prosjekt3

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Problem 2

```
long <- read.csv("https://www.math.ntnu.no/emner/TMA4315/2020h/eliteserie.csv", colClasses = c("factor"
```

2 a)

```
library(glmmTMB)
mod <- glmmTMB(goals ~ home + (1|attack) + (1|defence), poisson, data=long, REML=TRUE)
```

Part 1 State the precise assumptions of this model in suitable mathematical notation.

Part 2 Explain why the Poisson assumption may be reasonable way to model the inherent randomness of a football game.

Poisson distribution can be used to measure the probability of independent events occurring a certain number of times within a set period - such as the number of goals scored in a football match.

It can be used to do this by converting averages into a probability for the changeable outcomes.

The number of events occuring within a time interval or a region, is independent of the number of events that occurs in any other disjoint (non-overlapping) time interval or region. The probability that a single event occurs within a small time interval or region, is proportional to the length of the interval or the size of the region. The probability that more than one event may occur within a small time interval or region is negligable

When all of these three properties are funfilled we have a Poisson process. The number of events in a Poisson process follows a Poisson distribution.

https://help.smarkets.com/hc/en-gb/articles/115001457989-How-to-calculate-Poisson-distribution-for-football-betting

2b

```
summary(mod)
```

```
##  Family: poisson  ( log )
## Formula:          goals ~ home + (1 | attack) + (1 | defence)
## Data: long
##
##      AIC      BIC   logLik deviance df.resid
##   1147.2   1163.1   -569.6   1139.2      382
##
## Random effects:
##
```

```
## Conditional model:
##  Groups  Name        Variance Std.Dev.
##  attack  (Intercept) 0.007478 0.08647
##  defence (Intercept) 0.016383 0.12800
## Number of obs: 384, groups:  attack, 16; defence, 16
##
## Conditional model:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.12421    0.07809   1.591    0.112
## homeyes      0.40716    0.08745   4.656 3.22e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
ranef(mod)
```

```
## $attack
##                     (Intercept)
## BodoeGlimt         -0.036781062
## Brann               0.012026209
## Haugesund           0.011223106
## Kristiansund       -0.011367328
## Lillestroem        -0.049915996
## Molde               0.078390643
## Odd                 0.003654179
## Ranheim_TF          0.023375599
## Rosenborg           0.050622609
## Sandefjord_Fotball -0.058333079
## Sarpsborg08         0.026946364
## Stabaek            -0.026801293
## Start              -0.060500163
## Stroemsgodset       0.024556017
## Tromsoe             0.005756700
## Vaalerenga          0.007147494
##
## $defence
##                     (Intercept)
## BodoeGlimt         -0.042616090
## Brann              -0.123934761
## Haugesund          -0.061931278
## Kristiansund        0.008112432
## Lillestroem         0.030699257
## Molde              -0.036630979
## Odd                -0.052013600
## Ranheim_TF          0.062209734
## Rosenborg          -0.152631173
## Sandefjord_Fotball  0.133164228
## Sarpsborg08         0.006574064
## Stabaek             0.085376126
## Start               0.081958112
## Stroemsgodset       0.040486666
## Tromsoe            -0.009852817
## Vaalerenga          0.031030079
```

Part 1 Briefly discuss if the various parameter estimates appear reasonable.