Modellazione multilevel

Daniele Zago

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Aggiungo una variabile `current` che indica a quale sillaba (`syllable1` o `syllable2`) corrisponde la riga.

```
mandarino$current = ifelse(mandarino$time <= 10, mandarino$syllable1, mandarino$syllable2)
mandarino$current = levels(mandarino$syllable1)[mandarino$current]
head(mandarino)
```

cog_load	syllable1	syllable2	subject	repetition	f0	time	current
CL0	T1	T1	S1	1	237.8565	1	T1
CL0	T1	T2	S1	1	202.9726	1	T1
CL0	T1	T3	S1	1	229.1408	1	T1
CL0	T1	T4	S1	1	223.7852	1	T1
CL0	T2	T1	S1	1	186.8410	1	T2
CL0	T2	T2	S1	1	192.3721	1	T2

```
library(rstanarm)
library(bayesplot)
library(tidybayes)
library(ggplot2)
library(magrittr)
library(lme4)
library(dplyr)
```

Dalle considerazioni effettuate nell'analisi esplorativa, definisco inizialmente un modello che tenga conto di:

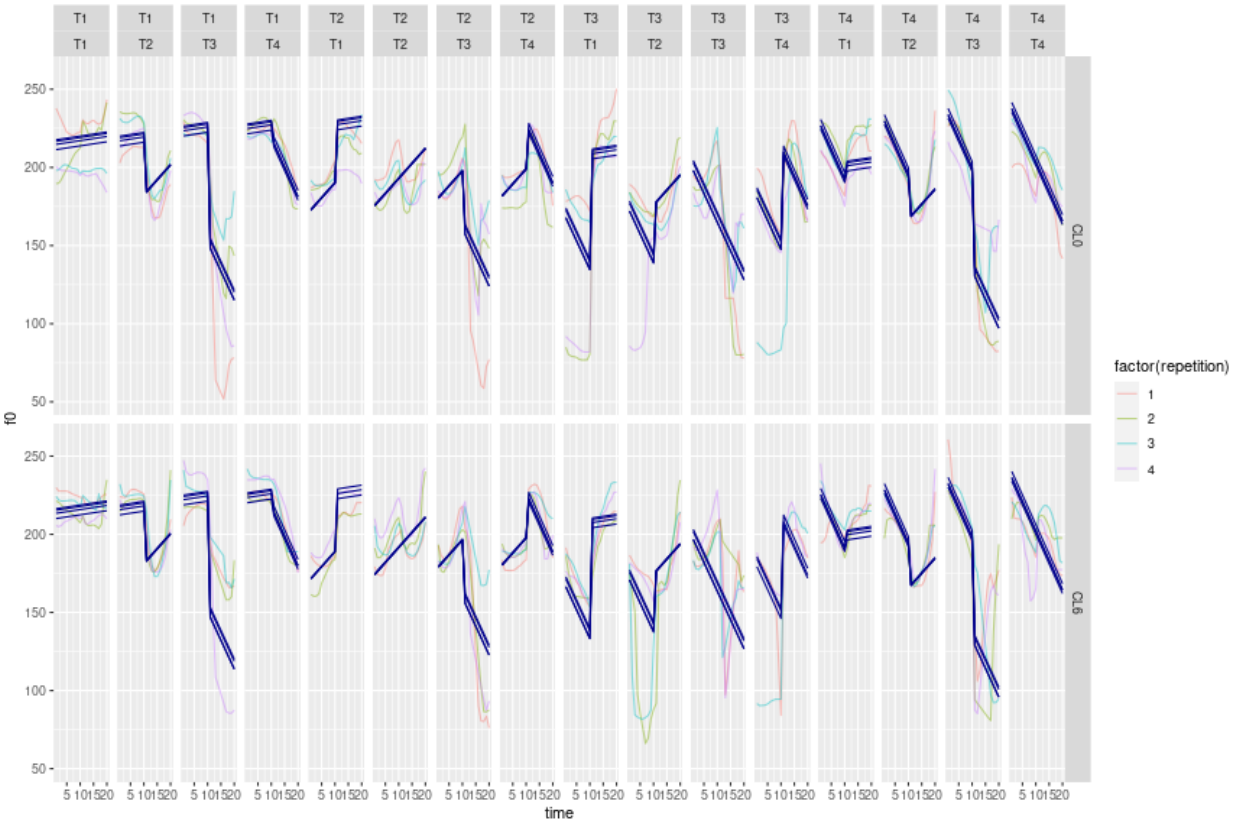
- Effetto globale del carico cognitivo: $\beta_{\text{cog}} \cdot x_{\text{cog}}$
- Effetto medio del tempo: $\beta_t \cdot t$
- Effetto medio della sillaba che si sta pronunciando: $\beta_{\text{cur}} x_{\text{cur}}$
- Diverso andamento medio nel tempo in base alla sillaba che si sta pronunciando: $\beta_{t,cur_i} t \cdot x_{cur_i}$
- Effetto medio della prima e ultima sillaba: $\beta_{\text{s1}} x_{\text{s1}}, \beta_{\text{s2}} x_{\text{s2}}$
- Effetto medio della combinazione di prima e ultima sillaba: $\beta_{\text{s1s2}} x_{\text{s1}} \cdot x_{\text{s2}}$
- Effetto casuale dei soggetti e delle ripetizioni: $\alpha_{(j)} + \alpha_{\text{cur}(j)} + \alpha_{\text{s1}(j)} + \alpha_{\text{s2}(j)} + \alpha_{\text{rep}(j)}$

```
if(file.exists("fitLmer.Rdata")){
    load("fitLmer.Rdata")
} else{
    fit = lmer(f0 ~ cog_load + time + current + time:current + syllable1 + syllable2 +
                syllable1:syllable2 + (1 + current + syllable1+syllable2 + repetition|subject),
           control = lmerControl(optimizer = "bobyqa"),
           data = mandarino,
```

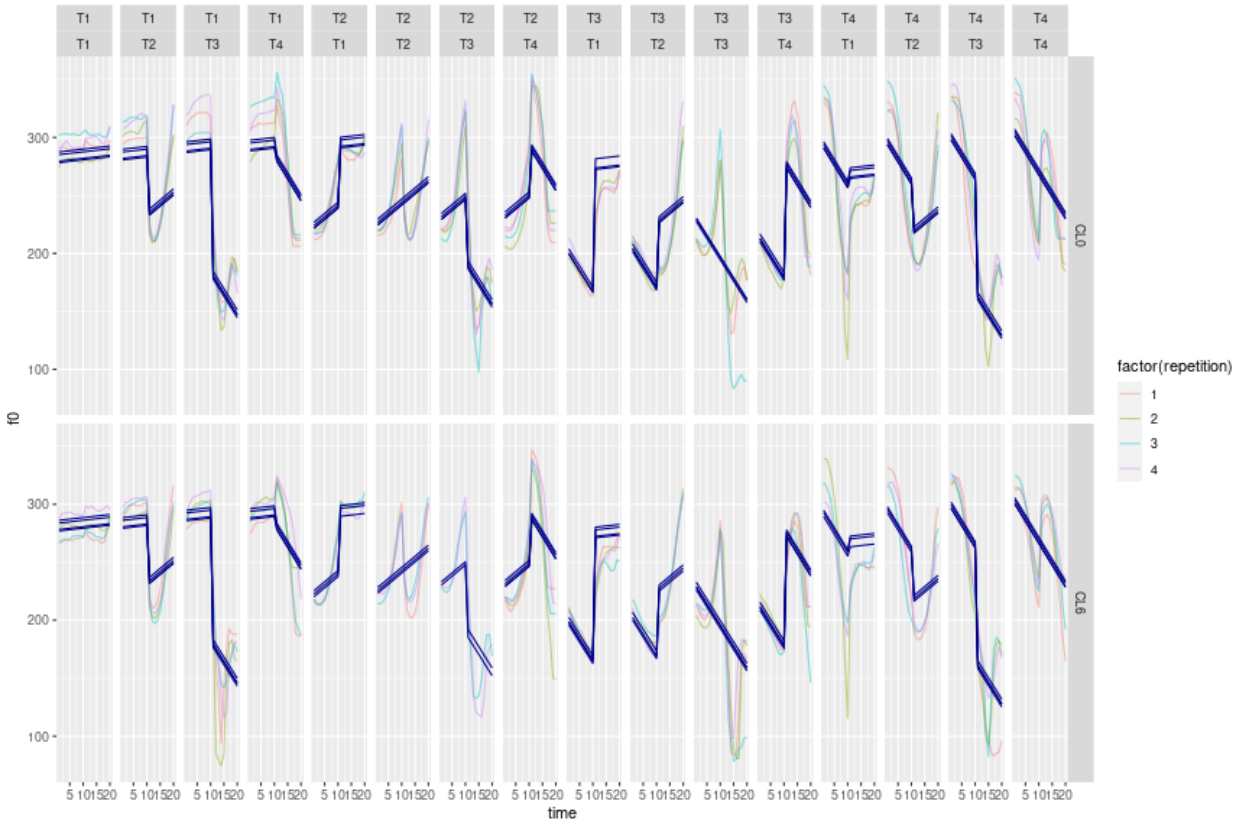
```
            verbose = 2)
    save(fit, file="fitLmer.Rdata")
}
```

```
ppc_subject = function(subj, datiPred){
    # Plot frequency profiles (f_0) for an individual subject with predictions
    #
    # @param subj: string containing subject identifier, e.g. "S10"
    # @param datiPred: dataset with an additional `ypred` column
    #
    # @return ggplot2 object, plot with average effect over different repetitions

    if(!subj %in% levels(datiPred$subject)) stop("Subject not found")

    datiPred %>%
        subset(subject == subj) %>%
        ggplot(aes(time))+
        geom_line(aes(y = f0, group = repetition, color = factor(repetition)), alpha=0.45) +
        geom_line(aes(y = ypred, group = repetition), color = "darkblue") +
        facet_grid(cog_load ~  syllable1*syllable2)
}
```

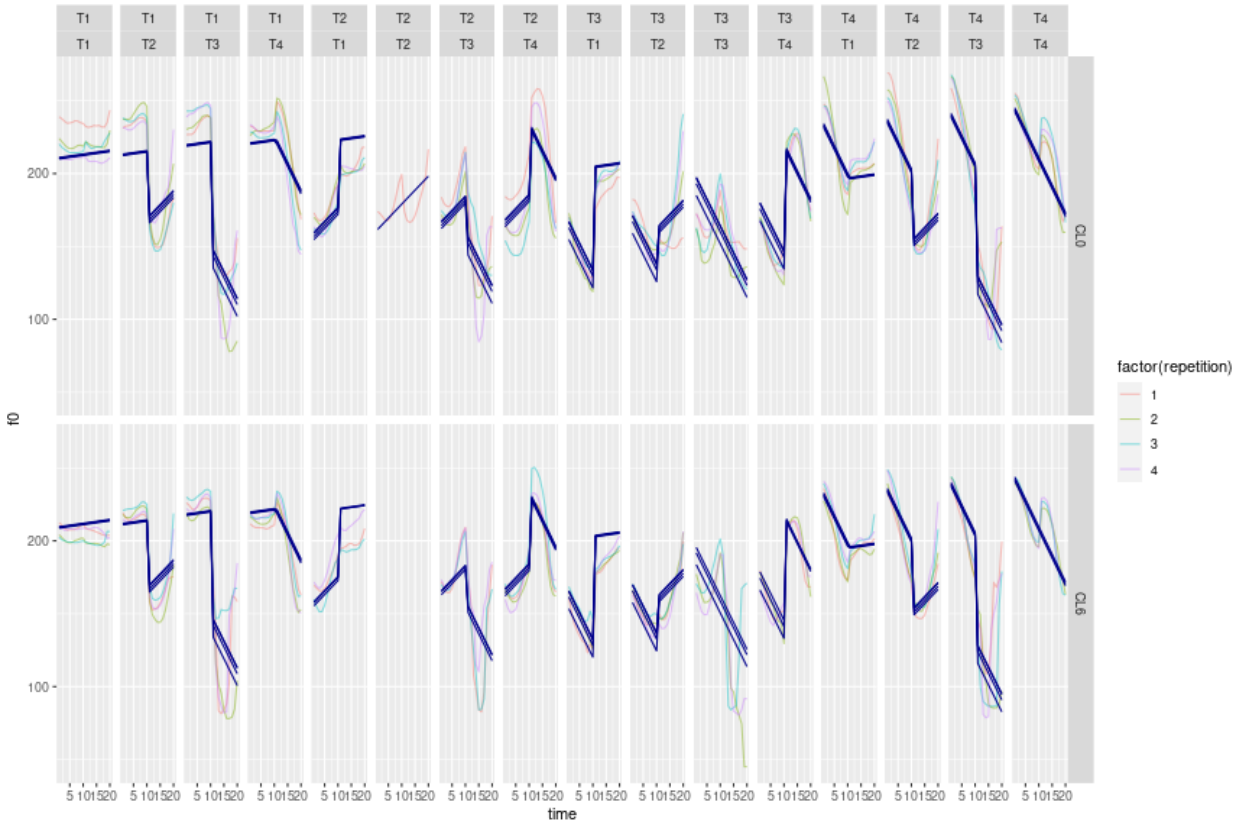
```
ypred = predict(fit)
datiPred = cbind(mandarino, ypred)

ppc_subject("S1", datiPred)
```



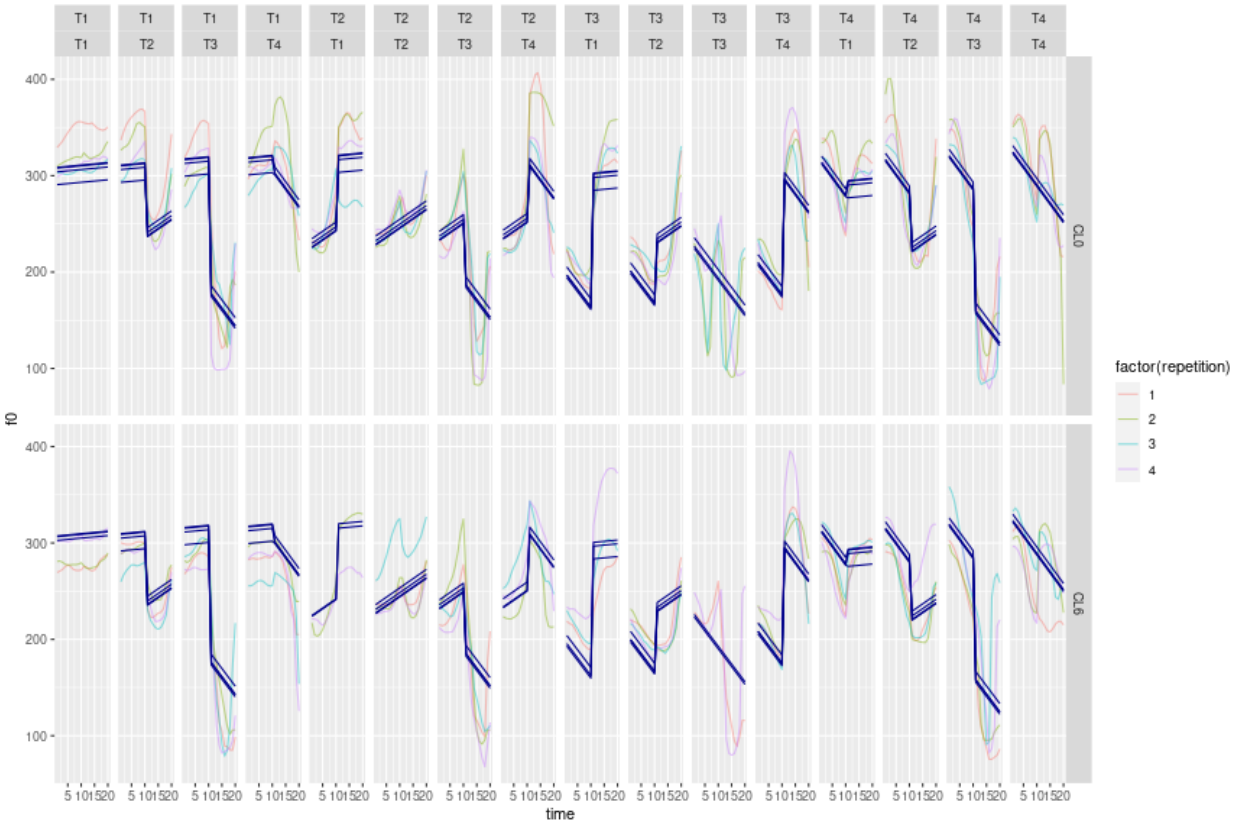
```
ppc_subject("S2", datiPred)
```




```
ppc_subject("S3", datiPred)
```




```
ppc_subject("S4", datiPred)
```


T1 T1
T1 T2
T1 T3
T1 T4
T2 T1
T2 T2
T2 T3
T2 T4
T3 T1
T3 T2
T3 T3
T3 T4
T4 T1
T4 T2
T4 T3
T4 T4
CL0
CL6
f0
400
300
200
100
5 10 15 20
time
factor(repetition)
1
2
3
4