Linear_analysis

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Linear analysis

This is the first approach to relate different variables of the HCHS dataset to the segregation of functional connectivity. Segregation relates connectivity within and between networks.

```
setwd("C:/Users/mschu/Documents/Documents/CSI/R-Skripte/")
```

```
HCHS = read.csv("C:/Users/mschu/Documents/Documents/CSI/R-Skripte/HCHS/HCHS_conn_0.5_aroma_gsr_abs.csv")
```

Packages needed
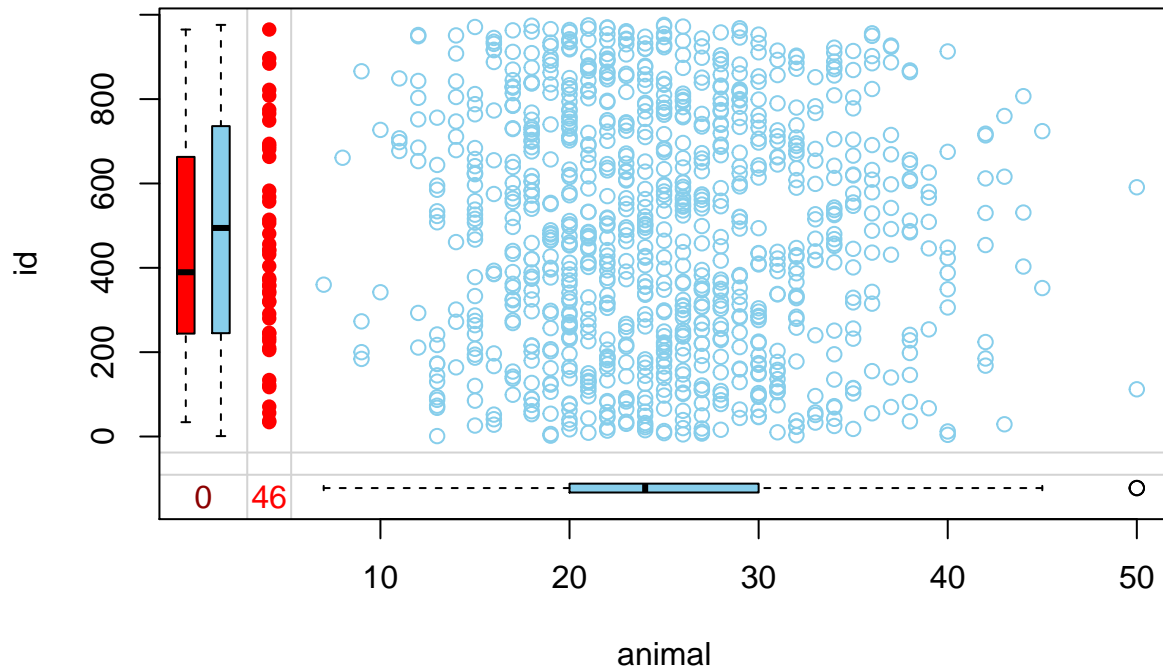
Summary of Data

Smoking into dummy variables

```
smoking = transform(HCHS$smoking,id=as.numeric(factor(HCHS$smoking)))
smoking = smoking$id
HCHS["smoking"] <- smoking
```

Round up years of Education

```
HCHS$education=round(HCHS$education)
```

Checking missing data (percentage)

```
marginplot(HCHS[c(16,1)])
```

constrained at plotting 2 variables at a time only. The red box plot on the left shows the distribution of varialbe one with variable two missing while the blue box plot shows the distribution of the remaining datapoints. Likewhise for the Ozone box plots at the bottom of the graph. If our assumption of MCAR data is correct, then we expect the red and blue box plots to be very similar

Imputing Data

MICE assumes that the missing data are Missing at Random (MAR), which means that the probability that a value is missing depends only on observed value and can be predicted using them.It imputes data on a variable by variable basis by specifying an imputation model per variable.A CART is a predictive algorithm that determines how a given variable's values can be predicted based on other values. It is composed of decision trees where each fork is a split in a predictor variable and each node at the end has a prediction for the target variable.

```
densityplot( x=tempData , data= ~ psmd+diabetes+smoking+animal+word+sumwords+word_perc+education + TM
```
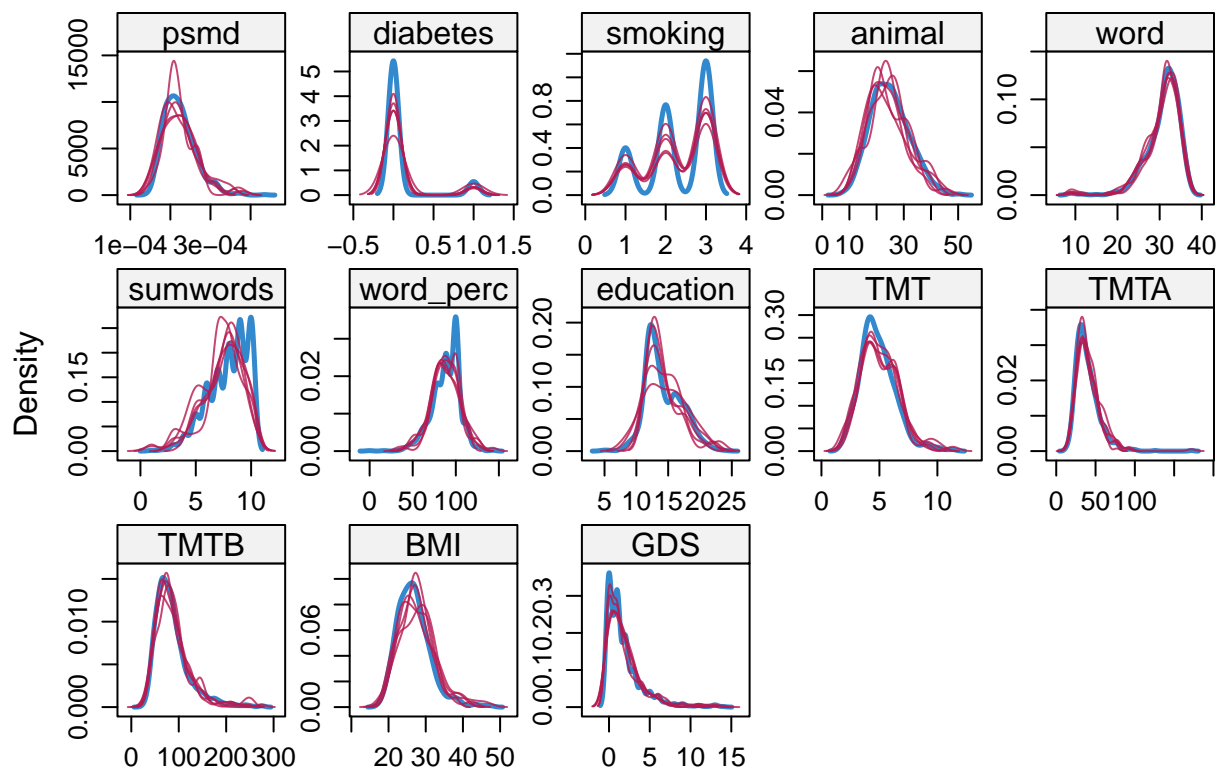
```r
# stripplot(tempData, pch = 20, cex = 1.2)
  HCHS <- complete(tempData,2)
```

Check for na in data frame

Testing linear relationship with age

```r
for (i in c( "seg", "mean_conn_all", "mean_within_all", "mean_between_all", "seg_asso",
            "mean_within_asso_all", " mean_between_asso_all", "seg_sensor", "mean_within_sensor_all",
            "mean_between_sensor_all","animal", "word", "sumwords","word_perc", "TMT", "TMTA","TMTB")).

  HCHS_cov = lm(as.formula(paste(i,"~ age + education ")), data =HCHS)
  print(i)
  print(summary(HCHS_cov))
  #autoplot(HCHS_cov)
  #cook=cooks.distance(HCHS_cov)
  #print( length(cook[cook > 10]))
  print(lm.beta(HCHS_cov))
  #print(car::outlierTest(HCHS_cov))
# vif(HCHS_cov)
  print (AIC(HCHS_cov))
```

```
  # print (autoplot(HCHS_cov))

}
```

```
## [1] "seg"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##        Min        1Q     Median        3Q       Max
## -0.101749 -0.014219  0.000973  0.016323  0.065998
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.343e-01  7.367e-03  86.108  < 2e-16 ***
## age         -5.762e-04  9.185e-05  -6.273 5.32e-10 ***
## education    4.806e-04  2.660e-04   1.807   0.0711 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02321 on 973 degrees of freedom
## Multiple R-squared:  0.04616,    Adjusted R-squared:  0.0442
## F-statistic: 23.55 on 2 and 973 DF,  p-value: 1.032e-10
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.19866838  0.05722197
##
## [1] -4571.28
## [1] "mean_conn_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q     Median       3Q       Max
## -0.11723 -0.02239 -0.00120   0.01941   0.34587
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4027963  0.0123946  32.498  < 2e-16 ***
## age         -0.0007934  0.0001545  -5.134 3.43e-07 ***
## education    0.0006510  0.0004475   1.455    0.146
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03904 on 973 degrees of freedom
## Multiple R-squared:  0.03129,    Adjusted R-squared:  0.0293
```

```
## F-statistic: 15.71 on 2 and 973 DF,  p-value: 1.92e-07
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.16384555  0.04642661
##
## [1] -3555.702
## [1] "mean_within_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.14345 -0.02860  0.00079  0.02712  0.34155
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4603507  0.0145000   31.748  < 2e-16 ***
## age         -0.0011047  0.0001808   -6.110 1.44e-09 ***
## education    0.0007997  0.0005236    1.527    0.127
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04568 on 973 degrees of freedom
## Multiple R-squared:  0.04275,    Adjusted R-squared:  0.04079
## F-statistic: 21.73 on 2 and 973 DF,  p-value: 5.863e-10
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.19384962  0.04846028
##
## [1] -3249.457
## [1] "mean_between_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.038855 -0.009793 -0.001192  0.007409  0.196830
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.709e-01  5.408e-03   31.599  < 2e-16 ***
## age         -2.267e-04  6.742e-05   -3.363 0.000802 ***
```

```
## education     1.245e-04  1.953e-04    0.638 0.523713
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.01703 on 973 degrees of freedom
## Multiple R-squared:  0.01283,    Adjusted R-squared:  0.0108
## F-statistic: 6.323 on 2 and 973 DF,  p-value: 0.00187
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.10833838  0.02055133
##
## [1] -5174.834
## [1] "seg_asso"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.100651 -0.020498  0.000457  0.019864  0.097799
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.6001019  0.0101361  59.204  < 2e-16 ***
## age         -0.0005908  0.0001264  -4.675 3.36e-06 ***
## education    0.0004693  0.0003660   1.282      0.2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03193 on 973 degrees of freedom
## Multiple R-squared:  0.02592,    Adjusted R-squared:  0.02392
## F-statistic: 12.94 on 2 and 973 DF,  p-value: 2.83e-06
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.14961758  0.04103933
##
## [1] -3948.366
## [1] "mean_within_asso_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
```

```
## -0.13474 -0.02811 -0.00086  0.02756  0.33380
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4434974  0.0138943  31.919  < 2e-16 ***
## age         -0.0009565  0.0001732  -5.521 4.32e-08 ***
## education    0.0006026  0.0005017   1.201     0.23
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.04377 on 973 degrees of freedom
## Multiple R-squared:  0.03444,   Adjusted R-squared:  0.03246
## F-statistic: 17.35 on 2 and 973 DF,  p-value: 3.934e-08
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##    0.000000   -0.175927     0.038272
##
## [1] -3332.755
## [1] " mean_between_asso_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.047440 -0.014071 -0.001962  0.010288  0.215306
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.796e-01  6.581e-03  27.295   <2e-16 ***
## age         -1.968e-04  8.205e-05  -2.398   0.0167 *
## education    7.548e-05  2.376e-04   0.318   0.7508
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02073 on 973 degrees of freedom
## Multiple R-squared:  0.006354,   Adjusted R-squared:  0.004311
## F-statistic: 3.111 on 2 and 973 DF,  p-value: 0.04501
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.07751536  0.01026826
##
## [1] -4791.524
## [1] "seg_sensor"
```

```
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.127270 -0.023620  0.003887  0.025850  0.099351
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.6684455  0.0113111  59.096  < 2e-16 ***
## age         -0.0006288  0.0001410  -4.458 9.23e-06 ***
## education    0.0006579  0.0004084   1.611    0.108
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03563 on 973 degrees of freedom
## Multiple R-squared:  0.02525,    Adjusted R-squared:  0.02324
## F-statistic:  12.6 on 2 and 973 DF,  p-value: 3.954e-06
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##  0.00000000 -0.14273246  0.05157474
##
## [1] -3734.265
## [1] "mean_within_sensor_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.16521 -0.04321  0.00121  0.03767  0.36333
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.5024841  0.0199195  25.226  < 2e-16 ***
## age         -0.0014750  0.0002484  -5.939 3.99e-09 ***
## education    0.0012925  0.0007193   1.797   0.0726 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.06275 on 973 degrees of freedom
## Multiple R-squared:  0.04202,    Adjusted R-squared:  0.04005
## F-statistic: 21.34 on 2 and 973 DF,  p-value: 8.513e-10
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
```

```
## Standardized Coefficients::
## (Intercept)          age    education
##  0.00000000 -0.18849562  0.05703604
##
## [1] -2629.604
## [1] "mean_between_sensor_all"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.041032 -0.012874 -0.002584  0.008417  0.221867
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  1.704e-01  6.896e-03  24.705  < 2e-16 ***
## age         -3.060e-04  8.599e-05  -3.559  0.00039 ***
## education    1.772e-04  2.490e-04   0.712  0.47693
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02172 on 973 degrees of freedom
## Multiple R-squared:  0.01444,    Adjusted R-squared:  0.01242
## F-statistic: 7.129 on 2 and 973 DF,  p-value: 0.0008441
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)          age    education
##  0.00000000 -0.11457478  0.02290588
##
## [1] -4700.111
## [1] "animal"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -20.941  -4.879  -0.466   4.619  24.361
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 27.79928    2.20594  12.602  < 2e-16 ***
## age         -0.13417    0.02751  -4.878 1.25e-06 ***
## education    0.38490    0.07965   4.832 1.57e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.949 on 973 degrees of freedom
## Multiple R-squared:  0.05396,    Adjusted R-squared:  0.05201
```

```
## F-statistic: 27.75 on 2 and 973 DF,  p-value: 1.909e-12
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##   0.0000000  -0.1538511   0.1524112
##
## [1] 6558.866
## [1] "word"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -23.069  -1.758   0.730   2.443   7.327
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 18.92044    1.16883  16.187  < 2e-16 ***
## age          0.09380    0.01457   6.436 1.92e-10 ***
## education    0.42635    0.04220  10.102  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.682 on 973 degrees of freedom
## Multiple R-squared:  0.1153, Adjusted R-squared:  0.1135
## F-statistic: 63.39 on 2 and 973 DF,  p-value: < 2.2e-16
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age    education
##   0.0000000   0.1963122   0.3081240
##
## [1] 5319.063
## [1] "sumwords"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.0333 -1.1102  0.2071  1.2840  3.2649
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 11.02282    0.53171  20.731  < 2e-16 ***
## age         -0.06731    0.00663 -10.152  < 2e-16 ***
```

```
## education     0.07698     0.01920     4.009 6.55e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.675 on 973 degrees of freedom
## Multiple R-squared:  0.1214, Adjusted R-squared:  0.1196
## F-statistic: 67.22 on 2 and 973 DF,  p-value: < 2.2e-16
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)          age     education
##   0.0000000   -0.3085787    0.1218703
##
## [1] 3781.547
## [1] "word_perc"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -81.973   -8.533    1.480   10.579   58.407
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 112.05605    4.94752  22.649  < 2e-16 ***
## age          -0.45195    0.06169  -7.326 4.96e-13 ***
## education     0.33611    0.17865   1.881   0.0602 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 15.59 on 973 degrees of freedom
## Multiple R-squared:  0.06062,    Adjusted R-squared:  0.05869
## F-statistic: 31.39 on 2 and 973 DF,  p-value: 6.141e-14
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)          age     education
##  0.00000000  -0.23026397   0.05913301
##
## [1] 8135.563
## [1] "TMT"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -3.1712 -1.0407 -0.1754  0.8829  6.5176
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 4.124442   0.488771   8.438  < 2e-16 ***
## age         0.001075   0.006094   0.176  0.86007
## education   0.049936   0.017649   2.829  0.00476 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.54 on 973 degrees of freedom
## Multiple R-squared:  0.008225,   Adjusted R-squared:  0.006187
## F-statistic: 4.035 on 2 and 973 DF,  p-value: 0.01799
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age   education
## 0.000000000 0.005694335 0.091374276
##
## [1] 3617.176
## [1] "TMTA"
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -27.319  -9.264  -2.502   6.168 124.230
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  7.03266    4.40813   1.595    0.111
## age          0.59816    0.05496  10.883   <2e-16 ***
## education   -0.34375    0.15917  -2.160    0.031 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 13.89 on 973 degrees of freedom
## Multiple R-squared:  0.1204, Adjusted R-squared:  0.1186
## F-statistic:  66.6 on 2 and 973 DF,  p-value: < 2.2e-16
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age   education
##  0.00000000  0.33098139 -0.06568035
##
## [1] 7910.231
## [1] "TMTB"
```

```
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Residuals:
##      Min      1Q  Median      3Q     Max
## -64.430 -22.396  -6.456  14.181 176.102
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  32.4714    10.7260   3.027  0.00253 **
## age           1.3461     0.1337  10.065  < 2e-16 ***
## education    -2.1603     0.3873  -5.578 3.15e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 33.79 on 973 degrees of freedom
## Multiple R-squared:  0.1357, Adjusted R-squared:  0.1339
## F-statistic: 76.39 on 2 and 973 DF,  p-value: < 2.2e-16
##
##
## Call:
## lm(formula = as.formula(paste(i, "~ age + education ")), data = HCHS)
##
## Standardized Coefficients::
## (Intercept)         age   education
##   0.0000000   0.3034401  -0.1681601
##
## [1] 9645.985
```

```r
 # autoplot(HCHS_cov)
 vif(HCHS_cov)
```

```
##       age education
## 1.023166  1.023166
```

```r
 1/vif(HCHS_cov)
```

```
##       age education
## 0.9773582 0.9773582
```

```r
 mean(vif(HCHS_cov))
```

```
## [1] 1.023166
```

```r
 AIC(HCHS_cov)
```

```
## [1] 9645.985
```

Outlier diagnostics

```
sum(HCHS$large.residuals)
```

[1] 46

```
#HCHS[HCHS$large.residuals,c("mean_conn_all", "age", "mean_thickness", "psmd", "standardized.residual
HCHS[HCHS$large.residuals,c("cooks.distance", "leverage", "covariance.ratios")]
```

```
##      cooks.distance   leverage covariance.ratios
## 1       0.106536832 0.013980038         0.9482304
## 10      0.019605223 0.003410184         0.9541175
## 26      0.006207143 0.002333468         0.9809563
## 54      0.008063984 0.003094002         0.9822137
## 56      0.013341404 0.002303158         0.9526111
## 78      0.013841740 0.003948828         0.9748921
## 181     0.002836012 0.002023543         0.9921759
## 187     0.033934728 0.006212145         0.9595194
## 217     0.011387690 0.003757700         0.9790161
## 240     0.021734935 0.005703646         0.9738981
## 242     0.006827739 0.001655610         0.9669729
## 267     0.008303850 0.005871852         0.9959500
## 280     0.007646743 0.002245287         0.9740778
## 325     0.003310404 0.002172517         0.9912018
## 339     0.003055376 0.001658442         0.9877591
## 384     0.005106779 0.003479209         0.9930344
## 386     0.004346091 0.001986705         0.9849256
## 389     0.015616533 0.003965114         0.9709805
## 429     0.018043905 0.005586914         0.9790551
## 443     0.005856254 0.003350713         0.9903326
## 493     0.008956952 0.005649816         0.9941510
## 506     0.005089271 0.002333468         0.9853353
## 516     0.004941631 0.001743951         0.9787797
## 532     0.006898952 0.004950466         0.9952050
## 557     0.009386748 0.002063544         0.9635461
## 595     0.001862595 0.001131297         0.9890269
## 622     0.020852187 0.004298976         0.9630828
## 625     0.006581138 0.003088678         0.9865570
## 644     0.004025928 0.002765828         0.9924265
## 653     0.015333905 0.004800587         0.9785812
## 683     0.008981461 0.003108050         0.9796425
## 733     0.003023409 0.001758111         0.9889847
## 766     0.002921590 0.001938182         0.9911163
## 793     0.003978121 0.002142626         0.9881150
## 814     0.006012255 0.002222536         0.9804332
## 820     0.008008287 0.002809156         0.9796961
## 845     0.012913010 0.003094002         0.9679738
## 846     0.006263189 0.004298976         0.9939632
## 866     0.013921764 0.003410184         0.9691173
## 884     0.003640965 0.001684577         0.9848616
```

```
## 908    0.022801396 0.002505458         0.9235113
## 912    0.014970469 0.002639149         0.9540257
## 916    0.005001219 0.002943015         0.9903655
## 957    0.006079306 0.003084132         0.9880144
## 958    0.017098640 0.011121319         1.0001724
## 963    0.030415238 0.003662587         0.9316759
```

Including Plots

```r
HCHS$pc <- predict(prcomp(~mean_conn_all+age, HCHS))[,1]

ggplot(HCHS,aes(x=age,y=mean_conn_all,color = mean_conn_all, fill = "transparent" ))+geom_point()
  labs(x="Age", y="Global Connectivity") +
  ggtitle("Global Connectivity \n in dependence of age") +
  theme (legend.position = "none",plot.title = element_text(color="royalblue4", size=14, face="bold
  geom_smooth(method=lm,) + scale_color_gradient(low = "#0091ff", high = "#f0650e") +   theme(
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank(),
    panel.background = element_rect(fill = "transparent",colour = NA),
    plot.background = element_rect(fill = "transparent",colour = NA)
  )
```

```
## `geom_smooth()` using formula 'y ~ x'
```


Global Connectivity
in dependence of age
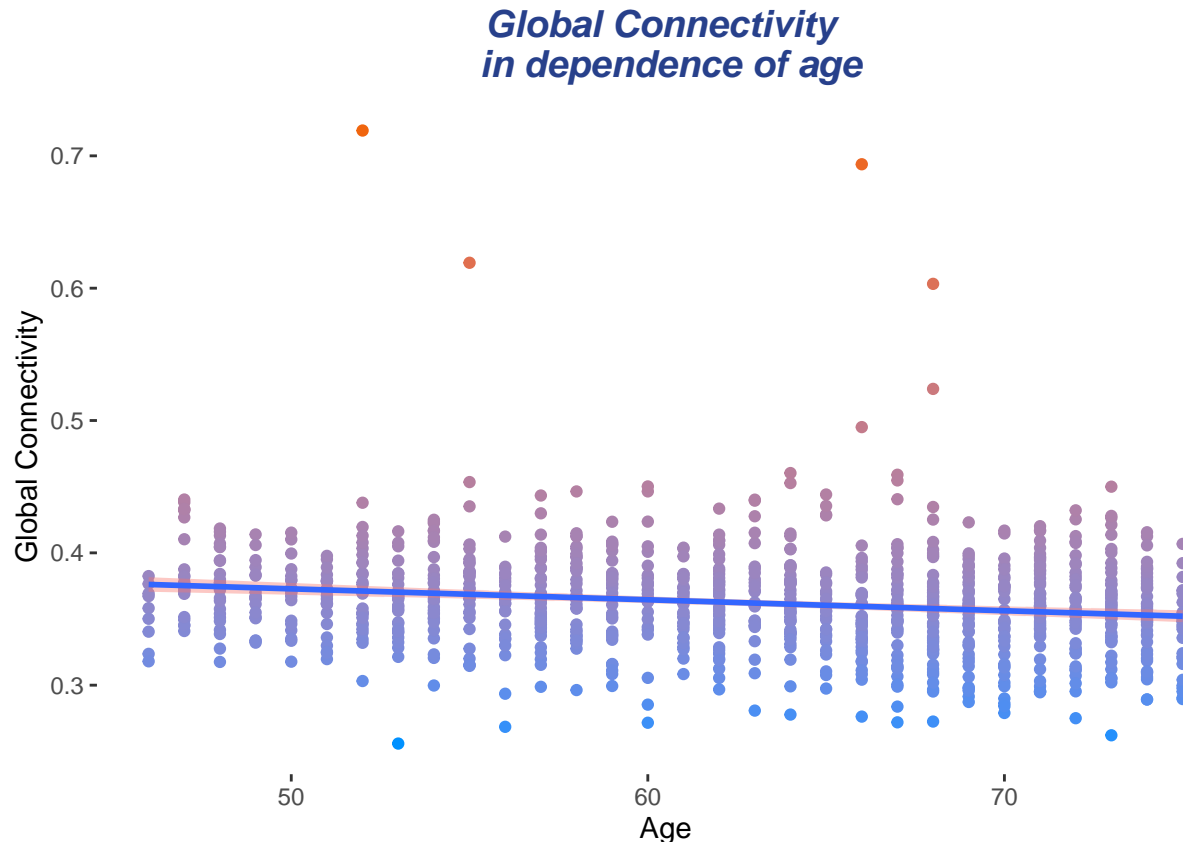
```r
    HCHS$pc <- predict(prcomp(~seg+age, HCHS))[,1]

ggplot(HCHS,aes(x=age,y=seg,color = seg, fill = "transparent" ))+geom_point()  +
  labs(x="Age", y="Global Segregation") +
  ggtitle("Global Segregation \n in dependence of age") +
  theme (legend.position = "none",plot.title = element_text(color="royalblue4", size=14, face="bold
  geom_smooth(method=lm,) + scale_color_gradient(low = "#0091ff", high = "#f0650e") +   theme(
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank(),
    panel.background = element_rect(fill = "transparent",colour = NA),
    plot.background = element_rect(fill = "transparent",colour = NA)
  )
```

`geom_smooth()` using formula 'y ~ x'