MRI Data for Alzheimer's

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Install Packages

```
```

Import Dataset

```
mydata<-select(mydata,-c(M.F,Hand,Educ,SES,ASF,Delay))
row.has.na <- apply(mydata, 1, function(x){any(is.na(x))})
sum(row.has.na)
```

```
## [1] 201
```

```
final.filtered <- mydata[!row.has.na,]
final.filtered
```

```
##                ID Age MMSE CDR eTIV  nWBV
## 1   OAS1_0001_MR1  74   29 0.0 1344 0.743
## 2   OAS1_0002_MR1  55   29 0.0 1147 0.810
## 3   OAS1_0003_MR1  73   27 0.5 1454 0.708
## 9   OAS1_0010_MR1  74   30 0.0 1636 0.689
## 10  OAS1_0011_MR1  52   30 0.0 1321 0.827
## 12  OAS1_0013_MR1  81   30 0.0 1664 0.679
## 14  OAS1_0015_MR1  76   28 0.5 1738 0.719
## 15  OAS1_0016_MR1  82   27 0.5 1477 0.739
## 17  OAS1_0018_MR1  39   28 0.0 1636 0.813
## 18  OAS1_0019_MR1  89   30 0.0 1536 0.715
## 19  OAS1_0020_MR1  48   29 0.0 1326 0.785
## 20  OAS1_0021_MR1  80   23 0.5 1794 0.765
## 21  OAS1_0022_MR1  69   23 0.5 1447 0.757
## 22  OAS1_0023_MR1  82   27 0.5 1420 0.710
## 24  OAS1_0026_MR1  58   30 0.0 1235 0.820
## 26  OAS1_0028_MR1  86   27 1.0 1449 0.738
## 28  OAS1_0030_MR1  65   29 0.0 1392 0.764
## 29  OAS1_0031_MR1  88   26 1.0 1419 0.674
## 30  OAS1_0032_MR1  89   28 0.0 1631 0.682
## 31  OAS1_0033_MR1  80   29 0.0 1323 0.735
## 32  OAS1_0034_MR1  51   29 0.0 1538 0.831
## 33  OAS1_0035_MR1  84   28 1.0 1402 0.695
## 36  OAS1_0039_MR1  70   29 0.5 1463 0.772
## 38  OAS1_0041_MR1  62   28 0.5 1350 0.758
## 39  OAS1_0042_MR1  80   29 0.5 1854 0.709
## 41  OAS1_0044_MR1  47   30 0.0 1346 0.829
## 43  OAS1_0046_MR1  64   22 0.5 1351 0.787
## 48  OAS1_0052_MR1  78   23 1.0 1462 0.697
## 49  OAS1_0053_MR1  83   21 1.0 1384 0.699
## 52  OAS1_0056_MR1  72   15 1.0 1324 0.668
## 54  OAS1_0058_MR1  46   30 0.0 1585 0.817
## 56  OAS1_0060_MR1  79   29 0.5 1564 0.734
## 58  OAS1_0062_MR1  73   30 0.0 1456 0.754
## 60  OAS1_0064_MR1  77   29 0.0 1583 0.767
## 61  OAS1_0065_MR1  90   25 0.0 1301 0.645
## 62  OAS1_0066_MR1  66   28 0.5 1309 0.765
## 63  OAS1_0067_MR1  71   27 1.0 1549 0.730
## 64  OAS1_0068_MR1  67   30 0.0 1508 0.805
## 65  OAS1_0069_MR1  33   30 0.0 1709 0.784
## 66  OAS1_0070_MR1  63   30 0.0 1327 0.801
## 67  OAS1_0071_MR1  49   30 0.0 1459 0.808
## 68  OAS1_0072_MR1  60   30 0.0 1402 0.823
## 69  OAS1_0073_MR1  69   21 1.0 1495 0.655
## 70  OAS1_0074_MR1  43   30 0.0 1547 0.847
## 71  OAS1_0075_MR1  83   30 0.0 1335 0.720
## 74  OAS1_0078_MR1  64   30 0.0 1395 0.809
## 78  OAS1_0082_MR1  75   28 0.5 1407 0.776
## 79  OAS1_0083_MR1  90   27 0.0 1200 0.727
## 80  OAS1_0084_MR1  81   27 0.5 1453 0.727
## 81  OAS1_0085_MR1  70   29 0.0 1283 0.791
## 82  OAS1_0086_MR1  47   30 0.0 1311 0.835
## 88  OAS1_0094_MR1  66   30 0.5 1447 0.772
```

```
## 90  OAS1_0096_MR1  47   29 0.0 1357 0.809
## 92  OAS1_0098_MR1  67   18 0.5 1653 0.693
## 99  OAS1_0106_MR1  81   30 0.0 1230 0.717
## 102 OAS1_0109_MR1  61   30 0.0 1313 0.813
## 103 OAS1_0110_MR1  84   28 0.0 1483 0.697
## 105 OAS1_0112_MR1  69   29 0.0 1536 0.733
## 106 OAS1_0113_MR1  83   29 0.0 1569 0.768
## 107 OAS1_0114_MR1  62   30 0.0 1378 0.804
## 108 OAS1_0115_MR1  72   26 0.5 1911 0.726
## 109 OAS1_0116_MR1  52   30 0.0 1373 0.784
## 112 OAS1_0120_MR1  70   26 0.5 1796 0.736
## 114 OAS1_0122_MR1  83   22 1.0 1377 0.715
## 115 OAS1_0123_MR1  83   24 0.5 1282 0.797
## 116 OAS1_0124_MR1  73   23 0.5 1661 0.709
## 121 OAS1_0130_MR1  68   26 0.0 1444 0.789
## 124 OAS1_0133_MR1  65   30 0.0 1277 0.814
## 125 OAS1_0134_MR1  80   20 1.0 1494 0.665
## 126 OAS1_0135_MR1  64   29 0.0 1561 0.801
## 128 OAS1_0137_MR1  87   22 1.0 1499 0.672
## 129 OAS1_0138_MR1  80   28 0.0 1689 0.706
## 130 OAS1_0139_MR1  72   28 0.0 1512 0.779
## 133 OAS1_0142_MR1  70   27 0.5 1581 0.695
## 134 OAS1_0143_MR1  66   30 0.5 1446 0.784
## 137 OAS1_0146_MR1  82   28 0.0 1513 0.742
## 144 OAS1_0155_MR1  71   28 0.5 1359 0.753
## 146 OAS1_0157_MR1  86   30 0.0 1293 0.756
## 147 OAS1_0158_MR1  81   26 0.5 1556 0.689
## 150 OAS1_0161_MR1  84   27 0.5 1390 0.727
## 153 OAS1_0164_MR1  81   28 0.5 1495 0.687
## 154 OAS1_0165_MR1  74   29 0.0 1395 0.787
## 155 OAS1_0166_MR1  80   27 0.5 1475 0.771
## 158 OAS1_0169_MR1  88   30 0.0 1445 0.718
## 159 OAS1_0170_MR1  71   29 0.0 1455 0.725
## 162 OAS1_0176_MR1  88   29 0.0 1398 0.712
## 163 OAS1_0177_MR1  54   30 0.0 1494 0.838
## 165 OAS1_0179_MR1  87   21 0.5 1250 0.653
## 166 OAS1_0180_MR1  80   30 0.0 1496 0.745
## 167 OAS1_0181_MR1  49   30 0.0 1316 0.820
## 170 OAS1_0184_MR1  65   16 1.0 1521 0.669
## 171 OAS1_0185_MR1  78   17 1.0 1314 0.739
## 172 OAS1_0186_MR1  84   29 0.0 1707 0.731
## 173 OAS1_0188_MR1  48   30 0.0 1464 0.790
## 179 OAS1_0195_MR1  76   28 0.0 1346 0.766
## 180 OAS1_0197_MR1  89   29 0.0 1154 0.747
## 182 OAS1_0199_MR1  69   30 0.0 1601 0.784
## 183 OAS1_0200_MR1  60   30 0.0 1366 0.807
## 184 OAS1_0201_MR1  85   26 0.0 1460 0.754
## 186 OAS1_0203_MR1  71   30 0.0 1360 0.779
## 187 OAS1_0204_MR1  48   29 0.0 1430 0.797
## 188 OAS1_0205_MR1  75   30 0.5 1891 0.716
## 189 OAS1_0206_MR1  78   30 0.0 1243 0.747
## 190 OAS1_0207_MR1  51   29 0.0 1714 0.819
## 191 OAS1_0208_MR1  55   29 0.0 1368 0.823
## 193 OAS1_0210_MR1  73   28 0.5 1676 0.722
```

```
## 195 OAS1_0212_MR1  74   28 0.0 1614 0.697
## 198 OAS1_0216_MR1  71   30 0.0 1503 0.792
## 199 OAS1_0217_MR1  78   27 0.5 1393 0.692
## 201 OAS1_0220_MR1  75   30 0.0 1317 0.742
## 202 OAS1_0221_MR1  94   29 0.0 1474 0.696
## 204 OAS1_0223_MR1  84   20 1.0 1641 0.703
## 206 OAS1_0226_MR1  90   23 0.5 1668 0.644
## 208 OAS1_0228_MR1  81   28 0.0 1486 0.759
## 209 OAS1_0229_MR1  55   30 0.0 1327 0.832
## 213 OAS1_0233_MR1  77   20 0.5 1376 0.701
## 214 OAS1_0234_MR1  75   29 0.0 1534 0.771
## 217 OAS1_0237_MR1  72   27 0.0 1322 0.764
## 218 OAS1_0238_MR1  77   28 0.5 1484 0.786
## 220 OAS1_0240_MR1  74   26 0.5 1171 0.736
## 221 OAS1_0241_MR1  74   30 0.0 1400 0.754
## 222 OAS1_0243_MR1  64   22 0.5 1547 0.742
## 223 OAS1_0244_MR1  80   29 0.0 1341 0.737
## 225 OAS1_0247_MR1  90   21 0.5 1307 0.689
## 229 OAS1_0254_MR1  85   29 0.0 1264 0.705
## 230 OAS1_0255_MR1  71   30 0.0 1426 0.737
## 231 OAS1_0256_MR1  70   30 0.0 1660 0.739
## 233 OAS1_0259_MR1  78   29 0.0 1334 0.773
## 234 OAS1_0260_MR1  87   30 0.0 1762 0.719
## 236 OAS1_0262_MR1  46   30 0.0 1604 0.784
## 237 OAS1_0263_MR1  79   30 0.5 1722 0.709
## 240 OAS1_0266_MR1  51   30 0.0 1793 0.834
## 241 OAS1_0267_MR1  80   28 0.5 1506 0.679
## 242 OAS1_0268_MR1  78   23 1.0 1491 0.715
## 243 OAS1_0269_MR1  72   21 1.0 1489 0.683
## 244 OAS1_0270_MR1  93   30 0.0 1272 0.703
## 245 OAS1_0271_MR1  89   27 0.0 1329 0.740
## 246 OAS1_0272_MR1  75   26 0.5 1355 0.745
## 247 OAS1_0273_MR1  89   18 0.5 1480 0.676
## 248 OAS1_0274_MR1  58   30 0.0 1373 0.815
## 251 OAS1_0278_MR1  96   26 1.0 1465 0.684
## 252 OAS1_0279_MR1  73   30 0.0 1475 0.721
## 253 OAS1_0280_MR1  78   30 0.0 1440 0.670
## 257 OAS1_0284_MR1  91   30 0.0 1714 0.746
## 259 OAS1_0286_MR1  83   20 0.5 1476 0.751
## 260 OAS1_0287_MR1  78   21 0.5 1194 0.694
## 261 OAS1_0288_MR1  71   20 0.5 1461 0.727
## 262 OAS1_0289_MR1  59   28 0.0 1334 0.767
## 263 OAS1_0290_MR1  83   26 0.5 1992 0.706
## 264 OAS1_0291_MR1  73   19 1.0 1274 0.745
## 265 OAS1_0292_MR1  64   30 0.0 1415 0.766
## 266 OAS1_0293_MR1  69   26 0.0 1384 0.783
## 270 OAS1_0298_MR1  72   24 0.5 1354 0.738
## 271 OAS1_0299_MR1  90   29 0.0 1475 0.671
## 272 OAS1_0300_MR1  68   30 0.5 1556 0.723
## 273 OAS1_0301_MR1  90   28 0.0 1495 0.761
## 275 OAS1_0303_MR1  67   30 0.0 1221 0.831
## 276 OAS1_0304_MR1  84   29 0.5 1497 0.693
## 278 OAS1_0307_MR1  67   23 0.5 1399 0.735
## 279 OAS1_0308_MR1  78   15 2.0 1401 0.703
```

```
## 280 OAS1_0309_MR1  54   30 0.0 1441 0.786
## 283 OAS1_0312_MR1  73   26 0.5 1311 0.756
## 286 OAS1_0315_MR1  77   25 0.5 1604 0.773
## 287 OAS1_0316_MR1  72   22 1.0 1493 0.690
## 288 OAS1_0317_MR1  86   26 0.0 1501 0.702
## 292 OAS1_0322_MR1  65   29 0.0 1335 0.776
## 293 OAS1_0323_MR1  50   30 0.0 1370 0.826
## 295 OAS1_0326_MR1  73   29 0.0 1272 0.700
## 298 OAS1_0329_MR1  80   29 0.5 1209 0.760
## 299 OAS1_0330_MR1  80   27 0.0 1381 0.752
## 301 OAS1_0332_MR1  72   29 0.0 1734 0.762
## 303 OAS1_0335_MR1  80   27 0.5 1654 0.678
## 305 OAS1_0337_MR1  81   28 0.0 1750 0.676
## 306 OAS1_0338_MR1  77   29 0.0 1818 0.736
## 307 OAS1_0339_MR1  79   24 0.5 1211 0.694
## 309 OAS1_0341_MR1  71   30 0.0 1479 0.772
## 310 OAS1_0342_MR1  88   28 0.0 1370 0.765
## 311 OAS1_0343_MR1  68   30 0.0 1441 0.811
## 313 OAS1_0345_MR1  54   30 0.0 1389 0.831
## 318 OAS1_0351_MR1  86   15 2.0 1512 0.665
## 319 OAS1_0352_MR1  81   26 0.5 1174 0.743
## 321 OAS1_0354_MR1  74   26 0.0 1367 0.776
## 322 OAS1_0355_MR1  73   29 0.0 1123 0.790
## 323 OAS1_0356_MR1  68   30 0.0 1506 0.740
## 324 OAS1_0357_MR1  55   30 0.0 1450 0.820
## 325 OAS1_0358_MR1  65   29 0.0 1362 0.839
## 328 OAS1_0362_MR1  63   14 0.5 1439 0.716
## 329 OAS1_0363_MR1  87   30 0.0 1398 0.702
## 330 OAS1_0365_MR1  74   30 0.0 1806 0.754
## 331 OAS1_0366_MR1  45   29 0.0 1549 0.813
## 332 OAS1_0367_MR1  46   28 0.0 1161 0.841
## 334 OAS1_0369_MR1  73   28 0.0 1295 0.772
## 336 OAS1_0371_MR1  70   30 0.0 1361 0.783
## 337 OAS1_0372_MR1  59   29 0.0 1596 0.817
## 338 OAS1_0373_MR1  80   20 1.0 1732 0.692
## 339 OAS1_0374_MR1  73   29 0.5 1238 0.760
## 343 OAS1_0378_MR1  58   30 0.0 1418 0.821
## 345 OAS1_0380_MR1  83   18 0.5 1313 0.705
## 346 OAS1_0381_MR1  59   29 0.0 1795 0.809
## 347 OAS1_0382_MR1  67   15 1.0 1288 0.763
## 353 OAS1_0388_MR1  77   22 1.0 1350 0.736
## 355 OAS1_0390_MR1  69   24 0.5 1480 0.794
## 361 OAS1_0398_MR1  71   30 0.0 1769 0.716
## 362 OAS1_0399_MR1  78   29 1.0 1569 0.706
## 363 OAS1_0400_MR1  92   25 0.5 1774 0.644
## 364 OAS1_0401_MR1  54   29 0.0 1287 0.827
## 365 OAS1_0402_MR1  76   30 0.5 1350 0.763
## 367 OAS1_0404_MR1  73   29 0.0 1465 0.776
## 368 OAS1_0405_MR1  77   23 1.0 1713 0.761
## 374 OAS1_0411_MR1  71   29 0.5 1346 0.742
## 379 OAS1_0418_MR1  74   28 0.5 1659 0.747
## 383 OAS1_0422_MR1  69   29 0.0 1380 0.809
## 384 OAS1_0423_MR1  75   28 0.0 1511 0.749
## 385 OAS1_0424_MR1  75   20 1.0 1613 0.715
```

```
## 386 OAS1_0425_MR1  78   23 1.0 1461 0.715
## 387 OAS1_0426_MR1  82   29 0.0 1316 0.791
## 388 OAS1_0428_MR1  84   28 0.0 1500 0.751
## 390 OAS1_0430_MR1  71   17 1.0 1562 0.687
## 392 OAS1_0432_MR1  72   26 0.5 1453 0.773
## 393 OAS1_0433_MR1  58   27 0.0 1606 0.779
## 397 OAS1_0438_MR1  66   29 0.0 1191 0.787
## 399 OAS1_0440_MR1  86   27 0.5 1320 0.723
## 400 OAS1_0441_MR1  81   29 0.5 1647 0.721
## 402 OAS1_0443_MR1  52   30 0.0 1431 0.814
## 404 OAS1_0445_MR1  90   29 0.0 1362 0.673
## 405 OAS1_0446_MR1  80   30 0.0 1390 0.748
## 406 OAS1_0447_MR1  92   24 0.5 1388 0.739
## 408 OAS1_0449_MR1  71   29 0.0 1264 0.818
## 410 OAS1_0451_MR1  73   27 0.5 1687 0.728
## 411 OAS1_0452_MR1  75   22 1.0 1656 0.762
## 412 OAS1_0453_MR1  70   29 0.5 1295 0.748
## 413 OAS1_0454_MR1  73   23 0.5 1536 0.730
## 414 OAS1_0455_MR1  61   28 0.0 1354 0.825
## 415 OAS1_0456_MR1  61   30 0.0 1637 0.780
## 416 OAS1_0457_MR1  62   26 0.0 1372 0.766
```

Two Groups

```
zero_group<-final.filtered[final.filtered$CDR == 0.0, ]
zero_group<-zero_group[2:31,]
nrow(zero_group)
```

```
## [1] 30
```

```
one_group<-final.filtered[final.filtered$CDR > 0.5, ]
one_group
```

```
##                ID Age MMSE CDR eTIV  nWBV
## 26  OAS1_0028_MR1  86   27   1 1449 0.738
## 29  OAS1_0031_MR1  88   26   1 1419 0.674
## 33  OAS1_0035_MR1  84   28   1 1402 0.695
## 48  OAS1_0052_MR1  78   23   1 1462 0.697
## 49  OAS1_0053_MR1  83   21   1 1384 0.699
## 52  OAS1_0056_MR1  72   15   1 1324 0.668
## 63  OAS1_0067_MR1  71   27   1 1549 0.730
## 69  OAS1_0073_MR1  69   21   1 1495 0.655
## 114 OAS1_0122_MR1  83   22   1 1377 0.715
## 125 OAS1_0134_MR1  80   20   1 1494 0.665
## 128 OAS1_0137_MR1  87   22   1 1499 0.672
## 170 OAS1_0184_MR1  65   16   1 1521 0.669
## 171 OAS1_0185_MR1  78   17   1 1314 0.739
## 204 OAS1_0223_MR1  84   20   1 1641 0.703
## 242 OAS1_0268_MR1  78   23   1 1491 0.715
## 243 OAS1_0269_MR1  72   21   1 1489 0.683
## 251 OAS1_0278_MR1  96   26   1 1465 0.684
## 264 OAS1_0291_MR1  73   19   1 1274 0.745
## 279 OAS1_0308_MR1  78   15   2 1401 0.703
## 287 OAS1_0316_MR1  72   22   1 1493 0.690
## 318 OAS1_0351_MR1  86   15   2 1512 0.665
## 338 OAS1_0373_MR1  80   20   1 1732 0.692
## 347 OAS1_0382_MR1  67   15   1 1288 0.763
## 353 OAS1_0388_MR1  77   22   1 1350 0.736
## 362 OAS1_0399_MR1  78   29   1 1569 0.706
## 368 OAS1_0405_MR1  77   23   1 1713 0.761
## 385 OAS1_0424_MR1  75   20   1 1613 0.715
## 386 OAS1_0425_MR1  78   23   1 1461 0.715
## 390 OAS1_0430_MR1  71   17   1 1562 0.687
## 411 OAS1_0452_MR1  75   22   1 1656 0.762
```

MMSE t test

```
mean(zero_group[["MMSE"]])
```

```
## [1] 29.33333
```

```
sd(zero_group[["MMSE"]])
```

```
## [1] 1.124441
```

```
t.test(zero_group$MMSE,y=NULL,alternative = c("greater"),mu=25)
```

```
##
##  One Sample t-test
##
## data:  zero_group$MMSE
## t = 21.108, df = 29, p-value < 2.2e-16
## alternative hypothesis: true mean is greater than 25
## 95 percent confidence interval:
##  28.98451      Inf
## sample estimates:
## mean of x
##  29.33333
```

```
mean(one_group[["MMSE"]])
```

```
## [1] 21.23333
```

```
t.test(one_group$MMSE,y=NULL,alternative = c("less"),mu=25)
```

```
##
##  One Sample t-test
##
## data:  one_group$MMSE
## t = -5.1612, df = 29, p-value = 8.102e-06
## alternative hypothesis: true mean is less than 25
## 95 percent confidence interval:
##      -Inf 22.47335
## sample estimates:
## mean of x
##  21.23333
```

eTIV t-test

```
t.test(zero_group$eTIV,y=NULL,alternative = c("less"),mu=1428)
```

```
##
##  One Sample t-test
##
## data:  zero_group$eTIV
## t = -0.14411, df = 29, p-value = 0.4432
## alternative hypothesis: true mean is less than 1428
## 95 percent confidence interval:
##     -Inf 1471.52
## sample estimates:
## mean of x
##  1423.967
```

```
t.test(one_group$eTIV,y=NULL,alternative = c("greater"),mu=1428)
```

```
##
##  One Sample t-test
##
## data:  one_group$eTIV
## t = 2.4191, df = 29, p-value = 0.01103
## alternative hypothesis: true mean is greater than 1428
## 95 percent confidence interval:
##  1443.466      Inf
## sample estimates:
## mean of x
##  1479.967
```

nWBV t-test

```
t.test(zero_group$nWBV,y=NULL,alternative = c("greater"),mu=0.745)
```

```
##
##  One Sample t-test
##
## data:  zero_group$nWBV
## t = 2.9366, df = 29, p-value = 0.003219
## alternative hypothesis: true mean is greater than 0.745
## 95 percent confidence interval:
##  0.7574734       Inf
## sample estimates:
## mean of x
##    0.7746
```

```
t.test(one_group$nWBV,y=NULL,alternative = c("less"),mu=0.745)
```

```
##
##  One Sample t-test
##
## data:  one_group$nWBV
## t = -7.1236, df = 29, p-value = 3.859e-08
## alternative hypothesis: true mean is less than 0.745
## 95 percent confidence interval:
##       -Inf 0.7143125
## sample estimates:
## mean of x
##    0.7047
```