Examples and Figures from Wang et al. Journal of Circadian Rhythms 2011

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First we need to load the `Actigraphy` package:

```
>         library(Actigraphy)
>         library(lattice)
```

1 Figure 1(a)

```
>         ### Load Data
>         data(weekday)
>         ### Data Management
>         data2 <- NULL
>         data2$act <- weekday[,3]
>         data2$t <- weekday[,2]
>         data2$day <- weekday[,1]
>         data2$date <- factor(data2$day, levels=c("Monday", "Tuesday", "Wednesday", "Thur
>         ### Plot Options and Parameters
>         lb <- c("Midnight", "6AM", "Noon", "6PM", "Midnight")
>         L <- 1440
>         xat <- c(0, L/4, L/2, 3*L/4, L)
>         ### Plot Figure
>         lattice::xyplot(act ~ t | date, data=data2, as.table=TRUE,
+                 main="Subject 002 Activity from Monday to Friday",
+                 scales=list(x=list(at=xat, labels=lb)), cex.main=0.5,
+                 layout=c(1, 5, 1), xlim=c(0, L), xlab="(a)",
+                 ylab="Activity", panel=function(x,y) {
+                         fbase <- create.fourier.basis(rangeval=c(0,L), nbasis=9)
+                         fpar <- fdPar(fbase)
+                         fd <- smooth.basis(c(1:L), y, fpar)
+                         panel.xyplot(x, y, type="h")
+                 })
```

2 Figure 2

```
>         ### Load Data
>         data(act_8pt)
>         data(clinic_8pt)
```

```
>         ### Plot Options and Parameters
>         lb <- c("Midnight", "6AM", "Noon", "6PM", "Midnight")
>         L <- 1440
>         xat <- c(0, L/4, L/2, 3*L/4, L)
>         matchid <- fda.matchid(act_8pt, clinic_8pt, type="factor", grouplab=c("AHI", "NO
>         idhigh <- paste("Subj", colnames(matchid$mat)[matchid$cov$"NO AHI" != 1])
>         idlow <- paste("Subj", colnames(matchid$mat)[matchid$cov$"NO AHI" == 1])
>         idorder <- c(idhigh, idlow)
>         datavec <- matchid$mat
>         dim(datavec) <- NULL
>         datanew <- data.frame(y=datavec, id=rep(paste("Subj", colnames(matchid$mat)), ea
>         datanew$id <- factor(datanew$id, idorder)
>         ### Plot Figure
>         lattice::xyplot(y~t|id, data=datanew, as.table=TRUE,
+                 main="Circadian Activity from 8 Subjects",
+                 ylab="Activity", xlab="", cex.main=.7,
+                 scales=list(x=list(at=xat, labels=lb)), cex=.05,
+                 type="p", layout=c(4, 2, 1), ylim=c(0, 1200),
+                 xlim=c(0, L), panel=function(x,y) {
+                         fbase <- create.fourier.basis(rangeval=c(0, L), nbasis=9)
+                         fpar <- fdPar(fbase)
+                         sm <- smooth.basis(1:L, y, fpar)
+                         panel.xyplot(x, y, col=1, cex=0.1)
+                         panel.lines(predict(sm$fd, 1:L), col=2, lwd=3)
+                 })
```

3 Figure 3

```
>         ### Load Data
>         data(act_8pt)
>         data(clinic_8pt)
>         ahidatav2 <- fda.matchid(act_8pt, clinic_8pt, type="factor", grouplab=c("AHI", "
>         tempv2 <- ahidatav2[[2]]
>         tempv2[,3] <- ifelse(tempv2[,3] == 0, -1, 1)
>         ahidatav2$cov <- data.frame(id=tempv2$id, mean=1, ahi=tempv2[,3])
>         colv2 <- ifelse(tempv2[,3] == -1, 4, 2)
>         smoothDatav2 <- fda.smoothdata(ahidatav2)
>         geftahiv2 <- flm_cate(smoothDatav2)
>         meanefv2 <- geftahiv2$freg$betaestlist[[1]]
>         ahiefv2 <- geftahiv2$freg$betaestlist[[2]]
>         ### Plot Options and Parameters
>         L <- 1440
>         xat <- c(0, L/4, L/2, 3*L/4, L)
>         lb <- c("Midnight", "6AM", "Noon", "6PM", "Midnight")
>         ### Plot Figure
>         par(mfrow=c(2, 1), mar=c(4, 4, 3, 1))
>         plot(0, 0, xlim=c(0, L), ylim=c(0, 1200), xaxt="n", xlab="(a)", ylab="Acitivity"
>         for(i in 1:8)
+                 lines(predict(smoothDatav2$fd$fd, 1:L)[,i], col=colv2[i])
```

```
>         ### Plot the group mean activities
>         lines(meanefv2$fd-ahiefv2$fd, col=4, lwd=3)
>         lines(meanefv2$fd+ahiefv2$fd, col=2, lwd=3)
>         ### Plot the overall mean
>         lines(meanefv2$fd, col=1, lwd=3)
>         ### Add the axis and legend to finish the plot
>         axis(1, at=xat, labels=lb)
>         legend("topleft", c("AHI High Curves", "AHI High Mean", "AHI Low Curves", "AHI L
+                        lty=1, col=c(4,4,2,2,1), lwd=c(1,3,1,3,3), cex=.8)
>         ### F Test
>         cov2 <- smoothDatav2$cov[, -1]
>         grp2 <- ncol(cov2)
>         fd <- smoothDatav2$fd
>         L <- length(fd$argvals)
>         npt <- ncol(fd$y)
>         fbase <- create.fourier.basis(rangeval=c(0, 1440), nbasis=9)
>         fpar <- fdPar(fbase)
>         xfdlist <- vector("list", grp2)
>         xfdlist[[1]] <- cov2[, 1] + 0
>         for(i in 2:grp2)
+                 xfdlist[[i]] <- cov2[, i] + 0
>         betalist <- xfdlist
>         for(i in 1:grp2)
+                 betalist[[i]] <- fpar
>         freg2 <- fRegress(fd$fd, xfdlist, betalist)
>         preact2 <- predict(freg2$yhatfdobj, 1:L)
>         resid2 <- fd$y - preact2[, 1:npt]
>         sigma2 <- cov(t(resid2))
>         fregstd2 <- fRegress.stderr(freg2, fd$y2cMap, sigma2)
>         Fratio <- Ftest(fd$fd, xfdlist, betalist, argvals=1:1440,  nperm=10, xaxt="n")
>         axis(1, at=xat, labels=lb)
```