

FPCA with longitudinal projections

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Simulate data

```
rm(list=ls())
library(mvtnorm)
library(fdapace)

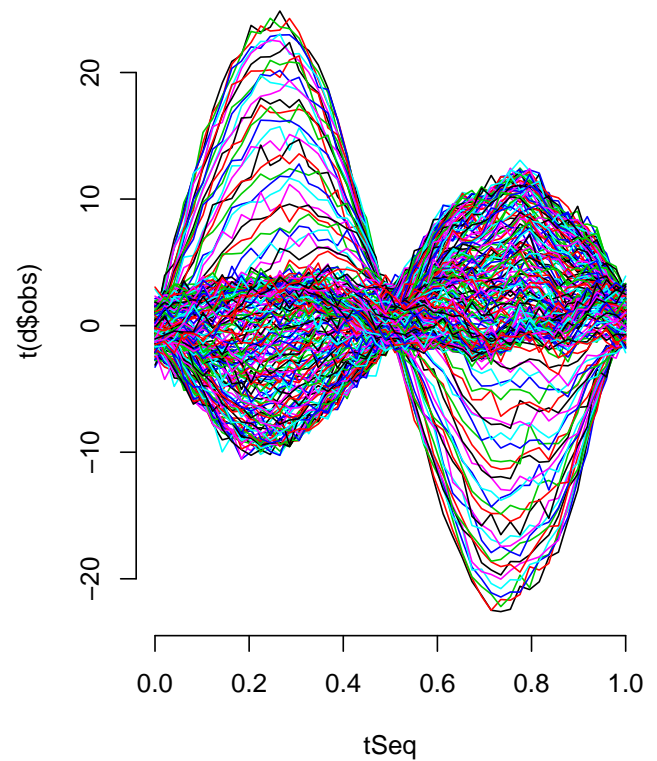
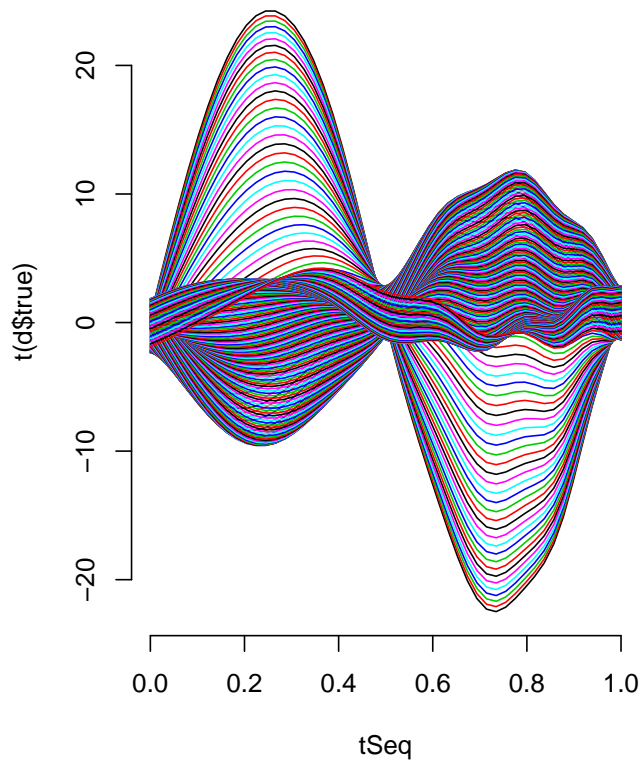
source("util.R")

N <- 200
D <- 50
K <- 2
tSeq <- seq(0, 1, length.out=D)

set.seed(123456)
d <- simData_long(N, tSeq, 0.5)

par(mfrow=c(1,2), bty="n")

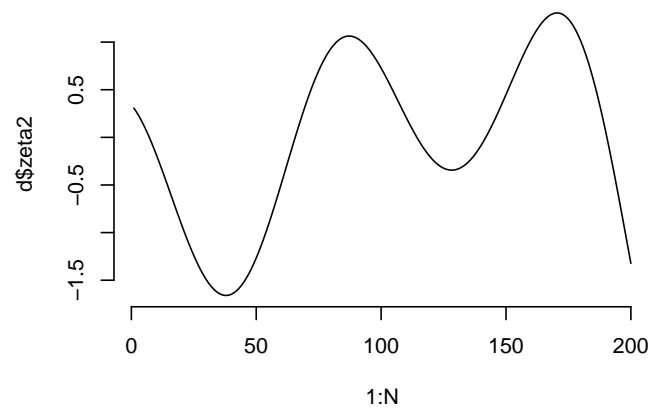
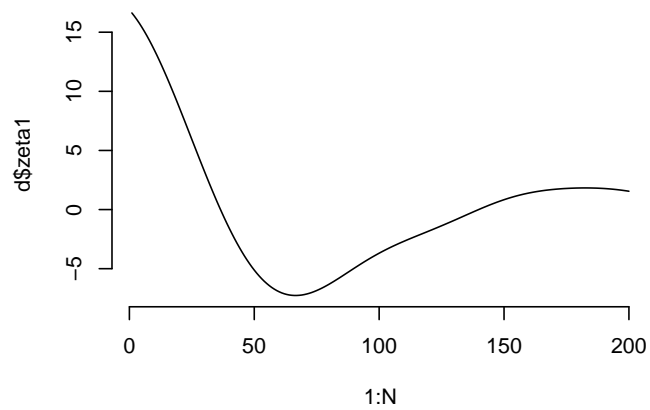
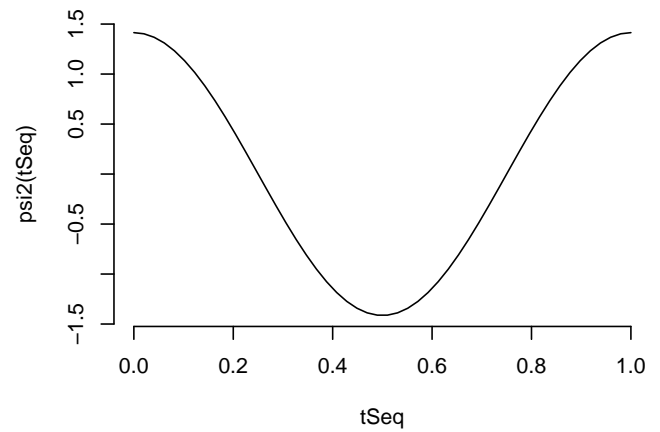
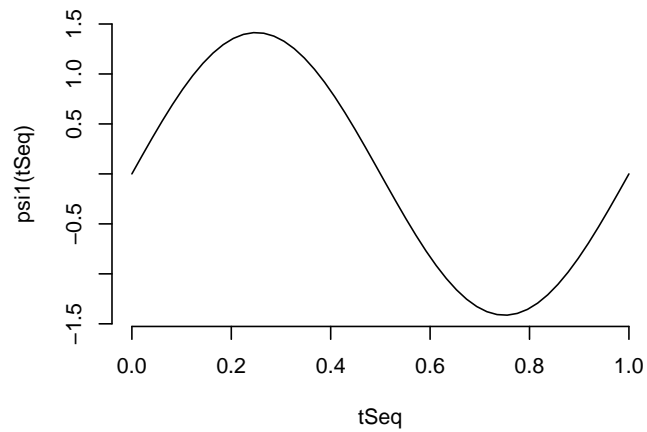
matplot(tSeq, t(d$true), type="l", lty=1)
matplot(tSeq, t(d$obs), type="l", lty=1)
```



```
par(mfrow=c(2,2), bty="n")

plot(tSeq, psi1(tSeq), type="l", lty=1)
```

```
plot(tSeq, psi2(tSeq), type="l", lty=1)
plot(1:N, d$zeta1, type="l", lty=1)
plot(1:N, d$zeta2, type="l", lty=1)
```

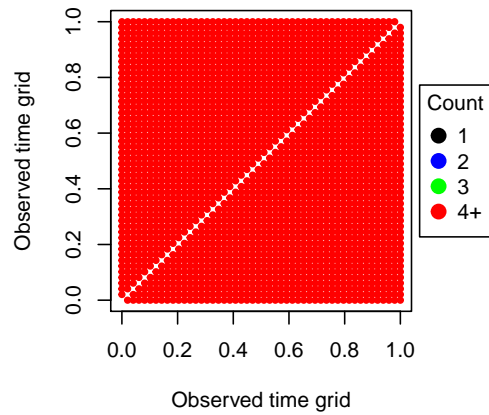


Ordinary FPCA

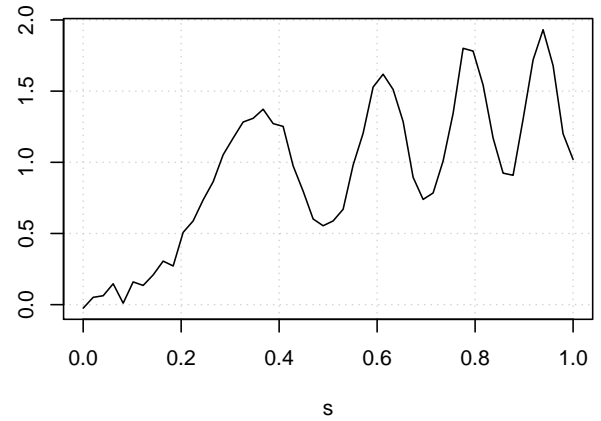
```
m_fpca <- FPCA(lapply(1:N, function(i) d$obs[i,]),
               lapply(1:N, function(i) tSeq))

plot(m_fpca)
```

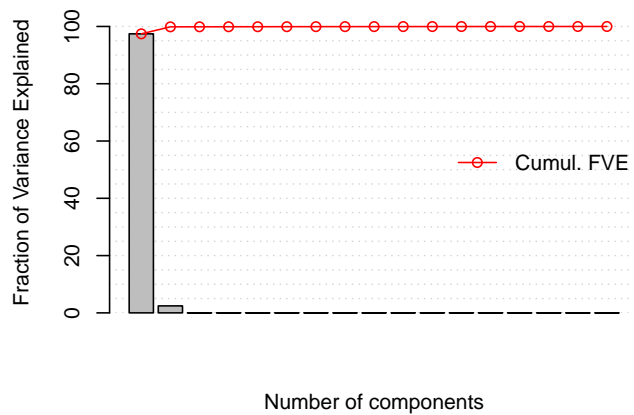
Design Plot



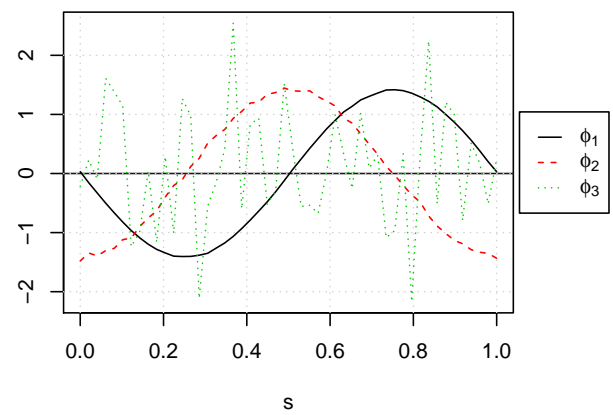
Mean Function



Scree-plot



First 3 Eigenfunctions



```
par(mfrow=c(2,2), bty="n")

plot(tSeq, -m_fpca$phi[,1], col="gray")
lines(tSeq, psi1(tSeq))

plot(tSeq, -m_fpca$phi[,2], col="gray")
lines(tSeq, psi2(tSeq))

plot(1:N, -m_fpca$xiEst[,1], col="gray")
lines(1:N, d$zeta1)

plot(1:N, -m_fpca$xiEst[,2], col="gray")
lines(1:N, d$zeta2)
```

