# PCA on Subject 0 of HBN

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The following runs Principal Component Analysis (PCA) on the time series of Subject 0's EEG signals from the Healthy Brain network.\

Required packages below, along with path to subject's CSV file.

```
require(stats)
require(data.table)
```

```
## Loading required package: data.table
```

```
subject_file <- "C:/Users/Ronak Mehta/Desktop/NeuroData/NDARAA075AMK_RestingState_data.csv"
knitr::opts_chunk$set(fig.width=8, fig.height=6)
```

## Select Downsampling parameters

Input the first observation index, last observation index, and the separation between observations.

```
first_obs_no <- 1
last_obs_no <- 180001
sep <- 100
```

## Ingest Data

The data ingests as a data frame with rows representing observations, and columns representing electrodes.

```
# Set the columns (observations) we want to take.
columns <- seq(first_obs_no, last_obs_no, sep)

# Injest CSV of subject's data.
dat <- transpose(fread(input = subject_file,
                       sep = ",",
                       nrows = 128,
                       header = FALSE,
                       showProgress = TRUE,
                       select = columns,
                       data.table = FALSE))
```

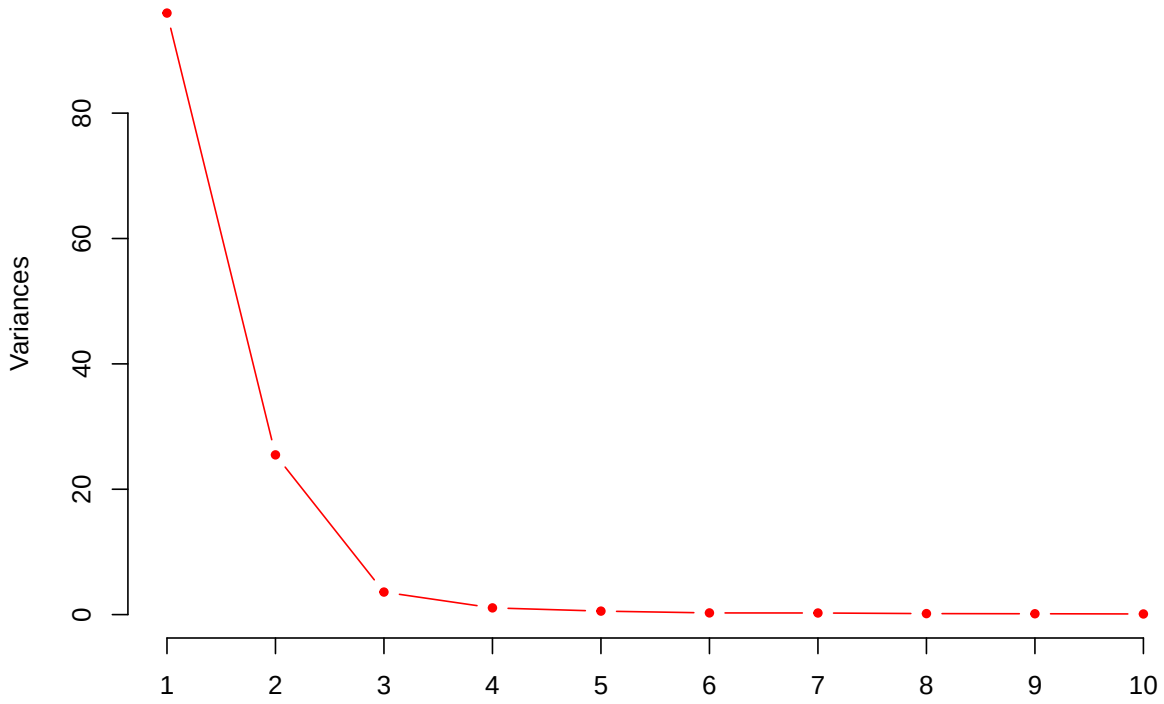
```
##
Read 0.0% of 128 rows
Read 128 rows and 1801 (of 182086) columns from 0.158 GB file in 00:00:09
```

```
# Set column names to the electrodes.
col_names <- rep("E", 128)
for (i in 1:length(col_names)) { col_names[i] <- paste(col_names[i], as.character(i), sep = "") }
colnames(dat) <- col_names
```

## Run PCA and Plot Variances

Below is a plot of the variances of the first 10 principal components.

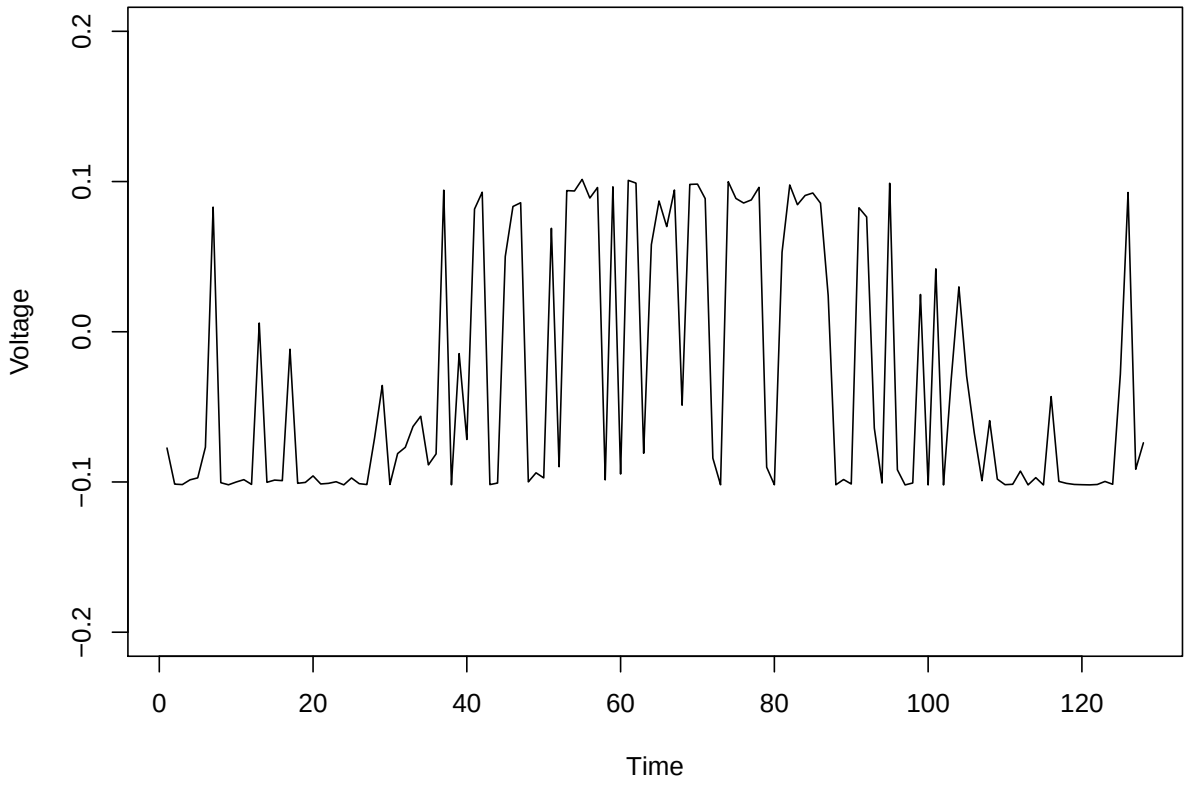
```
# Run PCA
dat.pcomps <- prcomp(dat,
                     center = TRUE,
                     scale. = TRUE)

# Plot Variances of principle components.
plot(dat.pcomps, type = "l", col = "red", pch = 20, main = NULL)
```



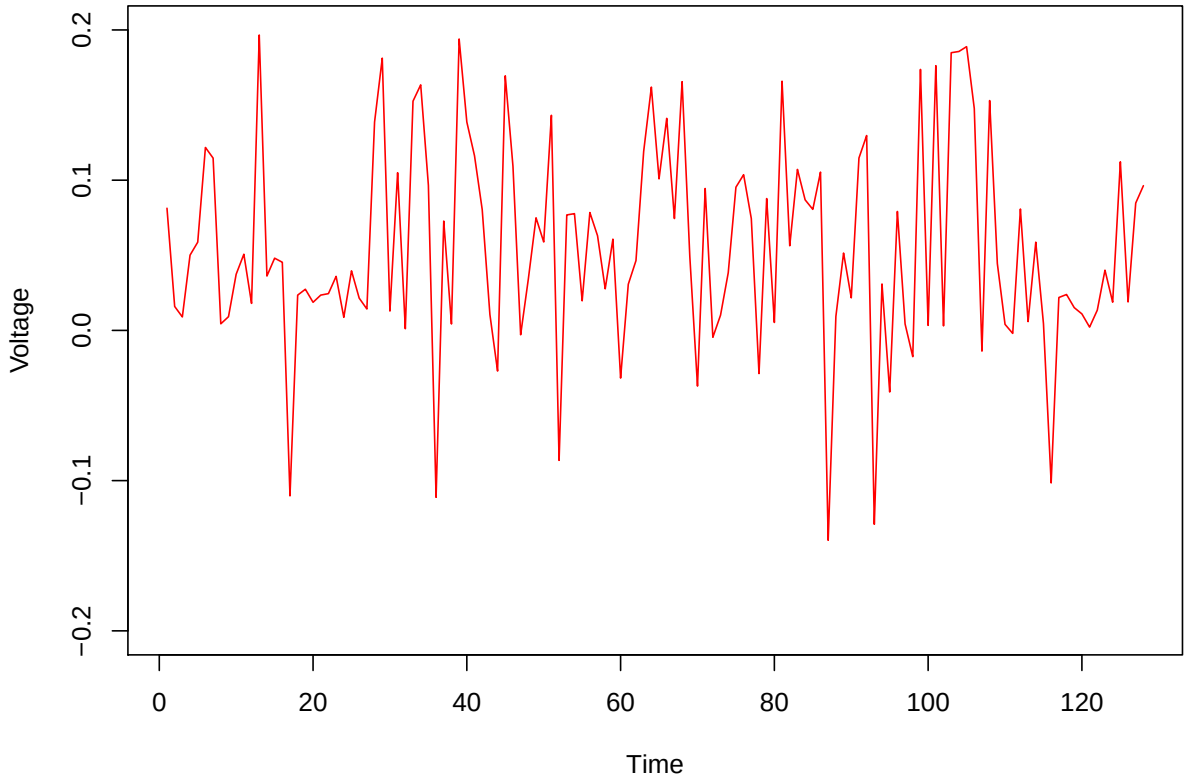
### Plot Values of Significant Components

Below is a plot of values of the first 3 principal components. Their cumulative variance is 97.69%.

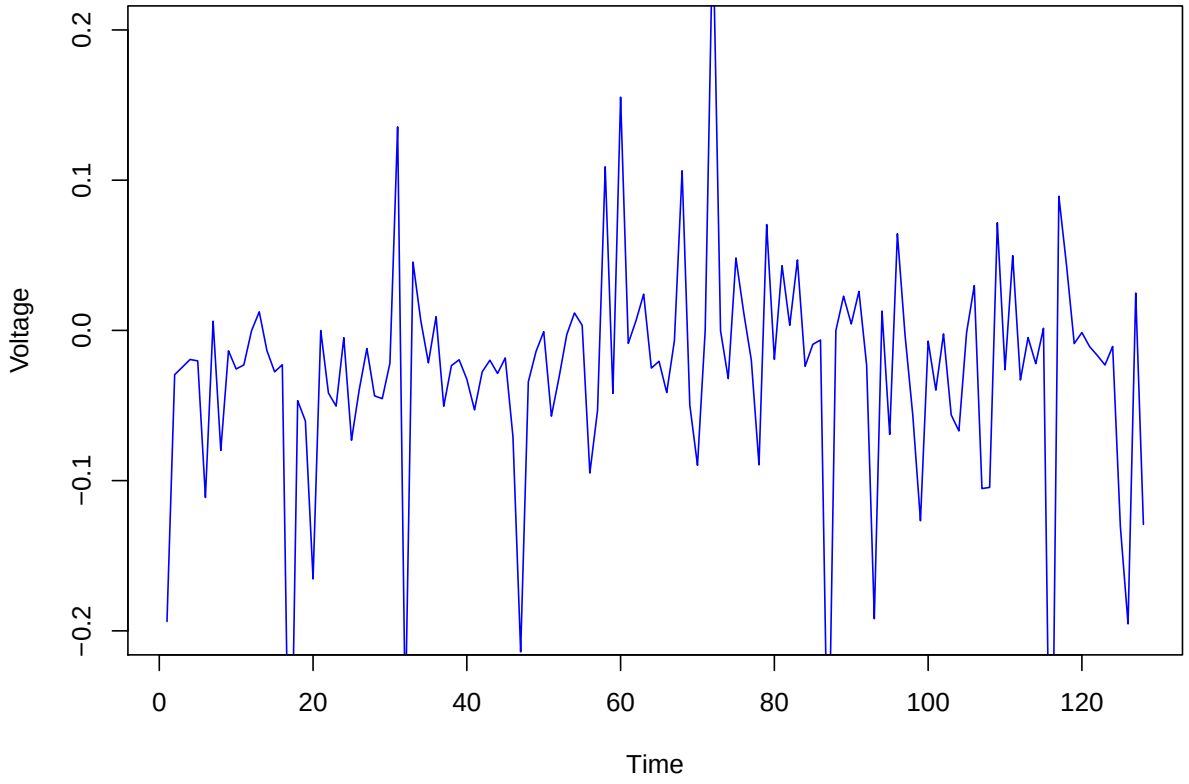
```
# Plot values of first 3 Prinicipal components
PC1 = ts(dat.pcomps$rotation[,1])
PC2 = ts(dat.pcomps$rotation[,2])
PC3 = ts(dat.pcomps$rotation[,3])
ts.plot(PC1, gpars = list(col = c("black")), ylim = c(-0.20, 0.20), ylab = "Voltage")
```



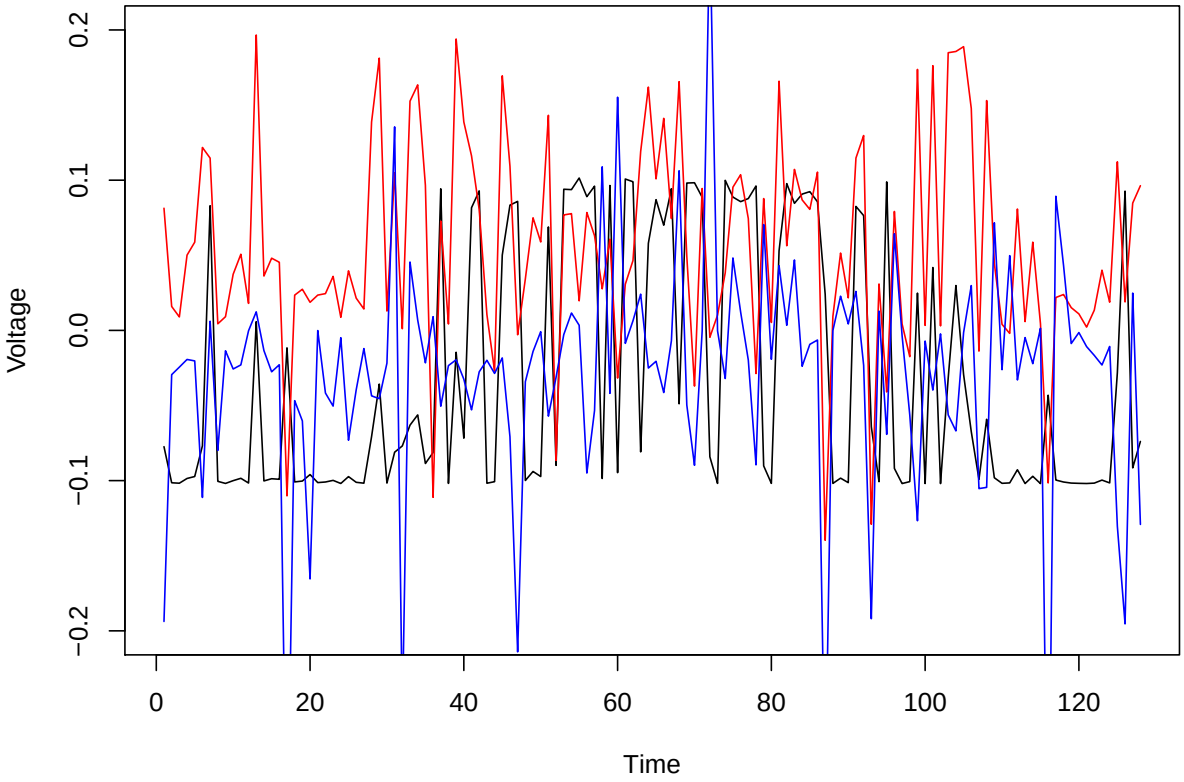

```
ts.plot(PC2, gpars = list(col = c("red")), ylim = c(-0.20, 0.20), ylab = "Voltage")
```




```
ts.plot(PC3, gpars = list(col = c("blue")), ylim = c(-0.20, 0.20), ylab = "Voltage")
```




```
ts.plot(PC1, PC2, PC3, gpars = list(col = c("black", "red", "blue")),
        ylim = c(-0.20, 0.20), ylab = "Voltage")
```


Voltage
0.2
0.1
0.0
−0.1
−0.2
0
20
40
60
80
100
120
Time