 |
| posteriorcingulate             | $\mathbf{R}$ | 0.2817009 | 1.8943317 | 0.9213483 |
| precentral                     | $\mathbf{R}$ | 0.4659028 | 2.5932762 | 1.0000000 |
| precuneus                      | $\mathbf{R}$ | 0.5123514 | 2.6940579 | 1.0000000 |
| rostralanteriorcingulate       | R            | 0.3510545 | 2.3634144 | 1.0000000 |
| ${\bf rostral middle frontal}$ | R            | 0.5073621 | 2.5170747 | 1.0000000 |
| superiorfrontal                | R            | 0.5030256 | 2.3807782 | 1.0000000 |
| superiorparietal               | R            | 0.4236839 | 2.0812547 | 0.9887640 |
| superiortemporal               | R            | 0.5911591 | 2.5192918 | 1.0000000 |
| supramarginal                  | R            | 0.5031457 | 2.4577148 | 1.0000000 |
| transversetemporal             | R            | 0.3915666 | 1.9011166 | 0.9887640 |
| insula                         | R            | 0.4777559 | 2.5923254 | 1.0000000 |

Table 4: Summary of Freesurfer 5.1 to ANTS comparsion

| Mean      | Min       | Max       |
|-----------|-----------|-----------|
| 0.4315906 | 0.1945296 | 0.5911591 |

kable(select(filter(checks\_fs5.1ants,rankZ==1.0), region1, hemi1, region\_ants, hemi\_ants, rho, popZ, rankz==1.0)

Table 5: The most correlated region from ANTS for each ROI

| region1                  | hemi1 | region_ants          | hemi_ants               | rho       | popZ     | $\operatorname{rank} Z$ |
|--------------------------|-------|----------------------|-------------------------|-----------|----------|-------------------------|
| bankssts                 | L     | supramarginal        | L                       | 0.4152559 | 2.087573 | 1                       |
| caudalanteriorcingulate  | L     | paracentral          | L                       | 0.3085564 | 2.724948 | 1                       |
| caudalmiddlefrontal      | L     | caudalmiddlefrontal  | ${ m L}$                | 0.4906335 | 2.359594 | 1                       |
| cuneus                   | L     | cuneus               | ${ m L}$                | 0.5463324 | 3.009542 | 1                       |
| entorhinal               | L     | superiortemporal     | R                       | 0.4573453 | 1.913814 | 1                       |
| fusiform                 | L     | lingual              | $\mathbf{R}$            | 0.4293519 | 1.535067 | 1                       |
| inferiorparietal         | L     | precuneus            | R                       | 0.4523869 | 1.928208 | 1                       |
| inferiortemporal         | L     | middletemporal       | $\mathbf{R}$            | 0.5101360 | 2.247581 | 1                       |
| isthmuscingulate         | L     | precuneus            | ${ m L}$                | 0.3904086 | 2.733795 | 1                       |
| lateraloccipital         | L     | cuneus               | R                       | 0.5084063 | 2.587701 | 1                       |
| lateralorbitofrontal     | L     | parsorbitalis        | ${ m L}$                | 0.4065808 | 1.902026 | 1                       |
| lingual                  | L     | cuneus               | $\mathbf{R}$            | 0.4629391 | 2.388759 | 1                       |
| medialorbitofrontal      | L     | parstriangularis     | R                       | 0.3415877 | 1.976959 | 1                       |
| middletemporal           | L     | middletemporal       | R                       | 0.5269248 | 2.544612 | 1                       |
| parahippocampal          | L     | parahippocampal      | L                       | 0.5436401 | 3.256696 | 1                       |
| paracentral              | L     | paracentral          | L                       | 0.5383150 | 2.737072 | 1                       |
| parsopercularis          | L     | parstriangularis     | L                       | 0.5247496 | 2.384853 | 1                       |
| parsorbitalis            | L     | parstriangularis     | L                       | 0.5055120 | 2.489271 | 1                       |
| parstriangularis         | L     | parstriangularis     | L                       | 0.5638157 | 2.788096 | 1                       |
| pericalcarine            | L     | pericalcarine        | L                       | 0.4774892 | 2.892194 | 1                       |
| postcentral              | L     | paracentral          | $\mathbf{R}$            | 0.3936564 | 1.858558 | 1                       |
| posteriorcingulate       | L     | precuneus            | L                       | 0.4330005 | 2.778737 | 1                       |
| precentral               | L     | precentral           | L                       | 0.5335484 | 2.741982 | 1                       |
| precuneus                | L     | precuneus            | L                       | 0.5628855 | 2.676845 | 1                       |
| rostralanteriorcingulate | L     | paracentral          | $\mathbf{R}$            | 0.3282748 | 1.858962 | 1                       |
| rostralmiddlefrontal     | L     | rostralmiddlefrontal | L                       | 0.5356709 | 2.496351 | 1                       |
| superiorfrontal          | L     | superiorfrontal      | L                       | 0.5081856 | 2.296326 | 1                       |
| superiorparietal         | L     | precuneus            | $\mathbf{R}$            | 0.4893038 | 2.245373 | 1                       |
| superiortemporal         | L     | superiortemporal     | $\mathbf{R}$            | 0.5918975 | 2.419736 | 1                       |
| supramarginal            | L     | supramarginal        | L                       | 0.5255745 | 2.476912 | 1                       |
| frontalpole              | L     | rostralmiddlefrontal | L                       | 0.3984708 | 2.361904 | 1                       |
| temporalpole             | L     | superiortemporal     | $\mathbf{R}$            | 0.5538200 | 2.206248 | 1                       |
| transversetemporal       | L     | transversetemporal   | L                       | 0.4471937 | 2.154728 | 1                       |
| insula                   | L     | insula               | L                       | 0.4668492 | 2.384627 | 1                       |
| bankssts                 | R     | supramarginal        | $\mathbf{R}$            | 0.4088876 | 1.889233 | 1                       |
| caudalanteriorcingulate  | R     | paracentral          | L                       | 0.2846817 | 2.587334 | 1                       |
| caudalmiddlefrontal      | R     | superiorfrontal      | L                       | 0.3926259 | 1.970193 | 1                       |
| cuneus                   | R     | cuneus               | $\overline{\mathrm{R}}$ | 0.4850643 | 2.812434 | 1                       |
| entorhinal               | R     | superiortemporal     | R                       | 0.4722043 | 2.010530 | 1                       |
| fusiform                 | R     | superiortemporal     | R                       | 0.4498609 | 1.795398 | 1                       |
|                          | R     | precuneus            | R                       | 0.4324786 | 2.014803 | 1                       |

| region1                   | hemi1        | region_ants                       | hemi_ants    | rho       | popZ     | rankZ |
|---------------------------|--------------|-----------------------------------|--------------|-----------|----------|-------|
| inferiortemporal          | R            | superiortemporal                  | R            | 0.4879529 | 2.149333 | 1     |
| isthmuscingulate          | R            | precuneus                         | ${ m L}$     | 0.3964581 | 2.795535 | 1     |
| lateraloccipital          | R            | cuneus                            | R            | 0.4489967 | 2.463374 | 1     |
| lateralorbitofrontal      | R            | lateralorbitofrontal              | R            | 0.4894783 | 2.527760 | 1     |
| lingual                   | $\mathbf{R}$ | cuneus                            | R            | 0.4272672 | 2.390289 | 1     |
| medialorbitofrontal       | R            | rostralanterior cingulate         | $\mathbf{L}$ | 0.3281812 | 1.836317 | 1     |
| middletemporal            | R            | middletemporal                    | R            | 0.5375897 | 2.636671 | 1     |
| parahippocampal           | R            | parahippocampal                   | R            | 0.5260459 | 2.628990 | 1     |
| paracentral               | R            | paracentral                       | R            | 0.5472166 | 2.918960 | 1     |
| parsopercularis           | R            | parsopercularis                   | R            | 0.4625236 | 2.259382 | 1     |
| parsorbitalis             | R            | parstriangularis                  | R            | 0.4875493 | 2.416698 | 1     |
| parstriangularis          | R            | parstriangularis                  | R            | 0.5443982 | 2.679498 | 1     |
| pericalcarine             | R            | pericalcarine                     | R            | 0.3963888 | 2.772297 | 1     |
| postcentral               | R            | postcentral                       | R            | 0.3530563 | 1.896865 | 1     |
| posteriorcingulate        | R            | precuneus                         | R            | 0.3909741 | 2.984256 | 1     |
| precentral                | R            | precentral                        | R            | 0.4659028 | 2.593276 | 1     |
| precuneus                 | R            | precuneus                         | R            | 0.5123514 | 2.694058 | 1     |
| rostralanterior cingulate | R            | rostralanterior cingulate         | R            | 0.3510545 | 2.363414 | 1     |
| rostralmiddle frontal     | R            | rostralmiddle frontal             | R            | 0.5073621 | 2.517075 | 1     |
| superiorfrontal           | R            | superiorfrontal                   | R            | 0.5030256 | 2.380778 | 1     |
| superiorparietal          | R            | precuneus                         | R            | 0.4738715 | 2.479219 | 1     |
| superiortemporal          | R            | $\operatorname{superiortemporal}$ | R            | 0.5911591 | 2.519292 | 1     |
| supramarginal             | R            | supramarginal                     | R            | 0.5031457 | 2.457715 | 1     |
| frontalpole               | R            | superiorfrontal                   | R            | 0.3597933 | 2.212083 | 1     |
| temporalpole              | $\mathbf{R}$ | superiortemporal                  | R            | 0.5439934 | 2.309225 | 1     |
| transversetemporal        | R            | parsopercularis                   | R            | 0.4126603 | 2.094183 | 1     |
| insula                    | R            | insula                            | R            | 0.4777559 | 2.592325 | 1     |

```
ants_fs5.3 = merge(ants, fs5.3, by.x = 'Code', by.y = 'SubjID', suffixes = c('ants','_fs5.1'))
cor5.3toants <- cor(select(ants_fs5.3, starts_with('left'), starts_with('right')), select(ants_fs5.3, st
## Warning in cor(select(ants_fs5.3, starts_with("left"),
## starts with("right")), : the standard deviation is zero
fsdf <- as.data.frame(cor5.3toants)</pre>
fsdf$ants_var <- row.names(fsdf)</pre>
fs_g <- gather(fsdf, fs5.3_var, rho, -ants_var)</pre>
df <- fs_g %>%
  separate(fs5.3_var, c("hemi3","stuff"), sep = '_', extra = "merge", fill = "left") %>%
separate(stuff, c("region3","version3"), sep = '_', extra = "merge", fill = "right") %>%
  separate(ants_var, c("hemi_a","stuff"), sep = '\\.', extra = "merge", fill = "left")
df$region_ants <- gsub('\\.','',df$stuff)</pre>
df$hemi_ants <- NA
df$hemi_ants[df$hemi_a == "left"] <- "L"</pre>
df$hemi_ants[df$hemi_a == "right"] <- "R"</pre>
df$roipair <- NA
df$roipair[df$hemi3==df$hemi_ants & df$region3==df$region_ants] <- "same"</pre>
```

Table 6: Comparison of Freesurfer 5.3 to ANTS

| region3         hemi3         rho         popZ         rankZ           caudalanteriorcingulate         L         0.2094435         1.4826871         0.9090909           caudalmiddlefrontal         L         0.5395686         2.3576352         1.0000000           cuneus         L         0.5741928         2.8895465         1.0000000           entorhinal         L         0.3845368         1.5265038         0.9545455           fusiform         L         0.3657561         0.4697851         0.6931818           inferiorparietal         L         0.5047017         2.0115307         1.0000000           inferiortemporal         L         0.3388892         0.2561540         0.6250000           isthmuscingulate         L         0.3054623         1.7887582         0.8977273           lateraloccipital         L         0.3577505         1.0381530         0.8181818           lateralorbitofrontal         L         0.4602697         1.7778615         0.9772727           lateralorbitofrontal         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.5491394         2.1714234         0.9886364           parashippocampal         L         0.62  |                            | 1 10         |           |           |           |
|--|----------------------------|--------------|-----------|-----------|-----------|
| caudalmiddlefrontal         L         0.5395686         2.3576352         1.0000000           cuneus         L         0.5741928         2.8895465         1.0000000           entorhinal         L         0.3845368         1.5265038         0.9545455           fusiform         L         0.3657561         0.4697851         0.6931818           inferiorparietal         L         0.5047017         2.0115307         1.000000           inferiortemporal         L         0.3388892         0.2561540         0.6250000           isthmuscingulate         L         0.3054623         1.7887582         0.8977273           lateralociptid         L         0.3577505         1.0381530         0.8181818           lateralorbitofrontal         L         0.4602697         1.7778615         0.9772727           lingual         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.5491344         2.1714234         0.9886364           parachippocampal         L         0.6085769         2.8309325         1.000000           paracentral         L         0.6085769<  | region3                    | hemi3        | rho       | popZ      | rankZ     |
| cuneus         L         0.5741928         2.8895465         1.000000           entorhinal         L         0.3845368         1.5265038         0.9545455           fusiform         L         0.3657561         0.4697851         0.6931818           inferiorparietal         L         0.5047017         2.0115307         1.0000000           inferiortemporal         L         0.3388892         0.2561540         0.6250000           isthmuscingulate         L         0.3054623         1.7887582         0.8977273           lateraloccipital         L         0.3577505         1.0381530         0.8181818           lateralorbitofrontal         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.3088465         1.2860036         0.9990909           middletemporal         L         0.5491394         2.1714234         0.9886364           parahippocampal         L         0.6272843         4.020884         1.000000           paracentral         L         0.6085769         2.8309325         1.0000000           parsorbitalis         L         0.5183139  | cauda la nterior cingulate | L            | 0.2094435 | 1.4826871 | 0.9090909 |
| entorhinal L 0.3845368 1.5265038 0.9545455 fusiform L 0.3657561 0.4697851 0.6931818 inferiorparietal L 0.5047017 2.0115307 1.0000000 inferiortemporal L 0.3388892 0.2561540 0.6250000 isthmuscingulate L 0.3388892 0.2561540 0.6250000 isthmuscingulate L 0.3577505 1.0381530 0.8181818 lateralocipital L 0.4602697 1.7778615 0.9772727 lingual L 0.4956377 2.0726760 0.95454555 medialorbitofrontal L 0.4956377 2.0726760 0.95454555 medialorbitofrontal L 0.5491394 2.1714234 0.9886364 parahippocampal L 0.5491394 2.1714234 0.9886364 parahippocampal L 0.6272843 4.0208884 1.0000000 paracentral L 0.6085769 2.8309325 1.0000000 paracentral L 0.5183139 1.9520872 0.9772727 parsorbitalis L 0.5183139 1.9520872 0.9772727 parstriangularis L 0.5669626 2.5643830 1.0000000 postcentral L 0.4773544 1.8706944 0.9772727 posteriorcingulate L 0.4772065 1.9502265 0.9772727 posteriorcingulate L 0.4772065 1.9502265 0.9772727 posteriorcingulate L 0.5872341 2.5083745 1.0000000 precuneus L 0.5872341 2.5083745 1.0000000 rostralanteriorcingulate L 0.2091735 0.7429913 0.7500000 rostralmiddlefrontal L 0.5896913 2.4927402 1.0000000 superiorparietal L 0.4426648 1.6484566 0.9204545 superiorparietal L 0.4426648 1.6484566 0.9204545 superiortemporal L 0.4426648 1.6484566 0.9204545 superiortemporal L 0.4426648 1.6484566 0.9204545 superiortemporal L 0.4426648 1.6484560 0.9204545 superiortemporal R 0.4667614 1.7322132 0.9545455 superiortempo | caudal middle front al     | ${ m L}$     | 0.5395686 | 2.3576352 | 1.0000000 |
| fusiform         L         0.3657561         0.4697851         0.6931818           inferiorparietal         L         0.5047017         2.0115307         1.0000000           inferiortemporal         L         0.3388892         0.2561540         0.6250000           isthmuscingulate         L         0.3354623         1.7887582         0.8977273           lateralocipital         L         0.3577505         1.0381530         0.8181818           lateralorbitofrontal         L         0.4602697         1.7778615         0.9772727           lingual         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.3088465         1.2860036         0.990909           middletemporal         L         0.5491394         2.1714234         0.9886364           parahippocampal         L         0.6272843         4.0208884         1.0000000           parsopercularis         L         0.6085769         2.8309325         1.0000000           parsorbitalis         L         0.4773544         1.8706944         0.9772727           parsorbitalis         L         0.4569626         2.5643830         1.0000000           pericalcarine         L         0.4569  | cuneus                     | ${ m L}$     | 0.5741928 | 2.8895465 | 1.0000000 |
| inferiorparietal         L         0.5047017         2.0115307         1.0000000           inferiortemporal         L         0.3388892         0.2561540         0.6250000           isthmuscingulate         L         0.3354623         1.7887582         0.8977273           lateralocipital         L         0.3577505         1.0381530         0.8181818           lateralorbitofrontal         L         0.4602697         1.7778615         0.9772727           lingual         L         0.4956377         2.0726760         0.9545455           medialorbitofrontal         L         0.3088465         1.2860036         0.9090909           middletemporal         L         0.5491394         2.1714234         0.9886364           parahippocampal         L         0.6272843         4.020884         1.0000000           paracentral         L         0.6272843         4.020884         1.0000000           parsopercularis         L         0.5183139         1.9520872         0.9772727           parsorbitalis         L         0.4773544         1.8706944         0.9772727           parstriangularis         L         0.4654477         2.6585260         1.0000000           pericalcarine         L         0  | entorhinal                 | ${ m L}$     | 0.3845368 | 1.5265038 | 0.9545455 |
| inferiortemporal L 0.3388892 0.2561540 0.6250000 isthmuscingulate L 0.3054623 1.7887582 0.8977273 lateraloccipital L 0.3577505 1.0381530 0.8181818 lateralorbitofrontal L 0.4602697 1.7778615 0.9772727 lingual L 0.4956377 2.0726760 0.9545455 medialorbitofrontal L 0.3088465 1.2860036 0.9090909 middletemporal L 0.5491394 2.1714234 0.9886364 parahippocampal L 0.6272843 4.0208884 1.0000000 paracentral L 0.6085769 2.8309325 1.0000000 parsopercularis L 0.5183139 1.9520872 0.9772727 parsorbitalis L 0.44773544 1.8706944 0.9772727 parstriangularis L 0.5669626 2.5643830 1.0000000 pericalcarine L 0.4654477 2.6585260 1.0000000 postcentral L 0.4772065 1.9502265 0.9772727 posteriorcingulate L 0.5913266 2.7822125 1.0000000 precuneus L 0.5872341 2.5083745 1.0000000 precuneus L 0.5872341 2.5083745 1.0000000 superiorfrontal L 0.5896913 2.4927402 1.0000000 superiorparietal L 0.442648 1.6484566 0.9204545 superiorparietal L 0.442648 1.6484566 0.9204545 superiorparietal L 0.442648 1.6484566 0.9204545 superiorparietal L 0.4434101 1.9461312 1.0000000 transversetemporal L 0.4434101 1.9461312 1.0000000 insula L 0.4565778 1.9485829 0.9772727 caudalanteriorcingulate R 0.1871205 1.5296639 0.9431818 caudalmiddlefrontal R 0.4067614 1.7322132 0.9545455 cuneus R 0.5970522 2.9111149 1.0000000 entorhinal R 0.3557165 1.3062621 0.8863636   | fusiform                   | ${ m L}$     | 0.3657561 | 0.4697851 | 0.6931818 |
| isthmuscingulate L 0.3054623 1.7887582 0.8977273 lateraloccipital L 0.3577505 1.0381530 0.8181818 lateralorbitofrontal L 0.4602697 1.7778615 0.9772727 lingual L 0.4956377 2.0726760 0.95454555 medialorbitofrontal L 0.3088465 1.2860036 0.9090909 middletemporal L 0.5491394 2.1714234 0.9886364 parahippocampal L 0.6272843 4.0208884 1.0000000 paracentral L 0.6085769 2.8309325 1.0000000 parsopercularis L 0.5183139 1.9520872 0.9772727 parsorbitalis L 0.4773544 1.8706944 0.9772727 parstriangularis L 0.5669626 2.5643830 1.0000000 postcentral L 0.4654477 2.6585260 1.0000000 postcentral L 0.4772065 1.9502265 0.9772727 posteriorcingulate L 0.2792080 1.3557587 0.8863636 precentral L 0.5872341 2.5083745 1.0000000 rostralanteriorcingulate L 0.2891735 0.7429913 0.7500000 rostralmiddlefrontal L 0.5896913 2.4927402 1.0000000 superiorparietal L 0.4426648 1.6484566 0.9204545 superiortemporal L 0.4434101 1.9461312 1.0000000 transversetemporal L 0.4434101 1.9461312 1.0000000 insula L 0.4565778 1.9485829 0.9772727 caudalanteriorcingulate R 0.4067614 1.7322132 0.9545455 cuneus R 0.5970522 2.9111149 1.0000000 entorhinal R 0.3557165 1.3062621 0.8863636  | inferiorparietal           | ${ m L}$     | 0.5047017 | 2.0115307 | 1.0000000 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | inferiortemporal           | ${ m L}$     | 0.3388892 | 0.2561540 | 0.6250000 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | isthmuscingulate           | ${ m L}$     | 0.3054623 | 1.7887582 | 0.8977273 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | lateraloccipital           | L            | 0.3577505 | 1.0381530 | 0.8181818 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | lateralorbitofrontal       | L            | 0.4602697 | 1.7778615 | 0.9772727 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | lingual                    | L            | 0.4956377 | 2.0726760 | 0.9545455 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | medialorbitofrontal        | L            | 0.3088465 | 1.2860036 | 0.9090909 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | middletemporal             | ${ m L}$     | 0.5491394 | 2.1714234 | 0.9886364 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | parahippocampal            | ${ m L}$     | 0.6272843 | 4.0208884 | 1.0000000 |
| parsorbitalis L 0.4773544 1.8706944 0.9772727 parstriangularis L 0.5669626 2.5643830 1.0000000 pericalcarine L 0.4654477 2.6585260 1.0000000 postcentral L 0.4772065 1.9502265 0.9772727 posteriorcingulate L 0.2792080 1.3557587 0.8863636 precentral L 0.5913266 2.7822125 1.0000000 precuneus L 0.5872341 2.5083745 1.0000000 rostralanteriorcingulate L 0.2091735 0.7429913 0.7500000 rostralmiddlefrontal L 0.5896913 2.4927402 1.0000000 superiorfrontal L 0.5642336 2.1870985 1.0000000 superiorparietal L 0.4426648 1.6484566 0.9204545 superiortemporal L 0.6308561 2.3344741 0.9886364 supramarginal L 0.5722115 2.3757572 1.00000000 transversetemporal L 0.4434101 1.9461312 1.0000000 insula L 0.44565778 1.9485829 0.9772727 caudalanteriorcingulate R 0.1871205 1.5296639 0.9431818 caudalmiddlefrontal R 0.4067614 1.7322132 0.9545455 cuneus R 0.5970522 2.9111149 1.0000000 entorhinal R 0.3557165 1.3062621 0.8863636   | paracentral                | ${ m L}$     | 0.6085769 | 2.8309325 | 1.0000000 |
| parstriangularis         L         0.5669626         2.5643830         1.0000000           pericalcarine         L         0.4654477         2.6585260         1.0000000           postcentral         L         0.4772065         1.9502265         0.9772727           posteriorcingulate         L         0.2792080         1.3557587         0.8863636           precentral         L         0.5913266         2.7822125         1.0000000           precuneus         L         0.5872341         2.5083745         1.0000000           rostralanteriorcingulate         L         0.2091735         0.7429913         0.7500000           rostralmiddlefrontal         L         0.5896913         2.4927402         1.0000000           superiorfrontal         L         0.5642336         2.1870985         1.0000000           superiorparietal         L         0.4426648         1.6484566         0.9204545           superiortemporal         L         0.6308561         2.3344741         0.9886364           supramarginal         L         0.4434101         1.9461312         1.0000000           transversetemporal         L         0.44565778         1.9485829         0.9772727           caudalmiddlefrontal         R <td>parsopercularis</td> <td><math>{ m L}</math></td> <td>0.5183139</td> <td>1.9520872</td> <td>0.9772727</td>  | parsopercularis            | ${ m L}$     | 0.5183139 | 1.9520872 | 0.9772727 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | parsorbitalis              | ${ m L}$     | 0.4773544 | 1.8706944 | 0.9772727 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | parstriangularis           | ${ m L}$     | 0.5669626 | 2.5643830 | 1.0000000 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | pericalcarine              | ${ m L}$     | 0.4654477 | 2.6585260 | 1.0000000 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | postcentral                | ${ m L}$     | 0.4772065 | 1.9502265 | 0.9772727 |
| precuneus L 0.5872341 2.5083745 1.0000000 rostralanteriorcingulate L 0.2091735 0.7429913 0.7500000 rostralmiddlefrontal L 0.5896913 2.4927402 1.0000000 superiorfrontal L 0.5642336 2.1870985 1.0000000 superiorparietal L 0.4426648 1.6484566 0.9204545 superiortemporal L 0.6308561 2.3344741 0.9886364 supramarginal L 0.5722115 2.3757572 1.0000000 transversetemporal L 0.4434101 1.9461312 1.0000000 insula L 0.4565778 1.9485829 0.9772727 caudalanteriorcingulate R 0.1871205 1.5296639 0.9431818 caudalmiddlefrontal R 0.4067614 1.7322132 0.9545455 cuneus R 0.5970522 2.9111149 1.0000000 entorhinal R 0.3557165 1.3062621 0.8863636  | posteriorcingulate         | ${ m L}$     | 0.2792080 | 1.3557587 | 0.8863636 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | precentral                 | ${ m L}$     | 0.5913266 | 2.7822125 | 1.0000000 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | precuneus                  | ${ m L}$     | 0.5872341 | 2.5083745 | 1.0000000 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | rostralanterior cingulate  | L            | 0.2091735 | 0.7429913 | 0.7500000 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | rostralmiddle frontal      | L            | 0.5896913 | 2.4927402 | 1.0000000 |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | superiorfrontal            | L            | 0.5642336 | 2.1870985 | 1.0000000 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | superiorparietal           | L            | 0.4426648 | 1.6484566 | 0.9204545 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | superiortemporal           | L            | 0.6308561 | 2.3344741 | 0.9886364 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | supramarginal              | ${ m L}$     | 0.5722115 | 2.3757572 | 1.0000000 |
| caudalanteriorcingulate         R         0.1871205         1.5296639         0.9431818           caudalmiddlefrontal         R         0.4067614         1.7322132         0.9545455           cuneus         R         0.5970522         2.9111149         1.0000000           entorhinal         R         0.3557165         1.3062621         0.8863636  | transversetemporal         | ${ m L}$     | 0.4434101 | 1.9461312 | 1.0000000 |
| caudalmiddlefrontal         R         0.4067614         1.7322132         0.9545455           cuneus         R         0.5970522         2.9111149         1.0000000           entorhinal         R         0.3557165         1.3062621         0.8863636  | insula                     | L            | 0.4565778 | 1.9485829 | 0.9772727 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | caudalanteriorcingulate    | R            | 0.1871205 | 1.5296639 | 0.9431818 |
| entorhinal R $0.3557165$ $1.3062621$ $0.8863636$   | caudalmiddlefrontal        | R            | 0.4067614 | 1.7322132 | 0.9545455 |
|  | cuneus                     | R            | 0.5970522 | 2.9111149 | 1.0000000 |
| $ {\rm fusiform} \qquad {\rm R} \qquad 0.4733622  1.2382783  0.8863636 $   | entorhinal                 | R            | 0.3557165 | 1.3062621 | 0.8863636 |
|  | fusiform                   | $\mathbf{R}$ | 0.4733622 | 1.2382783 | 0.8863636 |

| region3                  | hemi3        | rho       | popZ      | rankZ     |
|--------------------------|--------------|-----------|-----------|-----------|
| inferiorparietal         | R            | 0.5209681 | 1.9821677 | 1.0000000 |
| inferiortemporal         | R            | 0.4100987 | 0.8529923 | 0.7840909 |
| isthmuscingulate         | $\mathbf{R}$ | 0.2543520 | 1.4211329 | 0.8750000 |
| lateraloccipital         | $\mathbf{R}$ | 0.4635403 | 1.7435956 | 0.9659091 |
| lateralorbitofrontal     | R            | 0.5930160 | 2.6338880 | 1.0000000 |
| lingual                  | $\mathbf{R}$ | 0.5095864 | 2.1716403 | 0.9886364 |
| medialorbitofrontal      | R            | 0.3780057 | 1.8924974 | 0.9886364 |
| middletemporal           | R            | 0.5957339 | 2.5073513 | 1.0000000 |
| parahippocampal          | $\mathbf{R}$ | 0.5918372 | 3.3394498 | 1.0000000 |
| paracentral              | $\mathbf{R}$ | 0.5843132 | 2.6061695 | 1.0000000 |
| parsopercularis          | R            | 0.4538626 | 1.9190202 | 0.9886364 |
| parsorbitalis            | $\mathbf{R}$ | 0.5251925 | 2.1964015 | 0.9886364 |
| parstriangularis         | $\mathbf{R}$ | 0.6093722 | 2.8031854 | 1.0000000 |
| pericalcarine            | $\mathbf{R}$ | 0.4469092 | 2.5896498 | 0.9886364 |
| postcentral              | $\mathbf{R}$ | 0.4770860 | 2.0360705 | 1.0000000 |
| posteriorcingulate       | $\mathbf{R}$ | 0.2569285 | 1.2563009 | 0.8750000 |
| precentral               | $\mathbf{R}$ | 0.5294188 | 2.4462003 | 0.9772727 |
| precuneus                | $\mathbf{R}$ | 0.5453160 | 2.2008551 | 1.0000000 |
| rostralanteriorcingulate | $\mathbf{R}$ | 0.3216031 | 2.6991847 | 1.0000000 |
| rostralmiddle frontal    | $\mathbf{R}$ | 0.5859909 | 2.6315610 | 1.0000000 |
| superiorfrontal          | $\mathbf{R}$ | 0.5782098 | 2.4003346 | 1.0000000 |
| superiorparietal         | $\mathbf{R}$ | 0.5172040 | 2.1841724 | 1.0000000 |
| superiortemporal         | $\mathbf{R}$ | 0.6743368 | 2.6822890 | 1.0000000 |
| supramarginal            | $\mathbf{R}$ | 0.5786078 | 2.3044839 | 1.0000000 |
| transversetemporal       | $\mathbf{R}$ | 0.4021224 | 1.9687978 | 1.0000000 |
| insula                   | R            | 0.4855564 | 1.9351831 | 0.9772727 |

Table 7: Summary of Freesurfer 5.3 to ANTS comparsion

| Mean      | Min       | Max       |
|-----------|-----------|-----------|
| 0.4743727 | 0.1871205 | 0.6743368 |

kable(select(filter(checks\_fs5.3ants,rankZ==1.0), region3, hemi3, region\_ants, hemi\_ants, rho, popZ, rankz==1.0)

Table 8: The most correlated region from ANTS for each ROI

| region3                 | hemi3 | region_ants         | hemi_ants    | rho       | popZ     | $\operatorname{rank} Z$ |
|-------------------------|-------|---------------------|--------------|-----------|----------|-------------------------|
| bankssts                | L     | middletemporal      | L            | 0.4724111 | 2.184197 | 1                       |
| caudalanteriorcingulate | L     | isthmuscingulate    | $\mathbf{R}$ | 0.3495686 | 2.892568 | 1                       |
| caudalmiddlefrontal     | L     | caudalmiddlefrontal | ${f L}$      | 0.5395686 | 2.357635 | 1                       |

| cuneus         L         cuneus         L         0.5741928         2.889546         1           cutorhinal         L         superiortemporal         R         0.4207837         1.88093         1           fusiorm         L         isthmuscingulate         L         0.5447787         1.8829333         1           inferiortemporal         L         superiortemporal         R         0.5569974         1.883948         1           inferioremporal         L         superiortemporal         R         0.5569974         1.883948         1           isthmuscingulate         L         precuneus         L         0.4261970         2.88766         1           lateralorbitofrontal         L         precuneus         R         0.5597914         2.474313         1           lingual         L         cuneus         R         0.5233440         2.276008         1           lingual         L         cuneus         R         0.5233440         2.287608         1           medialorbitofrontal         L         paratrippocampal         L         0.6972843         1         1           paratrippocampal         L         paratrippocampal         L         0.6563253         2.289444<   | region3                  | hemi3 | region_ants                    | hemi_        | _ants | rho       | popZ     | rankZ |
|--|--------------------------|-------|--------------------------------|--------------|-------|-----------|----------|-------|
| fusiform         L         ishmuscingulate         L         0.5447787         1.823733         1           inferiorparietal         L         inferiorparietal         L         0.5047017         2.011531         1           isthmuscingulate         L         superiortemporal         R         0.5569974         1.883948         1           lateralocipital         L         cuneus         R         0.5597914         2.474331         1           lateralorbitofrontal         L         parstriangularis         R         0.5233410         2.273608         1           lingual         L         cuneus         R         0.5233410         2.273608         1           medialorbitofrontal         L         inferiorparietal         L         0.3695105         1.782404         1           middletemporal         L         superiortemporal         L         0.5632533         2.298444         1           paracentral         L         paracentral         L         0.6085769         2.830932         1           paracentral         L         paratriangularis         L         0.6085769         2.830932         1           paracentral         L         paratriangularis         L         0  | cuneus                   | L     | cuneus                         | L            |       | 0.5741928 | 2.889546 | 1     |
| inferiorparietal         L         inferiorparietal         L         0.564971         2.011531         1           inferiortemporal         L         superiortemporal         R         0.5569974         2.88348         1           isthmuscingulate         L         precuneus         L         0.4261970         2.898766         1           lateralocipital         L         cuneus         R         0.5597914         2.474343         1           lateralocipitofrontal         L         cuneus         R         0.5293440         2.273608         1           medialorbitofrontal         L         cuneus         R         0.523340         2.273608         1           medialorbitofrontal         L         inferiorparietal         L         0.3695105         1.782404         1           middletemporal         L         superiortemporal         L         0.3695333         2.289444         1           paracentral         L         paratriangularis         L         0.6672533         2.289444         1           parsorbitalis         L         parstriangularis         L         0.567499         2.316024         1           parsorbitalis         L         parstriangularis         L  | entorhinal               | L     | superiortemporal               | $\mathbf{R}$ |       | 0.4207837 | 1.848093 | 1     |
| inferioriemporal         L         superiortemporal         R         0.5569974         1.883948         1           isthmuscingulate         L         precuneus         L         0.4261970         2.898766         I           lateralocipital         L         cuneus         R         0.5507914         2.47433         1           lingual         L         cuneus         R         0.523440         2.27668         1           medialorbitofrontal         L         inferiorparietal         L         0.3695105         1.782404         1           medialorbitofrontal         L         superiortemporal         L         0.3695105         1.782404         1           medialorbitofrontal         L         superiortemporal         L         0.3692533         2.289444         1           parabilipocampal         L         0.608769         2.830932         1           parachtral         L         0.608769         2.830932         1           parsorbtalis         L         parstriangularis         L         0.569662         2.564383         1           perscentral         L         parstriangularis         L         0.3696926         2.564383         1           posteriorin  | fusiform                 | L     | isthmuscingulate               | L            |       | 0.5447787 | 1.823733 | 1     |
| isthmuscingulate         L         precuneus         L         0.4261970         2.898766         1           lateralocipital         L         cuneus         R         0.5597914         2.474343         1           lateralorbitofrontal         L         cuneus         R         0.4806486         1.939587         1           lingual         L         cuneus         R         0.5233440         2.273608         1           medialorbitofrontal         L         inferiorparietal         L         0.5632533         2.289444         1           paracentral         L         parachippocampal         L         0.6672843         4.020888         1           paracentral         L         paracentral         L         0.667499         2.316024         1           parsopercularis         L         parstriangularis         L         0.567499         2.36092         1           parsopercularis         L         parstriangularis         L         0.5669602         2.564383         1           pericalcarine         L         pericalcarine         L         0.4654477         2.658526         1           posteriorcingulate         L         percentral         L         0.4773323  | inferiorparietal         | L     | inferiorparietal               | L            |       | 0.5047017 | 2.011531 | 1     |
| lateraloccipital   | inferiortemporal         | L     | superiortemporal               | $\mathbf{R}$ |       | 0.5569974 | 1.883948 | 1     |
| lateralorbitofrontal   | isthmuscingulate         | L     | precuneus                      | L            |       | 0.4261970 | 2.898766 | 1     |
| lingual         L         cuneus         R         0.5233440         2.273668         1           medialorbitofrontal         L         inferiorparietal         L         0.3095105         1.782404         1           middletemporal         L         0.6532533         2.289444         1           parabhippocampal         L         0.6672843         4.020888         1           parsopercularis         L         parstriangularis         L         0.5674499         2.330932         1           parsopercularis         L         parstriangularis         L         0.5674499         2.316024         1           parstriangularis         L         0.5676499         2.330932         1           parstriangularis         L         0.5676499         2.316024         1           percicalcarine         L         pericalcarine         L         0.4654477         2.658526         1           posterioringulate         L         percicalcarine         L         0.4934098         2.073555         1           posterioringulate         L         precuneus         L         0.4773323         2.952954         1           rostralmiddlefrontal         L         precuneus         L         <  | lateraloccipital         | L     | cuneus                         | $\mathbf{R}$ |       | 0.5597914 | 2.474343 | 1     |
| medialorbitofrontal         L         inferiorparietal         L         0.3695105         1.782404         1           middletemporal         L         superiortemporal         L         0.6632533         2.289444         1           parachippocampal         L         0.6272843         4.020888         1           paracentral         L         paracentral         L         0.66772843         4.020888         1           parsophitalis         L         parstriangularis         L         0.56674499         2.316024         1           parsophitalis         L         parstriangularis         L         0.5113004         2.124171         1           parstriangularis         L         0.5669626         2.564838         1           pericalcarine         L         pericalcarine         L         0.4654477         2.668826         1           postecentral         L         pericalcarine         L         0.4654477         2.668826         1           postecentral         L         percentral         L         0.4773323         2.952954         1           precentral         L         percentral         L         0.4773323         2.952954         1           precentral  | lateralorbitofrontal     | L     | parstriangularis               | $\mathbf{R}$ |       | 0.4806486 | 1.939587 | 1     |
| middletemporal         L         superiortemporal         L         0.6272843         2.289444         1           parahippocampal         L         parahippocampal         L         0.6272843         4.020888         1           paracentral         L         paracentral         L         0.6085769         2.830932         1           parsorbitalis         L         parstriangularis         L         0.566966         2.64383         1           pericalcarine         L         pericalcarine         L         0.4654477         2.658526         1           posterioringulate         L         percentral         R         0.4934098         2.073555         1           precentral         L         precentral         L         0.4773323         2.952954         1           precentral         L         precuneus         L         0.5872341         2.568374         1           precuneus         L         precuneus         L         0.5872341         2.568374         1           rostralmiddlefrontal         L         precuneus         L         0.5872341         2.568374         1           rostralmiddlefrontal         L         paracentral         L         0.569236  | lingual                  | L     | cuneus                         | $\mathbf{R}$ |       | 0.5233440 | 2.273608 | 1     |
| parahippocampal         L         parahippocampal         L         0.6272843         4.020888         1           paracentral         L         paracentral         L         0.6085769         2.830932         1           parsoporcularis         L         parstriangularis         L         0.5674499         2.316024         1           parsorbitalis         L         parstriangularis         L         0.5674499         2.316024         1           persorbitalis         L         parstriangularis         L         0.5669626         2.564383         1           percancarine         L         percialcarine         L         0.4654477         2.658526         1           postcentral         L         percuneus         L         0.473323         2.952954         1           postcentral         L         precuneus         L         0.473221         1           precuneus         L         precuneus         L         0.587231         2.508374         1           rostralmiddlefrontal         L         0.587231         2.250874         1         1           superiorfrontal         L         superiorfrontal         L         0.491974         1.99674         1      <  | medialorbitofrontal      | L     | inferiorparietal               | L            |       | 0.3695105 | 1.782404 | 1     |
| paracentral parsopercularis         L         paracentral parsopercularis         L         parstriangularis         L         0.5674499         2.316024         1           parsorbitalis         L         parstriangularis         L         0.56174499         2.316024         1           parstriangularis         L         0.5674499         2.316024         1           pericalcarine         L         0.5669626         2.564383         1           perculcarine         L         0.4664477         2.658526         1           postecinal         L         percuneus         L         0.4773323         2.952954         1           precuneus         L         0.572312         2.508374         1           precuneus         L         0.5872341         2.508374         1           rostralmiddlefrontal         L         precuneus         L         0.5872341         2.508374         1           rostralmiddlefrontal         L         precuneus         L         0.5896913         2.492740         1           superiorfontal         L         superiorfontal         L         0.564233         2.187098         1           superiortenporal         L         superiortemporal         R   | middletemporal           | L     | superiortemporal               | L            |       | 0.5632533 | 2.289444 | 1     |
| parsopercularis  | parahippocampal          | L     | parahippocampal                | L            |       | 0.6272843 | 4.020888 | 1     |
| parsorbitalis         L         parstriangularis         L         0.513004         2.124171         1           pericalcarine         L         pericalcarine         L         0.4669477         2.6584383         1           postcentral         L         pericalcarine         L         0.4664477         2.658526         1           postcentral         L         precuneus         L         0.4773323         2.952954         1           precuneus         L         precuneus         L         0.591326         2.782212         1           precuneus         L         precuneus         L         0.5872341         2.508374         1           rostralmidelferorial         L         precuneus         L         0.5872341         2.508374         1           rostralmiddlefrontal         L         precuneus         L         0.5896336         2.187098         1           superiorfontal         L         superiorfontal         L         0.5642333         2.92740         1           superiorfontal         L         superiorfontal         L         0.5642333         2.187088         1           superiorfontal         L         superiorfontal         R         0.6448259         <   | paracentral              | L     | paracentral                    | L            |       | 0.6085769 | 2.830932 | 1     |
| parsorbitalis         L         parstriangularis         L         0.513004         2.124171         1           pericalcarine         L         pericalcarine         L         0.4669477         2.6584383         1           postcentral         L         pericalcarine         L         0.4664477         2.658526         1           postcentral         L         precuneus         L         0.4773323         2.952954         1           precuneus         L         precuneus         L         0.591326         2.782212         1           precuneus         L         precuneus         L         0.5872341         2.508374         1           rostralmidelferorial         L         precuneus         L         0.5872341         2.508374         1           rostralmiddlefrontal         L         precuneus         L         0.5896336         2.187098         1           superiorfontal         L         superiorfontal         L         0.5642333         2.92740         1           superiorfontal         L         superiorfontal         L         0.5642333         2.187088         1           superiorfontal         L         superiorfontal         R         0.6448259         <   | parsopercularis          | L     | parstriangularis               | L            |       | 0.5674499 | 2.316024 | 1     |
| pericalcarine  | parsorbitalis            | L     |                                | L            |       | 0.5113004 | 2.124171 | 1     |
| postcentral         L         paracentral         R         0.4934098         2.073555         1           posteriorcingulate         L         precuneus         L         0.4773323         2.952954         1           precuneus         L         precuneus         L         0.5872341         2.508374         1           rostralanteriorcingulate         L         isthmuscingulate         L         0.3697407         2.546012         1           rostralmiddlefrontal         L         isthmuscingulate         L         0.3697407         2.546012         1           superiorfontal         L         superiorfontal         L         0.5896913         2.492740         1           superiorfontal         L         superiorfontal         L         0.5896913         2.492740         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           superiortemporal         L         supramarginal         L         0.5722115         2.375757         1           frontalpole         L         rostralmiddlefrontal         L         0.442829         2.457755         1           temporalpole         L         rostralmiddlefrontal  | parstriangularis         | L     | parstriangularis               | L            |       | 0.5669626 | 2.564383 | 1     |
| postcentral         L         paracentral         R         0.4934098         2.073555         1           posteriorcingulate         L         precuneus         L         0.4773323         2.952954         1           precuneus         L         precuneus         L         0.5872341         2.508374         1           rostralanteriorcingulate         L         isthmuscingulate         L         0.3697407         2.546012         1           rostralmiddlefrontal         L         isthmuscingulate         L         0.3697407         2.546012         1           superiorfontal         L         superiorfontal         L         0.5896913         2.492740         1           superiorfontal         L         superiorfontal         L         0.5896913         2.492740         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           superiortemporal         L         supramarginal         L         0.5722115         2.375757         1           frontalpole         L         rostralmiddlefrontal         L         0.442829         2.457755         1           temporalpole         L         rostralmiddlefrontal  | pericalcarine            | L     | pericalcarine                  | L            |       | 0.4654477 | 2.658526 | 1     |
| posteriorcingulate         L         precuneus         L         0.4773323         2.952954         1           precentral         L         precentral         L         0.5913266         2.782212         1           precuneus         L         precuneus         L         0.5872341         2.508374         1           rostralamidilefrontal         L         isthmuscingulate         L         0.3697407         2.546012         1           rostralmidilefrontal         L         0.5896913         2.492740         1         1           superiorfrontal         L         superiorfrontal         L         0.5642336         2.187098         1           superiortemporal corparietal         L         paracentral         L         0.494343         1.996974         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           superiortemporal         R         0.6722115         2.375757         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1 </td <td></td> <td>L</td> <td>paracentral</td> <td><math>\mathbf{R}</math></td> <td></td> <td>0.4934098</td> <td>2.073555</td> <td>1</td>           |                          | L     | paracentral                    | $\mathbf{R}$ |       | 0.4934098 | 2.073555 | 1     |
| precuneus         L         precuneus         L         0.5872341         2.508374         1           rostralanteriorcingulate         L         isthmuscingulate         L         0.3697407         2.546012         1           rostralmiddlefrontal         L         rostralmiddlefrontal         L         0.5896913         2.492740         1           superiorfrontal         L         superiorfrontal         L         0.5896913         2.492740         1           superiorfrontal         L         superiorfrontal         L         0.4919754         1.996974         1           superiortemporal         L         superiortemporal         R         0.648259         2.457755         1           superiortemporal         L         superiortemporal         R         0.648259         2.457755         1           frontalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         R         0.5058216         2.276729         1           transversetemporal         L         tisthmuscingulate         L         0.4434101         1.946131         1           transversetemporal         L   |                          | L     | precuneus                      | L            |       | 0.4773323 | 2.952954 | 1     |
| rostralanteriorcingulate   | precentral               | L     | precentral                     | L            |       | 0.5913266 | 2.782212 | 1     |
| rostralmiddlefrontal         L         rostralmiddlefrontal         L         0.5896913         2.492740         1           superiorfrontal         L         superiorfrontal         L         0.5642336         2.187098         1           superiorparietal         L         paracentral         L         0.4919754         1.996974         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           superiortemporal         L         superiortemporal         R         0.648259         2.457755         1           frontalpole         L         superiortemporal         R         0.5058216         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           temporalpole         L         transversetemporal         L         0.4474410         1.946131         1           temporalpole         L         transversetemporal         L         0.4478410         1.946131         1           temporal         R         0.4782472  | precuneus                | L     | precuneus                      | L            |       | 0.5872341 | 2.508374 | 1     |
| superiorfrontal         L         superiorfrontal         L         0.5642336         2.187098         1           superiorparietal         L         paracentral         L         0.4919754         1.996974         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           frontalpole         L         supramarginal         L         0.5722115         2.375757         1           frontalpole         L         superiortemporal         L         0.4029488         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.4718986         2.085660         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalmiddlefrontal         R         sithmuscingulate         R         0.2921776         2.743644         1           cuneus         R         cuneus         R         0.42  | rostralanteriorcingulate | L     |                                | L            |       | 0.3697407 | 2.546012 | 1     |
| superiorparietal         L         paracentral         L         0.4919754         1.996974         1           superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           supramarginal         L         supramarginal         L         0.5722115         2.375757         1           frontalpole         L         rostralmiddlefrontal         L         0.4029488         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.4718986         2.085660         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalanterioringulate         R         isthmuscingulate         R         0.2921776         2.743644         1           caudalamiddlefrontal         R         superiorfrontal         R         0.2921776         2.743644         1           caudalamiddlefrontal         R         superiortemporal <td>rostralmiddlefrontal</td> <td>L</td> <td>rostralmiddlefrontal</td> <td>L</td> <td></td> <td>0.5896913</td> <td>2.492740</td> <td>1</td> | rostralmiddlefrontal     | L     | rostralmiddlefrontal           | L            |       | 0.5896913 | 2.492740 | 1     |
| superiortemporal         L         superiortemporal         R         0.6448259         2.457755         1           supramarginal         L         supramarginal         L         0.5722115         2.375757         1           frontalpole         L         superiortemporal         L         0.4029488         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.4718986         2.085660         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalanteriorcingulate         R         isthmuscingulate         R         0.4286695         1.855999         1           caudalmiddlefrontal         R         superiorfrontal         L         0.4266695         1.855999         1           cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565 <td>superiorfrontal</td> <td>L</td> <td>superiorfrontal</td> <td>L</td> <td></td> <td>0.5642336</td> <td>2.187098</td> <td>1</td>                    | superiorfrontal          | L     | superiorfrontal                | L            |       | 0.5642336 | 2.187098 | 1     |
| supramarginal         L         supramarginal         L         0.5722115         2.375757         1           frontalpole         L         rostralmiddlefrontal         L         0.4029488         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.4718986         2.085660         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalmiddlefrontal         R         isthmuscingulate         R         0.2921776         2.743644         1           caudalmiddlefrontal         R         superiorfrontal         L         0.4266695         1.855999         1           cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5569576         1.877585         1<  | superiorparietal         | L     | paracentral                    | L            |       | 0.4919754 | 1.996974 | 1     |
| frontalpole         L         rostralmiddlefrontal         L         0.4029488         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.44782472         2.06666         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalmiddlefrontal         R         middletemporal         R         0.2921776         2.743644         1           caudalmiddlefrontal         R         superiorfrontal         R         0.9221776         2.743644         1           caudalmiddlefrontal         R         superiortemporal         R         0.5970522         2.911115         1           cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.5209681         1.   | superiortemporal         | L     | superiortemporal               | ${ m R}$     |       | 0.6448259 | 2.457755 | 1     |
| frontalpole         L         rostralmiddlefrontal         L         0.4029488         2.230908         1           temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.447886         2.085660         1           banksts         R         middletemporal         R         0.4582472         2.006067         1           caudalanteriorcingulate         R         middletemporal         R         0.2921776         2.743644         1           caudalanteriorcingulate         R         superiortemporal         R         0.2266695         1.855999         1           cuneus         R         cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.5569576         1.877855         1           fusiform         R         lingual         R <th< td=""><td>supramarginal</td><td>L</td><td>supramarginal</td><td>L</td><td></td><td>0.5722115</td><td>2.375757</td><td>1</td></th<>                            | supramarginal            | L     | supramarginal                  | L            |       | 0.5722115 | 2.375757 | 1     |
| temporalpole         L         superiortemporal         R         0.5058216         2.276729         1           transversetemporal         L         transversetemporal         L         0.4434101         1.946131         1           insula         L         isthmuscingulate         L         0.4718986         2.085660         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalanteriorcingulate         R         isthmuscingulate         R         0.2921776         2.743644         1           caudalmiddlefrontal         R         superiorfrontal         L         0.4266695         1.855999         1           cuneus         R         0.5970522         2.911115         1         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5509576         1.877585         1           inferiorparietal         R         0.5209681         1.982168         1           inferiorparietal         R         0.5209681         1.982168         1           inferiorparietal         R   |                          | L     | rostralmiddlefrontal           | L            |       | 0.4029488 | 2.230908 | 1     |
| insula         L         isthmuscingulate         L         0.4718986         2.085660         1           bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalanteriorcingulate         R         isthmuscingulate         R         0.2921776         2.743644         1           caudalmiddlefrontal         R         superiorfrontal         L         0.4266695         1.855999         1           cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5569576         1.877585         1           inferiorparietal         R         0.5209681         1.982168         1           inferiorparietal         R         0.5209681         1.982168         1           inferiortemporal         R         superiortemporal         R         0.5711545         2.100686         1           isthmuscingulate         R         precuneus         L         0.4164757         2.818605         1           lateralorciptial         R         cuneus   | temporalpole             | L     | superiortemporal               | $\mathbf{R}$ |       | 0.5058216 | 2.276729 | 1     |
| bankssts         R         middletemporal         R         0.4582472         2.006067         1           caudalanteriorcingulate         R         isthmuscingulate         R         0.2921776         2.743644         1           caudalmiddlefrontal         R         superiorfrontal         L         0.4266695         1.855999         1           cuneus         R         cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5569576         1.877585         1           inferiorparietal         R         inferiorparietal         R         0.5209681         1.982168         1           inferiorparietal         R         superiortemporal         R         0.5209681         1.982168         1           inferiorparietal         R         superiortemporal         R         0.5209681         1.982168         1           inferiorparietal         R         superiortemporal         R         0.5711545         2.100686         1           isthmuscingulate         R         precuneus         R <t< td=""><td>transversetemporal</td><td>L</td><td>transversetemporal</td><td>L</td><td></td><td>0.4434101</td><td>1.946131</td><td>1</td></t<>                   | transversetemporal       | L     | transversetemporal             | L            |       | 0.4434101 | 1.946131 | 1     |
| caudalanteriorcingulate         R         isthmuscingulate         R         0.2921776         2.743644         1           caudalmiddlefrontal         R         superiorfrontal         L         0.4266695         1.855999         1           cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5569576         1.877585         1           inferiorparietal         R         0.5209681         1.982168         1           inferiortemporal         R         0.5711545         2.100686         1           isthmuscingulate         R         precuneus         L         0.4146757         2.818605         1           lateralocipital         R         0.5696601         2.544479         1           lateralorbitofrontal         R         0.546  | insula                   | L     | isthmuscingulate               | L            |       | 0.4718986 | 2.085660 | 1     |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | bankssts                 | R     |                                | $\mathbf{R}$ |       | 0.4582472 | 2.006067 | 1     |
| cuneus         R         cuneus         R         0.5970522         2.911115         1           entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5569576         1.877585         1           inferiorparietal         R         0.5209681         1.982168         1           inferiorparietal         R         0.5920681         1         1           inferiorparietal         R         0.591068         1         1           isthmuscingulate         R         0.5696601         2.514479         1           lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cu  | caudalanteriorcingulate  | R     | isthmuscingulate               | $\mathbf{R}$ |       | 0.2921776 | 2.743644 | 1     |
| entorhinal         R         superiortemporal         R         0.4272084         1.931565         1           fusiform         R         lingual         R         0.5569576         1.877585         1           inferiorparietal         R         inferiorparietal         R         0.5209681         1.982168         1           inferiortemporal         R         superiortemporal         R         0.5711545         2.100686         1           isthmuscingulate         R         precuneus         L         0.4164757         2.818605         1           lateraloccipital         R         cuneus         R         0.5696601         2.544479         1           lateralorbitofrontal         R         lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5460055         2.450118         1           medialorbitofrontal         R         rostralmiddlefrontal         R         0.4148550         2.174570         1           middletemporal         R         parahippocampal         R         0.5918372         3.339450         1           paracentral         R         paracentral         R         0.58  | caudalmiddlefrontal      | R     | superiorfrontal                | L            |       | 0.4266695 | 1.855999 | 1     |
| fusiform         R         lingual         R         0.5569576         1.877585         1           inferiorparietal         R         inferiorparietal         R         0.5209681         1.982168         1           inferiortemporal         R         superiortemporal         R         0.5711545         2.100686         1           isthmuscingulate         R         precuneus         L         0.4164757         2.818605         1           lateraloccipital         R         cuneus         R         0.5696601         2.544479         1           lateralorbitofrontal         R         lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5460055         2.450118         1           medialorbitofrontal         R         cuneus         R         0.4148550         2.174570         1           middletemporal         R         middletemporal         R         0.5957339         2.507351         1           parahippocampal         R         paracentral         R         0.5918372         3.339450         1           parsopercularis         R         parstriangularis         R         0.5001274<  | cuneus                   | R     | cuneus                         | $\mathbf{R}$ |       | 0.5970522 | 2.911115 | 1     |
| inferiorparietal         R         inferiorparietal         R         0.5209681         1.982168         1           inferiortemporal         R         superiortemporal         R         0.5711545         2.100686         1           isthmuscingulate         R         precuneus         L         0.4164757         2.818605         1           lateraloccipital         R         cuneus         R         0.5696601         2.544479         1           lateralorbitofrontal         R         lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5460055         2.450118         1           medialorbitofrontal         R         rostralmiddlefrontal         R         0.4148550         2.174570         1           middletemporal         R         middletemporal         R         0.5957339         2.507351         1           paracentral         R         paracentral         R         0.5843132   | entorhinal               | R     | superiortemporal               | $\mathbf{R}$ |       | 0.4272084 | 1.931565 | 1     |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$   | fusiform                 | R     | lingual                        | $\mathbf{R}$ |       | 0.5569576 | 1.877585 | 1     |
| isthmuscingulate         R         precuneus         L         0.4164757         2.818605         1           lateraloccipital         R         cuneus         R         0.5696601         2.544479         1           lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5460055         2.450118         1           medialorbitofrontal         R         rostralmiddlefrontal         R         0.4148550         2.174570         1           middletemporal         R         middletemporal         R         0.5957339         2.507351         1           parahippocampal         R         parahippocampal         R         0.5918372         3.339450         1           paracentral         R         paracentral         R         0.5843132         2.606170         1           parsorbitalis         R         parstriangularis         R         0.5001274         2.290142         1           parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         0.4849361         2.878502         1   | inferiorparietal         | R     | inferiorparietal               | $\mathbf{R}$ |       | 0.5209681 | 1.982168 | 1     |
| lateraloccipital         R         cuneus         R         0.5696601         2.544479         1           lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5460055         2.450118         1           medialorbitofrontal         R         rostralmiddlefrontal         R         0.4148550         2.174570         1           middletemporal         R         middletemporal         R         0.5957339         2.507351         1           parahippocampal         R         parahippocampal         R         0.5918372         3.339450         1           paracentral         R         paracentral         R         0.5843132         2.606170         1           parsopercularis         R         parstriangularis         R         0.5001274         2.290142         1           parstriangularis         R         parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         pericalcarine         L         0.4849361         2.878502         1  | inferiortemporal         | R     | superiortemporal               | $\mathbf{R}$ |       | 0.5711545 | 2.100686 | 1     |
| lateralorbitofrontal         R         lateralorbitofrontal         R         0.5930160         2.633888         1           lingual         R         cuneus         R         0.5460055         2.450118         1           medialorbitofrontal         R         rostralmiddlefrontal         R         0.4148550         2.174570         1           middletemporal         R         middletemporal         R         0.5957339         2.507351         1           parahippocampal         R         parahippocampal         R         0.5918372         3.339450         1           paracentral         R         paracentral         R         0.5843132         2.606170         1           parsopercularis         R         parstriangularis         R         0.5001274         2.290142         1           parstriangularis         R         parstriangularis         R         0.5541109         2.418488         1           pericalcarine         R         pericalcarine         L         0.4849361         2.878502         1  | isthmuscingulate         | R     | precuneus                      | L            |       | 0.4164757 | 2.818605 | 1     |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  | lateraloccipital         | R     | cuneus                         | $\mathbf{R}$ |       | 0.5696601 | 2.544479 | 1     |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | lateralorbitofrontal     | R     | lateralorbitofrontal           | $\mathbf{R}$ |       | 0.5930160 | 2.633888 | 1     |
| middletemporal         R         middletemporal         R         0.5957339         2.507351         1           parahippocampal         R         parahippocampal         R         0.5918372         3.339450         1           paracentral         R         paracentral         R         0.5843132         2.606170         1           parsopercularis         R         parstriangularis         R         0.5001274         2.290142         1           parsorbitalis         R         parstriangularis         R         0.5541109         2.418488         1           parstriangularis         R         parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         pericalcarine         L         0.4849361         2.878502         1   | lingual                  | R     | cuneus                         | $\mathbf{R}$ |       | 0.5460055 | 2.450118 | 1     |
| parahippocampal         R         parahippocampal         R         0.5918372         3.339450         1           paracentral         R         paracentral         R         0.5843132         2.606170         1           parsopercularis         R         parstriangularis         R         0.5001274         2.290142         1           parsorbitalis         R         parstriangularis         R         0.5541109         2.418488         1           parstriangularis         R         parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         pericalcarine         L         0.4849361         2.878502         1  | medialorbitofrontal      | R     | ${\it rostral middle frontal}$ | $\mathbf{R}$ |       | 0.4148550 | 2.174570 | 1     |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  | middletemporal           | R     | middletemporal                 | $\mathbf{R}$ |       | 0.5957339 | 2.507351 | 1     |
| parsopercularis         R         parstriangularis         R         0.5001274         2.290142         1           parsorbitalis         R         parstriangularis         R         0.5541109         2.418488         1           parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         0.4849361         2.878502         1   |                          | R     | parahippocampal                | $\mathbf{R}$ |       | 0.5918372 | 3.339450 | 1     |
| parsopercularis         R         parstriangularis         R         0.5001274         2.290142         1           parsorbitalis         R         parstriangularis         R         0.5541109         2.418488         1           parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         0.4849361         2.878502         1   | paracentral              | R     | paracentral                    | $\mathbf{R}$ |       | 0.5843132 | 2.606170 | 1     |
| parstriangularis         R         parstriangularis         R         0.6093722         2.803185         1           pericalcarine         R         pericalcarine         L         0.4849361         2.878502         1  |                          |       | parstriangularis               | $\mathbf{R}$ |       | 0.5001274 | 2.290142 | 1     |
| pericalcarine R pericalcarine L 0.4849361 2.878502 1   | parsorbitalis            |       | parstriangularis               | $\mathbf{R}$ |       | 0.5541109 | 2.418488 | 1     |
|  |                          | R     |                                | $\mathbf{R}$ |       | 0.6093722 | 2.803185 | 1     |
| postcentral R postcentral R $0.4770860$ $2.036071$ 1   | pericalcarine            |       | pericalcarine                  |              |       | 0.4849361 | 2.878502 | 1     |
|  | postcentral              | R     | postcentral                    | $\mathbf{R}$ |       | 0.4770860 | 2.036071 | 1     |

| region3                   | hemi3 | region_ants                       | hemi_ants | rho       | popZ     | rankZ |
|---------------------------|-------|-----------------------------------|-----------|-----------|----------|-------|
| posteriorcingulate        | R     | precuneus                         | L         | 0.4463705 | 2.850497 | 1     |
| precentral                | R     | paracentral                       | R         | 0.5371172 | 2.508815 | 1     |
| precuneus                 | R     | precuneus                         | R         | 0.5453160 | 2.200855 | 1     |
| rostralanterior cingulate | R     | rostralanteriorcingulate          | R         | 0.3216031 | 2.699185 | 1     |
| rostralmiddle frontal     | R     | rostralmiddle frontal             | R         | 0.5859909 | 2.631561 | 1     |
| superiorfrontal           | R     | superiorfrontal                   | R         | 0.5782098 | 2.400335 | 1     |
| superiorparietal          | R     | superiorparietal                  | R         | 0.5172040 | 2.184172 | 1     |
| superiortemporal          | R     | $\operatorname{superiortemporal}$ | R         | 0.6743368 | 2.682289 | 1     |
| supramarginal             | R     | supramarginal                     | R         | 0.5786078 | 2.304484 | 1     |
| frontalpole               | R     | superiorfrontal                   | R         | 0.3501968 | 2.054076 | 1     |
| temporalpole              | R     | $\operatorname{superiortemporal}$ | R         | 0.4892664 | 2.288988 | 1     |
| transversetemporal        | R     | transversetemporal                | R         | 0.4021224 | 1.968798 | 1     |
| insula                    | R     | isthmuscingulate                  | L         | 0.5303494 | 2.314678 | 1     |