Examples of LME4

This is just an example to show how to specify random effects in intercepts and slopes using lme4 package.

Suppose we only want to fit the model to predict CD4 by one predictor Time.

```
#install.packages("lme4")
library(lme4)
```

```
## Loading required package: Matrix
```

```
data.cd <- read.csv("BMACS.csv")
```

1. Random effect in intercept only:

$$y_{ij} = \beta_0 + b_{1i} + \beta_1 t_{ij} + \epsilon_{ij}$$

```
fit1 <- lmer(CD4 ~ Time + (1|ID), data = data.cd)
fit1
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: CD4 ~ Time + (1 | ID)
##    Data: data.cd
## REML criterion at convergence: 12553.91
## Random effects:
##  Groups   Name        Std.Dev.
##  ID       (Intercept) 8.825
##  Residual             6.345
## Number of obs: 1817, groups:  ID, 283
## Fixed Effects:
## (Intercept)         Time
##      35.372       -2.675
```

2. Random effect in slop only:

$$y_{ij} = \beta_0 + (\beta_1 + b_{1i}) t_{ij} + \epsilon_{ij}$$

```
fit2 <- lmer(CD4 ~ Time + (Time-1|ID), data = data.cd)
fit2
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: CD4 ~ Time + (Time - 1 | ID)
##    Data: data.cd
## REML criterion at convergence: 12776.76
## Random effects:
##  Groups   Name Std.Dev.
##  ID       Time 3.695
##  Residual      6.911
## Number of obs: 1817, groups:  ID, 283
## Fixed Effects:
## (Intercept)         Time
##      35.895       -3.109
```

3. Random effect in both intercept and slope

$$y_{ij} = \beta_0 + b_{1i} + (\beta_1 + b_{2i})t_{ij} + \epsilon_{ij}$$

```
fit3 <- lmer(CD4 ~ Time + (Time|ID), data = data.cd)
fit3
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: CD4 ~ Time + (Time | ID)
##    Data: data.cd
## REML criterion at convergence: 12154.3
## Random effects:
##  Groups   Name        Std.Dev. Corr
##  ID       (Intercept) 8.846
##           Time        3.052    -0.32
##  Residual             5.004
## Number of obs: 1817, groups:  ID, 283
## Fixed Effects:
## (Intercept)         Time
##      35.749       -3.081
```