**GEE Analysis in the Validation Study**

# Sample code for Linear regression model with GEE

# Linear regression model 1: GS = beta0 + beta1 \* avg(repeated measures) +

# randomeff\_individual

# Linear regression model 2: GS = beta0 + beta1 \* avg(repeated measures) +

# beta2 \* noise + beta3 \* avg(repeated measures) \* noise +

# randomeff\_individual

# Separated by frequency

# One with noise, one without noise

# Report intercept (hopefully 0);

library(geepack)

htdata\_gee <- read\_sas("Path for your data")

LinearRegressionGee<-function(Frequency){

htdata\_gee\_filtered <- htdata\_gee %>% filter(frequency == Frequency)

# threshold\_GS: gold standard measurement

# avg\_threshold\_NHS: average of hearing assessment measurements

# data must be in long format

# id: the variable for subject

# corstr="exchangeable": correlation between all time points are

# exchangeable

fit1<-geeglm(threshold\_GS ~ avg\_threshold\_NHS , data=htdata\_gee\_filtered, id=id,family=gaussian(), corstr="exchangeable")

print("Model without ambient noise as covariates: ")

print(fit1)

fit2<-geeglm(threshold\_GS ~ avg\_threshold\_NHS + Avg\_meanAmbientNoise + avg\_threshold\_NHS\*Avg\_meanAmbientNoise,data=htdata\_gee\_filtered, id=id, family=gaussian(), corstr="exchangeable")

print("Model with ambient noise and interaction term as covariates: ")

print(fit2)

}

LinearRegressionGee(Frequency = 1000)