mfccGamms

```
require(tidyverse)
require(mgcv)
require(mgcViz)
require(itsadug)
```

Load prepared mfcc data

```
setwd("C:/Users/Helen/Desktop/Stats/Pruned3_big")

mfccData = read.csv("mfcc_ready_for_gamms.csv")

mfccData$speaker = as.factor(mfccData$speaker)
mfccData$label = as.factor(mfccData$label)
```

GAM with tensor product interaction for mfcc

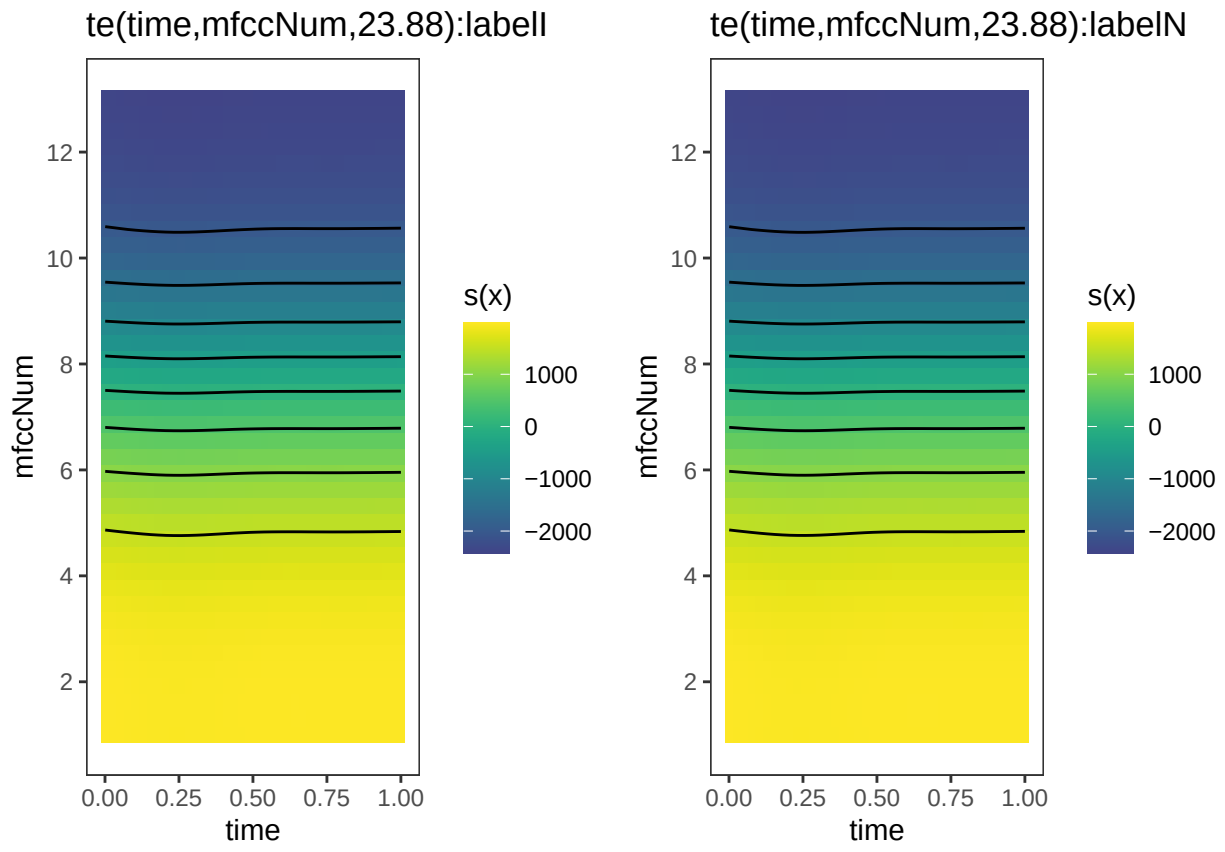
```
m1mfcc=bam(mfcc ~ label + te(time, mfccNum, by=label) + s(time, speaker, bs="fs", m=1)
           + s(mfccNum, speaker, bs="fs", m=1), data=mfccData)
m1mfccViz = getViz(m1mfcc)
```

```
summary(m1mfcc)
```

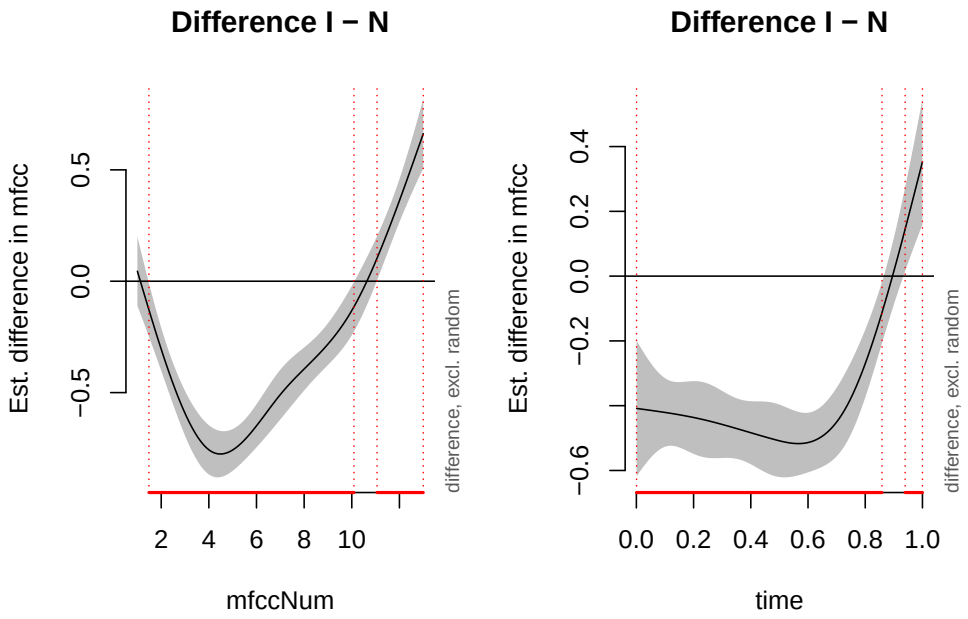
```
##
## Family: gaussian
## Link function: identity
##
## Formula:
## mfcc ~ label + te(time, mfccNum, by = label) + s(time, speaker,
##     bs = "fs", m = 1) + s(mfccNum, speaker, bs = "fs", m = 1)
##
## Parametric coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 213.33592    1.83902  116.00   <2e-16 ***
## labelN        0.21952    0.01188   18.48   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
##                             edf Ref.df      F p-value
## te(time,mfccNum):labelI   23.88   23.9 3510.4  <2e-16 ***
## te(time,mfccNum):labelN   23.88   23.9 3480.5  <2e-16 ***
## s(time,speaker)           99.76  107.0  143.5  <2e-16 ***
## s(mfccNum,speaker)       101.36  107.0 5586.6  <2e-16 ***
## ---
```

```
## Signif. codes:  0 ’***’ 0.001 ’**’ 0.01 ’*’ 0.05 ’.’ 0.1 ’ ’ 1
##
## R-sq.(adj) =  0.181   Deviance explained = 18.1%
## fREML = 2.2897e+07  Scale est. = 189.21    n = 5666700
```

```
print(plot(m1mfccViz, allTerms=T) + scale_y_continuous(
    breaks = c(2, 4, 6, 8, 10, 12),
    labels = c("2", "4", "6", "8", "10", "12")), pages=3)
```




```
par(mfrow=c(1, 2))
plot_diff(m1mfcc, view="mfccNum", shade=TRUE, comp=list(label=c("I", "N")), rm.ranef=TRUE)
plot_diff(m1mfcc, view="time", shade=TRUE, comp=list(label=c("I", "N")), rm.ranef=TRUE)
```




```
par(mfrow=c(1, 1))
par(mar=c(5, 5, 3, 8))
plot_diff2(m1mfcc, view=c('time', "mfccNum"), comp=list(label=c("I", "N")),
           main="Difference by label", xlab="Time", ylab="mfccNum", rm.ranef=TRUE)
```