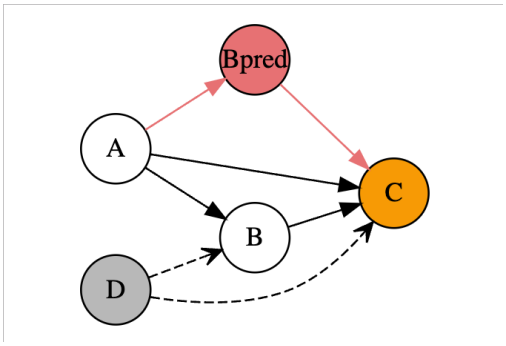
65_simulationofTwostep

2024-06-25

simulation for two step

simulation 1



$$A_{n\times a} \sim \mathcal{N}\left(0, \frac{1}{a}\right), D_{n\times d} \sim \mathcal{N}\left(0, \frac{1}{d}\right)$$

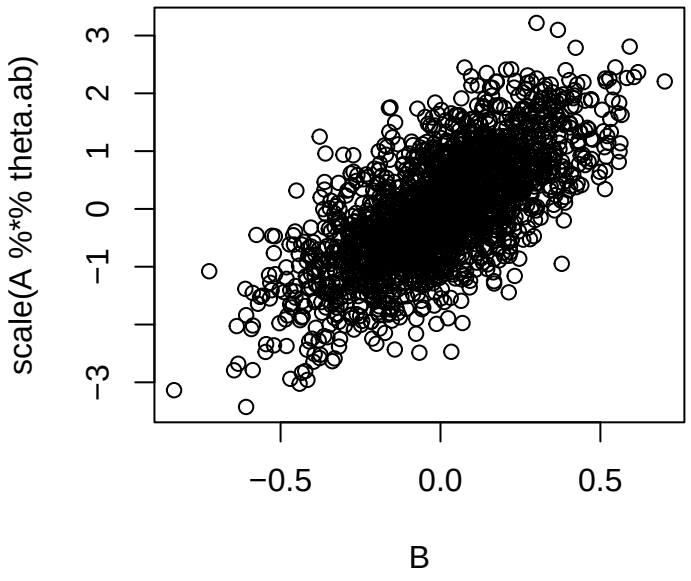
$$B_{n\times b} = A\theta_a + D\theta_d + \epsilon$$

$$C_{n\times c} = A\theta_a + B\theta_b + D\theta_d + \epsilon$$

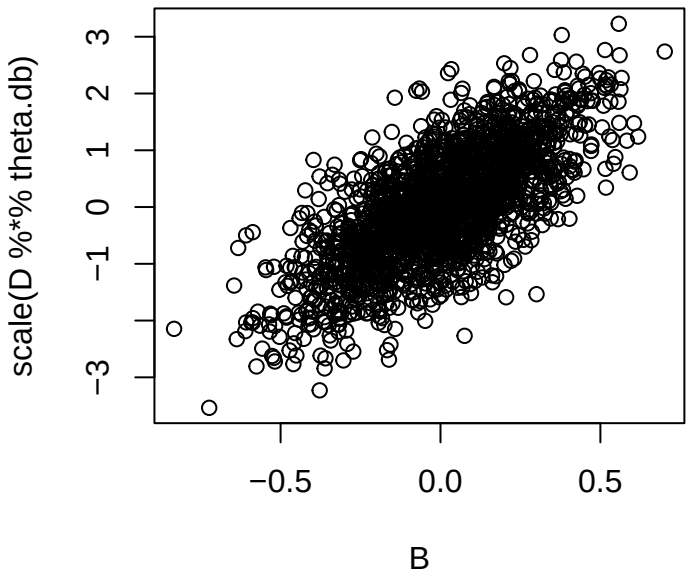
Data Generate

```
# Generate X
set.seed(123)

n <- 100 #Samples
a <- 20
a2<- 20
b <- 20
c <- 20
d <- 20

w <- 1

theta.ab <- matrix(runif(a*b,-w,w),a,b)
theta.ac <- matrix(runif(a*c,-w,w),a,c)

theta.a2b <- matrix(runif(a2*b,-w,w),a2,b)
theta.a2c <- matrix(runif(a2*c,-w,w),a2,c)
```

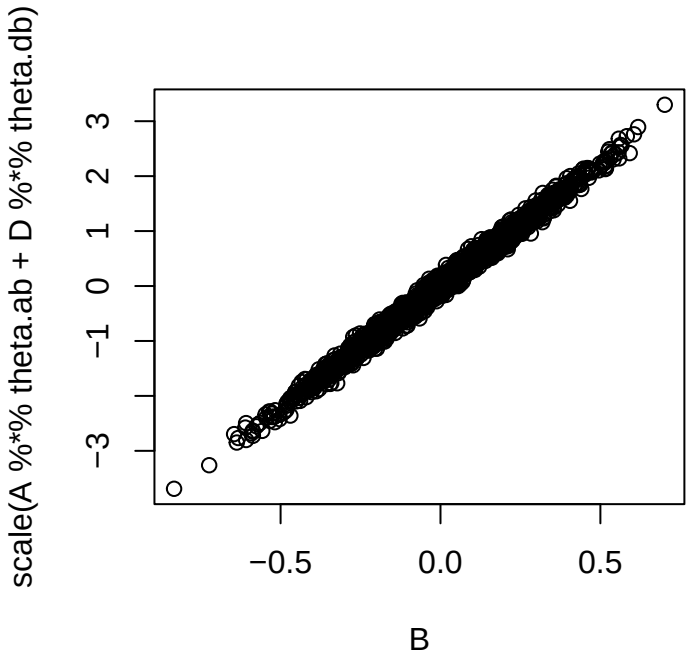
```r
theta.bc <- matrix(runif(b*c, -w,w),b,c)

theta.db <- matrix(runif(d*b,-w,w),d,b)
theta.dc <- matrix(runif(d*c,-w,w),d,c)


noise.B <- matrix(rnorm(n = n*b, mean = 0, sd = 0.1),n,b)
noise.C <- matrix(rnorm(n = n*c, mean = 0, sd = 0.1),n,c)

A <- matrix(rnorm(n = n*a, mean = 0, sd = 1 / (a**(1/2))),n,a)
A2 <- matrix(rnorm(n = n*a, mean = 0, sd = 1 / (a2**(1/2))),n,a)
D <- matrix(rnorm(n = n*d, mean = 0, sd = 1 / (d**(1/2))),n,d)
B <- scale(scale(A %*% theta.ab + D %*% theta.db) + noise.B)
B <- B / (b**(1/2))
C <- scale(A %*% theta.ac + B %*% theta.bc + D %*% theta.dc) + noise.C

# for the next simulation
B2 <- scale(scale(A %*% theta.ab + A2 %*% theta.a2b + D %*% theta.db) + noise.B)
B2 <- B2 / (b**(1/2))
C2 <- scale(A %*% theta.ac + A2 %*% theta.a2c  + B2 %*% theta.bc + D %*% theta.dc) + noise.C


plot(B,scale(A %*% theta.ab))
```



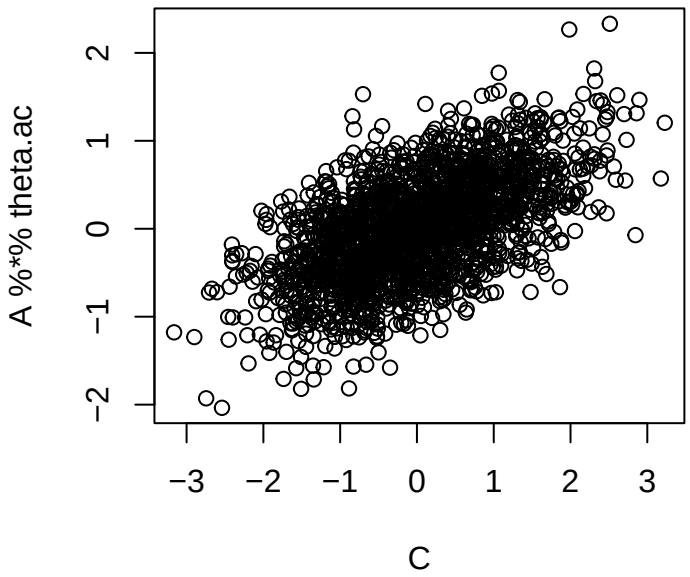
```
plot(B,scale (D %*% theta.db))
```



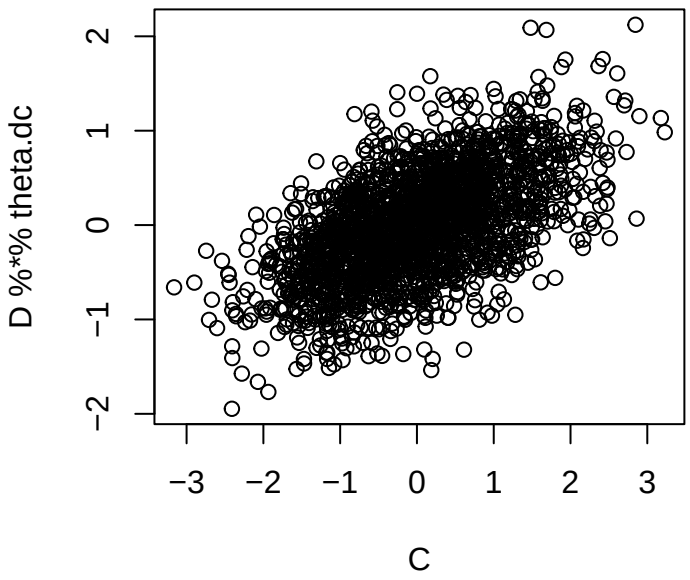

```
plot(B,scale(A %*% theta.ab + D %*% theta.db))
```



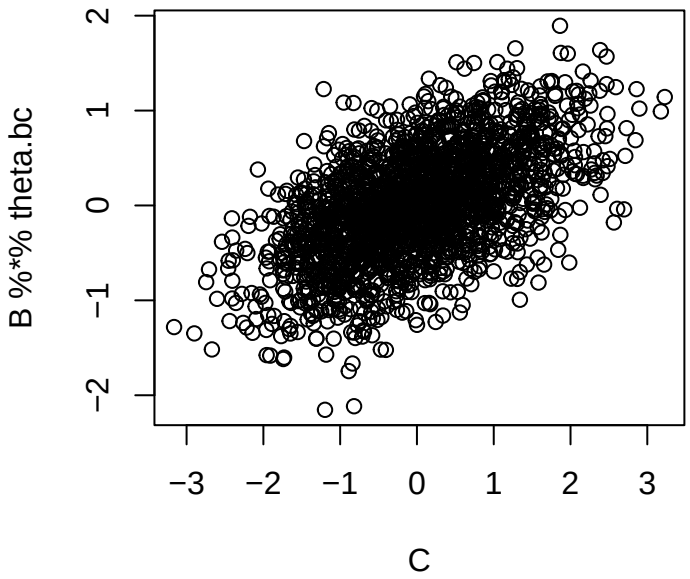
```
plot(C,A %*% theta.ac)
```



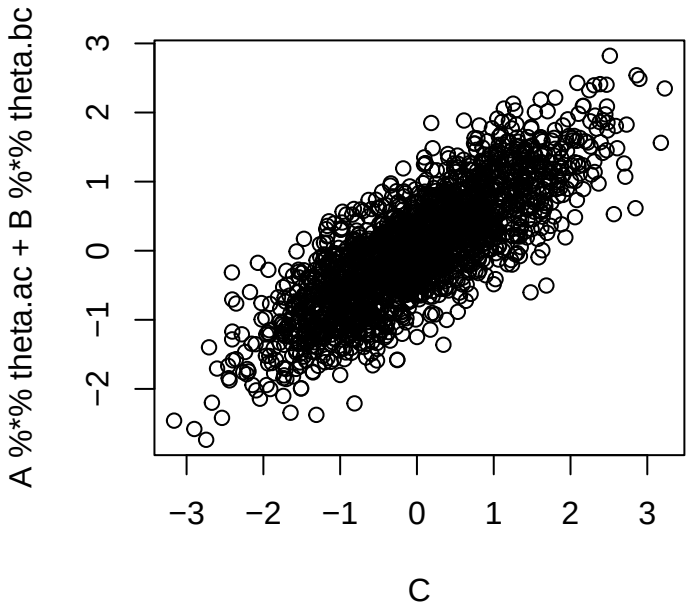

```
plot(C,D %*% theta.dc)
```



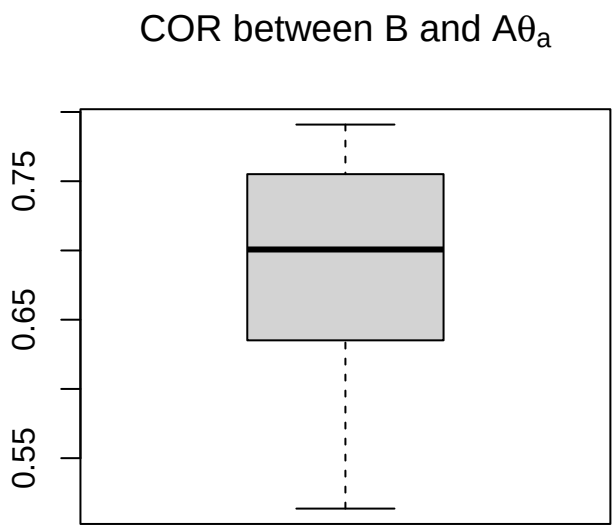
```
plot(C,B %*% theta.bc)
```




```
plot(C,A %*% theta.ac +  B %*% theta.bc)
```



```
boxplot(diag(cor(B,A %*% theta.ab)), main=expression(paste("COR between B and A", theta[a])))
```




```
# hist(A)
# hist(B)
# hist(C)
# hist(D)

fol<-paste0("out/TwostepSimulation_b","n",n)

if (!dir.exists(fol)) {
  dir.create(fol)
}
```

```
tr(crossprod(B,B))
```

```
## [1] 99
```

```
tr(crossprod(A,A))
```

```
## [1] 99.33882
```

```
tr(crossprod(D,D))
```

```
## [1] 98.29576
```

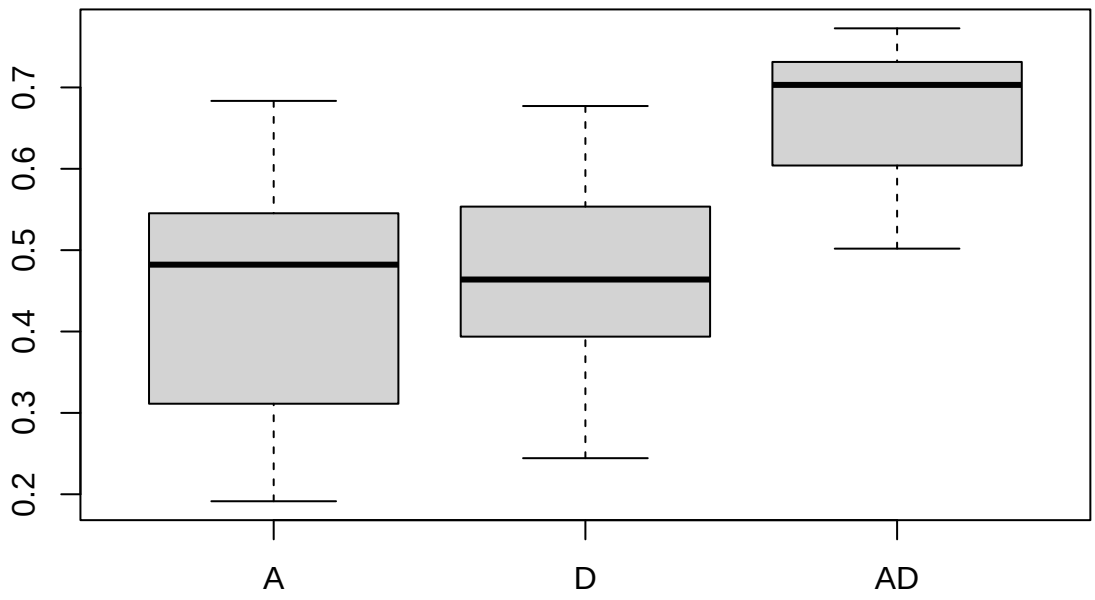
predict B

```
AD = list(A=A,D=D)
RFlist <- list(A=list(A=A),D=list(D=D),AD=AD)

Y <- B

tic()
res <- getRF(RFlist,Y)
toc()

saveRDS(res,paste0(fol,"/","resb_adad"))
```

```
res<- readRDS(paste0(fol,"/","resb_adad"))

file_path <- "/Users/hayatoyoshioka/Documents/R/HayatoINRAE/pdf/boxplot.pdf"

# Open a PDF device
pdf(file = file_path, width = 8, height = 5)

# Create the boxplot
boxplot(t(res$resultEachModel), main="Bpred fitting by")

# Close the PDF device
dev.off()
```

```
## pdf
##   2
```

```
boxplot(t(res$resultEachModel), main="Bpred fitting by")
```




```
res<- readRDS(paste0(fol,"/","resb_adad"))
Bpred <- matrix(NA, nrow = nrow(Y), ncol = ncol(Y))
for (i in 1:ncol(Y)){
Bpred[,i] <- res$y.pred.list[[i]][,"A"]
}
saveRDS(Bpred,paste0(fol,"/","Bpred"))
```

```
Bpred<- readRDS(paste0(fol,"/","Bpred"))
```

predict C

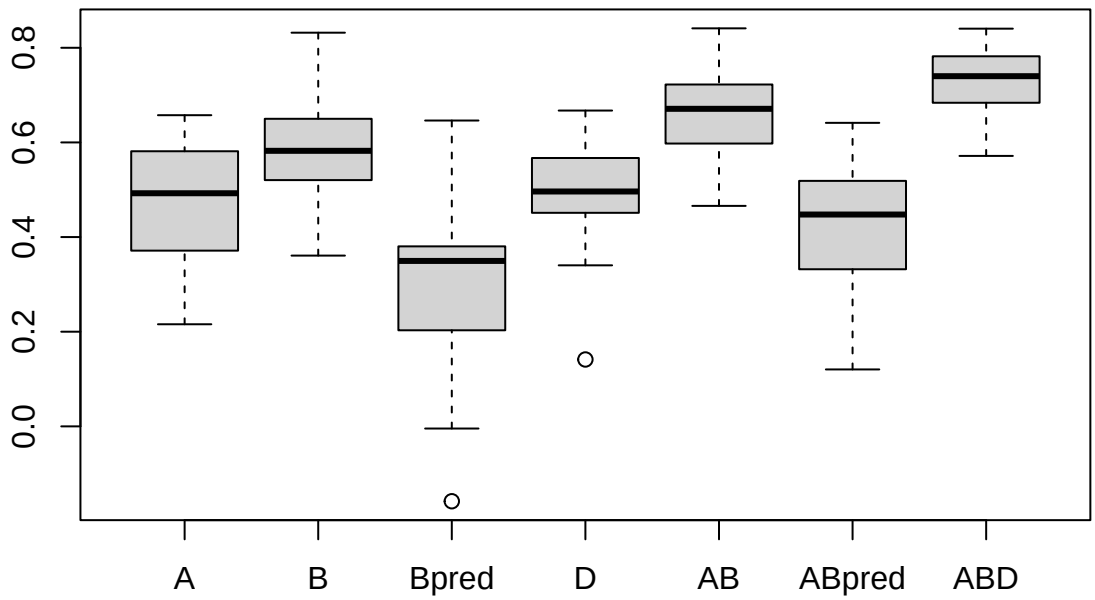
```
AB  <- list(A=A,B=B)
ABpred <- list(A=A, Bpred=Bpred)
ABD <- list(A=A, B=B, D=D)
RFlist <- list(A=list(A=A),B=list(B=B),Bpred=list(Bpred=Bpred),D=list(D=D),AB=AB,ABpred=ABpred,ABD=ABD)

Y <- C
tic()
res <- getRF(RFlist,Y)
toc()

saveRDS(res,paste0(fol,"/","res_abbdababd"))
```

```
RFlist <- list(Bpred_B=list(Bpred=Bpred))

Y <- C

tic()
res2 <- getRF(RFlist,Y,dummy="Bpred",Tv=B)
toc()
saveRDS(res2,paste0(fol,"/","res_bpred_b"))
```

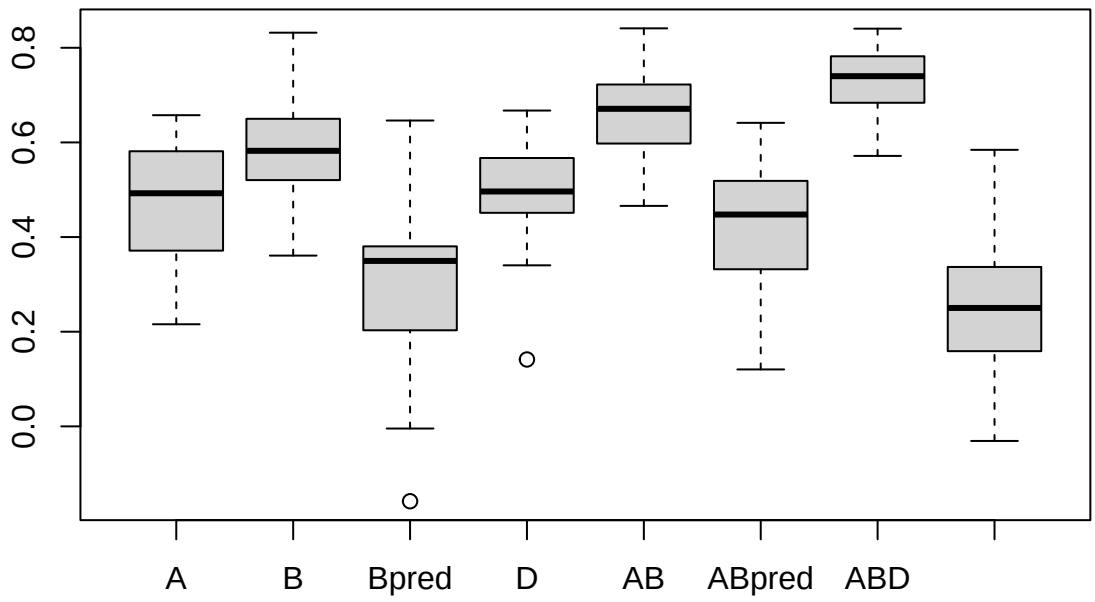
```
res<- readRDS(paste0(fol,"/","res_abbdababd"))
res2<- readRDS(paste0(fol,"/","res_bpred_b"))

res12_all<- rbind(data.frame(res$resultEachModel),data.frame(res2$resultEachModel))

file_path <- "/Users/hayatoyoshioka/Documents/R/HayatoINRAE/pdf/boxplot2.pdf"

# Open a PDF device
pdf(file = file_path, width = 8, height = 5)

# Create the boxplot
boxplot(t(res12_all),main="Cpred fitting")

# Close the PDF device
dev.off()
```

```
## pdf
##   2
```

```
boxplot(t(res$resultEachModel),main="Cpred fitting by")
```



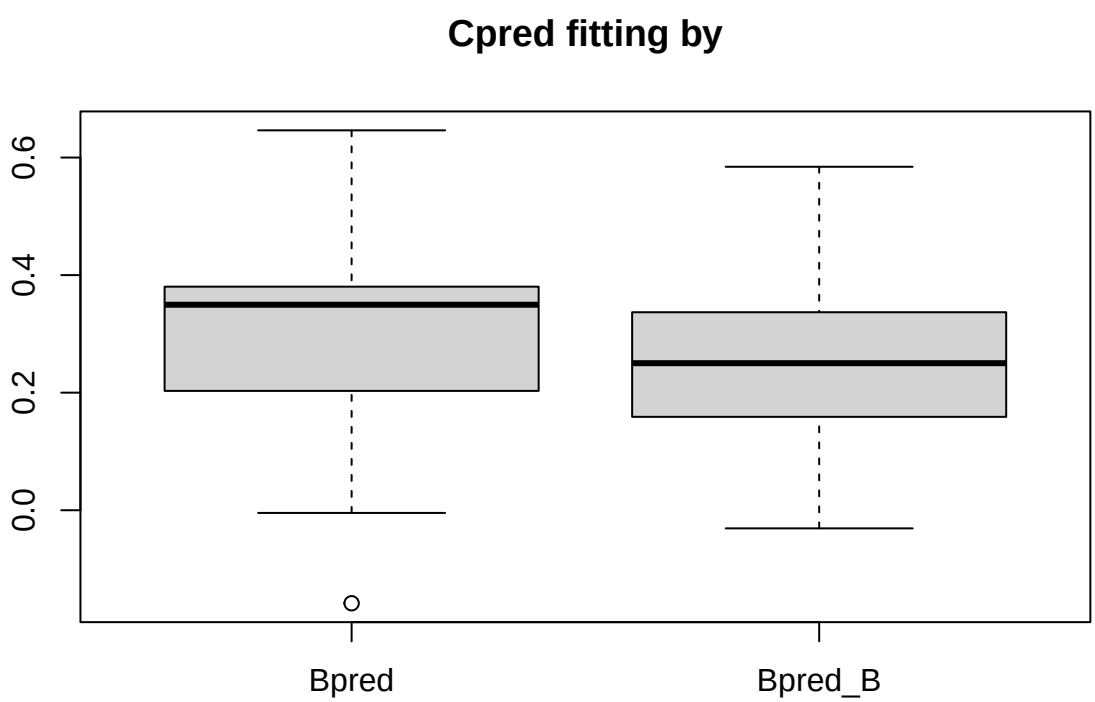

```
boxplot(t(res12_all),main="Cpred fitting by")
```




```
#res$resultEachModel
#res2$resultEachModel

res12<- rbind(data.frame(res$resultEachModel)[3,],data.frame(res2$resultEachModel))

file_path <- "/Users/hayatoyoshioka/Documents/R/HayatoINRAE/pdf/boxplot3.pdf"

# Open a PDF device
pdf(file = file_path, width = 8, height = 5)

boxplot(t(res12),main="Cpred fitting by")

# Close the PDF device
dev.off()
```

```
## pdf
##   2
```

```
boxplot(t(res12),main="Cpred fitting by")
```


Cpred fitting by
0.0
0.2
0.4
0.6
Bpred
Bpred_B