library(ggplot2)

library(brms)

options(mc.cores = parallel::detectCores())

rstan\_options(auto\_write = TRUE)

#The data

x = c(1,3,5,7,9,11)

y = 25 + 3\*x + rnorm(length(x),sd=2)

d = data.frame(y,x)

pp <- ggplot(d, aes(y=y,x=x)) + geom\_point()

print(pp)

#where to predict

newdata = data.frame(x= 1:11)

fmod <- lm(y ~ 1 + x , data = d)

fcpred <- cbind(newdata,predict(fmod,newdata=newdata,interval = "confidence"))

fpred <- cbind(newdata,predict(fmod,newdata=newdata,interval = "prediction"))

ppf <- pp + geom\_line(aes(y=fit),data=fpred) +geom\_line(aes(y=lwr),data=fcpred) +geom\_line(aes(y=upr),data=fcpred) +geom\_line(aes(y=lwr),data=fpred,col="red") +geom\_line(aes(y=upr),data=fpred,col="red")

print(ppf)

bmod <- brm(y ~ 1 + x , data = d,iter = 10000)

bpred <- cbind(newdata,predict(bmod,newdata=newdata))

ppb <- pp + geom\_line(aes(y=Estimate),data=bpred) +geom\_line(aes(y=Q2.5),data=bpred) +geom\_line(aes(y=Q97.5),data=bpred)

print(ppb)

#how it works behind the scene ?

coef <- as\_draws\_df(bmod)

names(coef)

plot(density(coef$b\_Intercept))

bpred2 = t(sapply(newdata$x, function(x){

 print(x)

y\_cred = coef$b\_Intercept + x \* coef$b\_x

y\_pred = rnorm(nrow(coef), y\_cred,coef$sigma) #the predictive

proba = mean(y\_pred > 60)

return(c(fit = mean(y\_cred),

 lwr = unname(quantile(y\_cred,probs=0.025)),

 upr = unname(quantile(y\_cred,probs=0.975)),

 plwr = unname(quantile(y\_pred,probs=0.025)),

 pupr = unname(quantile(y\_pred,probs=0.975)),

 proba = proba))

}))

bpred2 <- cbind(newdata,bpred2)

ppb2 <- pp + geom\_line(aes(y=fit),data=bpred2) +geom\_line(aes(y=lwr),data=bpred2) +geom\_line(aes(y=upr),data=bpred2) +geom\_line(aes(y=plwr),data=bpred2,col="red") +geom\_line(aes(y=pupr),data=bpred2,col="red")

print(ppb2)