```
library(MuMIn)
> #library(nlme)
>
> load("LoadedData.RData")
>
> colnames(NANDA_Data)[1]<-"TRACTFIPS"
>
> #Joining the two datasets based on the GEOID value
> Combined_Dataset <- left_join(NRI_Table_CensusTracts, NANDA_Data, by =
"TRACTFIPS")
>
> #Analyzing Different
Simulations!-----------------------------------------------------------------------
-----------------------------------------------------------------------------------
-----------------------------------------------------------------------------------
-----------------------------------------------------------------------------------
>
> #Creating a linear model to determine the correlation between Museum Count
(as an Example) against Risk Index
> Linear_Model <- lm(count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE *
RISK_VALUE, data = Combined_Dataset)
>
> #Linear Model Assessing All 'Count' Outputs at once
> Linear_Model <- lm(cbind(count_museums, count_theatricalproductions,
count_amusementparks,count_movietheaters,count_zoosaquariumsgardens,count_bingo
cardsgambling,count_poolhallsbowlingalleys,count_totartsentertainment,count_hot
els,count_casinohotels) ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE,
data = Combined_Dataset)
>
> # Summary of the model
> summary(Linear_Model)
Response count_museums :

Call:
lm(formula = count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE *
    RISK_VALUE, data = Combined_Dataset)

Residuals:
   Min     1Q Median     3Q    Max
-2.993 -0.242 -0.201 -0.165 97.759

Coefficients:
                         Estimate Std. Error t value Pr(>|t|)
(Intercept)            1.441e-01  1.924e-03  74.890  < 2e-16 ***
RISK_SCORE             8.426e-04  3.485e-05  24.179  < 2e-16 ***
RISK_VALUE             7.471e-08  1.232e-08   6.062 1.34e-09 ***
RISK_SCORE:RISK_VALUE -4.904e-10  1.199e-10  -4.090 4.32e-05 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
Residual standard error: 0.8272 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.005883, Adjusted R-squared:  0.005882
F-statistic:  5308 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_theatricalproductions :

Call:
lm(formula = count_theatricalproductions ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-0.7223 -0.0437 -0.0410 -0.0384 17.9586

Coefficients:
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)            3.003e-02  5.984e-04   50.18   <2e-16 ***
RISK_SCORE            -1.119e-04  1.084e-05  -10.33   <2e-16 ***
RISK_VALUE             5.651e-08  3.834e-09   14.74   <2e-16 ***
RISK_SCORE:RISK_VALUE -4.998e-10  3.730e-11  -13.40   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2573 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.001357, Adjusted R-squared:  0.001356
F-statistic:  1219 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_amusementparks :

Call:
lm(formula = count_amusementparks ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-0.8572 -0.0508 -0.0395 -0.0312 18.8950

Coefficients:
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)            2.526e-02  5.684e-04  44.430   <2e-16 ***
RISK_SCORE             2.715e-04  1.030e-05  26.366   <2e-16 ***
RISK_VALUE            -1.583e-09  3.642e-09  -0.435   0.6638
RISK_SCORE:RISK_VALUE  9.056e-11  3.543e-11   2.556   0.0106 *
---
```

```
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2444 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.005977, Adjusted R-squared:  0.005976
F-statistic:  5394 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_movietheaters :

Call:
lm(formula = count_movietheaters ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-0.6798 -0.0704 -0.0564 -0.0442  8.8663

Coefficients:
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)            3.414e-02  6.238e-04  54.720  < 2e-16 ***
RISK_SCORE             3.923e-04  1.130e-05  34.722  < 2e-16 ***
RISK_VALUE             1.051e-08  3.996e-09   2.630  0.00853 **
RISK_SCORE:RISK_VALUE -4.880e-11  3.888e-11  -1.255  0.20940
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2682 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.005057, Adjusted R-squared:  0.005056
F-statistic:  4559 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_zoosaquariumsgardens :

Call:
lm(formula = count_zoosaquariumsgardens ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-0.0855 -0.0121 -0.0093 -0.0082  4.9921

Coefficients:
                        Estimate Std. Error t value Pr(>|t|)
(Intercept)            1.140e-02  2.594e-04   43.94   <2e-16 ***
RISK_SCORE             1.448e-04  4.699e-06   30.82   <2e-16 ***
RISK_VALUE            -3.612e-08  1.662e-09  -21.74   <2e-16 ***
RISK_SCORE:RISK_VALUE  3.668e-10  1.617e-11   22.69   <2e-16 ***
```

```
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1115 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.001523, Adjusted R-squared:  0.001522
F-statistic:  1368 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_bingocardsgambling :

Call:
lm(formula = count_bingocardsgambling ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-0.4780 -0.0218 -0.0164 -0.0122 15.9745

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)           7.210e-03  3.575e-04  20.166  < 2e-16 ***
RISK_SCORE            9.977e-05  6.476e-06  15.407  < 2e-16 ***
RISK_VALUE            1.226e-08  2.290e-09   5.354 8.61e-08 ***
RISK_SCORE:RISK_VALUE -7.983e-11  2.228e-11  -3.583  0.00034 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1537 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.003925, Adjusted R-squared:  0.003924
F-statistic:  3535 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_poolhallsbowlingalleys :

Call:
lm(formula = count_poolhallsbowlingalleys ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-0.6502 -0.1039 -0.0923 -0.0769  6.8967

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)           5.289e-02  7.553e-04  70.029   <2e-16 ***
RISK_SCORE            1.333e-04  1.368e-05   9.741   <2e-16 ***
RISK_VALUE            1.268e-07  4.838e-09  26.204   <2e-16 ***
```

```
RISK_SCORE:RISK_VALUE -1.214e-09  4.707e-11 -25.782   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.3247 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.002197, Adjusted R-squared:  0.002196
F-statistic:  1975 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_totartsentertainment :

Call:
lm(formula = count_totartsentertainment ~ RISK_SCORE + RISK_VALUE +
    RISK_SCORE * RISK_VALUE, data = Combined_Dataset)

Residuals:
   Min     1Q Median     3Q    Max
-7.146 -0.578 -0.457  0.345 99.396

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)            3.391e-01  3.094e-03 109.614   <2e-16 ***
RISK_SCORE             2.165e-03  5.604e-05  38.626   <2e-16 ***
RISK_VALUE             2.536e-07  1.982e-08  12.795   <2e-16 ***
RISK_SCORE:RISK_VALUE -1.924e-09  1.928e-10  -9.977   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.33 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.01363,  Adjusted R-squared:  0.01363
F-statistic: 1.24e+04 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_hotels :

Call:
lm(formula = count_hotels ~ RISK_SCORE + RISK_VALUE + RISK_SCORE *
    RISK_VALUE, data = Combined_Dataset)

Residuals:
    Min      1Q  Median      3Q     Max
-15.609  -0.966  -0.650   0.125 156.575

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)            5.816e-01  6.214e-03   93.58   <2e-16 ***
RISK_SCORE             9.986e-03  1.126e-04   88.71   <2e-16 ***
```

```
RISK_VALUE            -8.650e-07  3.981e-08  -21.73   <2e-16 ***
RISK_SCORE:RISK_VALUE  9.953e-09  3.873e-10   25.70   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2.672 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.02773,  Adjusted R-squared:  0.02773
F-statistic: 2.559e+04 on 3 and 2690940 DF,  p-value: < 2.2e-16


Response count_casinohotels :

Call:
lm(formula = count_casinohotels ~ RISK_SCORE + RISK_VALUE + RISK_SCORE *
    RISK_VALUE, data = Combined_Dataset)

Residuals:
   Min     1Q Median     3Q    Max
-0.287 -0.014 -0.008 -0.005 31.960

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)            6.597e-03  4.088e-04   16.14   <2e-16 ***
RISK_SCORE             2.296e-04  7.404e-06   31.01   <2e-16 ***
RISK_VALUE            -3.990e-08  2.619e-09  -15.24   <2e-16 ***
RISK_SCORE:RISK_VALUE  4.229e-10  2.548e-11   16.60   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1757 on 2690940 degrees of freedom
  (33984 observations deleted due to missingness)
Multiple R-squared:  0.002795, Adjusted R-squared:  0.002794
F-statistic:  2514 on 3 and 2690940 DF,  p-value: < 2.2e-16


>
> #Creating a Multilevel Model Grouping by State
> MLM <- lmer(count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE
+ (1 | STATE), data = Combined_Dataset)
Warning message:
Some predictor variables are on very different scales: consider rescaling
> summary(MLM)
Linear mixed model fit by REML ['lmerMod']
Formula:
count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE +
    (1 | STATE)
   Data: Combined_Dataset
```

```
REML criterion at convergence: 6575523

Scaled residuals:
    Min      1Q  Median      3Q     Max
 -3.601  -0.320  -0.223  -0.121 118.808

Random effects:
 Groups   Name        Variance Std.Dev.
 STATE    (Intercept) 0.02844  0.1686
 Residual             0.67403  0.8210
Number of obs: 2690944, groups:  STATE, 51

Fixed effects:
                       Estimate Std. Error t value
(Intercept)            1.048e-01  2.372e-02   4.418
RISK_SCORE             2.931e-03  3.861e-05  75.899
RISK_VALUE             6.486e-08  1.272e-08   5.100
RISK_SCORE:RISK_VALUE -4.045e-10  1.239e-10  -3.266

Correlation of Fixed Effects:
            (Intr) RISK_SCORE RISK_V
RISK_SCORE   0.019
RISK_VALUE  -0.071 -0.733
RISK_SCORE:  0.072  0.724     -1.000
fit warnings:
Some predictor variables are on very different scales: consider rescaling
>
> #Creating a Multilevel Model Grouping by State
> MLM <- lmer(count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE
+ (1 | COUNTY), data = Combined_Dataset)
Warning message:
Some predictor variables are on very different scales: consider rescaling
> summary(MLM)
Linear mixed model fit by REML ['lmerMod']
Formula:
count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE +
    (1 | COUNTY)
   Data: Combined_Dataset

REML criterion at convergence: 6477344

Scaled residuals:
    Min      1Q  Median      3Q     Max
 -4.271  -0.312  -0.198  -0.084 119.239

Random effects:
 Groups   Name        Variance Std.Dev.
 COUNTY   (Intercept) 0.1121   0.3348
 Residual             0.6481   0.8050
```

```
Number of obs: 2690944, groups:  COUNTY, 1834

Fixed effects:
                        Estimate Std. Error t value
(Intercept)            1.024e-01  8.286e-03   12.36
RISK_SCORE             3.878e-03  4.228e-05   91.73
RISK_VALUE            -2.314e-07  1.397e-08  -16.56
RISK_SCORE:RISK_VALUE  2.531e-09  1.364e-10   18.56

Correlation of Fixed Effects:
            (Intr) RISK_SCORE RISK_V
RISK_SCORE   0.037
RISK_VALUE  -0.217 -0.736
RISK_SCORE:  0.217  0.728     -1.000
fit warnings:
Some predictor variables are on very different scales: consider rescaling
>
> #Creating a Multilevel Model Grouping by Tract (Tried adding another layer
but it added a ton to the processing time)
> MLM <- lmer(count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE
+ (1 | TRACTFIPS), data = Combined_Dataset)
Warning message:
Some predictor variables are on very different scales: consider rescaling
> summary(MLM)
Linear mixed model fit by REML ['lmerMod']
Formula:
count_museums ~ RISK_SCORE + RISK_VALUE + RISK_SCORE * RISK_VALUE +
    (1 | TRACTFIPS)
   Data: Combined_Dataset

REML criterion at convergence: 3232283

Scaled residuals:
     Min       1Q   Median       3Q      Max
-101.593   -0.007   -0.005   -0.004  117.602

Random effects:
 Groups    Name        Variance Std.Dev.
 TRACTFIPS (Intercept) 0.5156   0.7181
 Residual              0.1686   0.4106
Number of obs: 2690944, groups:  TRACTFIPS, 84092

Fixed effects:
                        Estimate Std. Error t value
(Intercept)            1.441e-01  9.496e-03  15.173
RISK_SCORE             8.426e-04  1.720e-04   4.899
RISK_VALUE             7.471e-08  6.083e-08   1.228
RISK_SCORE:RISK_VALUE -4.904e-10  5.918e-10  -0.829
```

```
Correlation of Fixed Effects:
            (Intr) RISK_SCORE RISK_V
RISK_SCORE   0.383
RISK_VALUE  -0.836 -0.796
RISK_SCORE:  0.840  0.786     -1.000
fit warnings:
Some predictor variables are on very different scales: consider rescaling
>
> r.squaredGLMM(MLM)
             R2m       R2c
[1,] 0.005882448 0.7550609
> #Note Going from State->County->Tract, appears to add R-squared in
explanatory power per level of additional granularity, though not fully
> #It appears the NRI itself explains very little (<1%) but the TRACTFIPS
explains nearly 75%
> #summary(MLM)
> #r.squaredGLMM(MLM)
```