ST3233 Tutorial 1 Solution

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Preliminary:

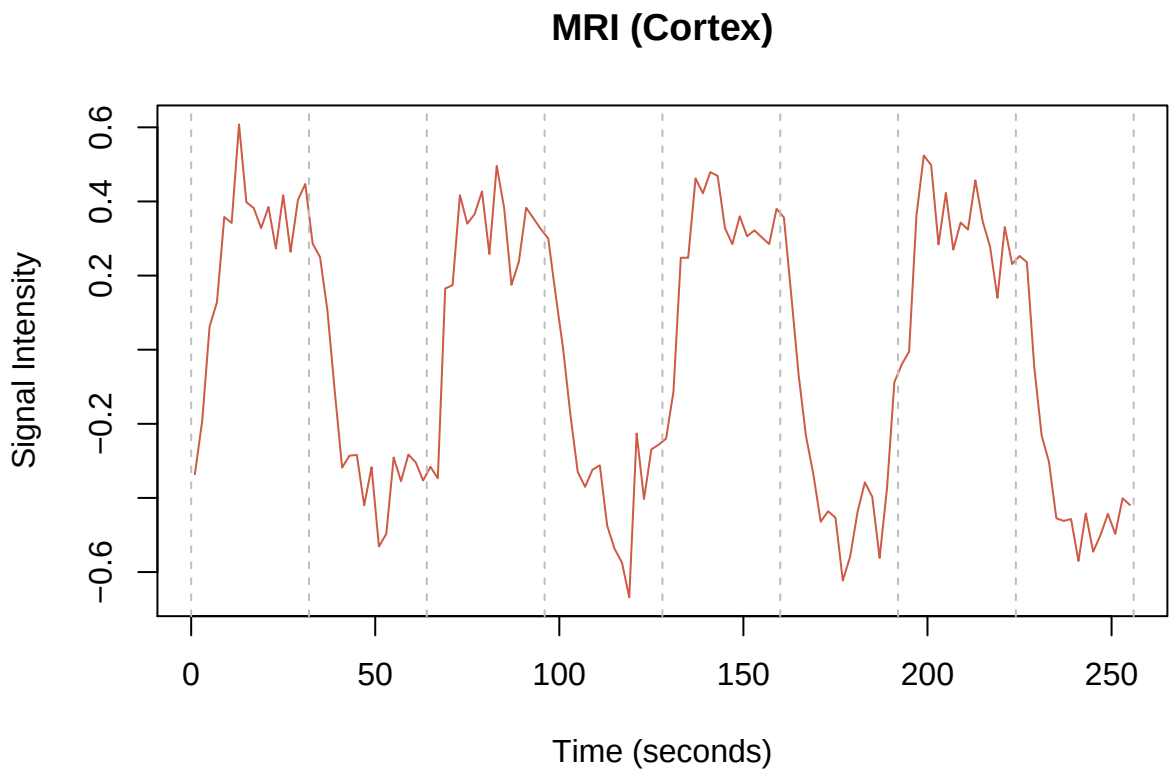
```
library(fpp2)
```

```
## Loading required package: forecast
## Loading required package: fma
## Loading required package: expsmooth
## Loading required package: ggplot2
```

Question 1: plot the graph

```
fmri_data <- read.table("fmri.dat.txt")
fmri_ts <- ts(fmri_data[,2], deltat = 2, frequency=0.5, start=1)

plot(fmri_ts, xlab="Time (seconds)", ylab="Signal Intensity",
     main="MRI (Cortex)", col="coral3")
abline(v=seq(0, 256, by=32), col="grey", lty=2)
```



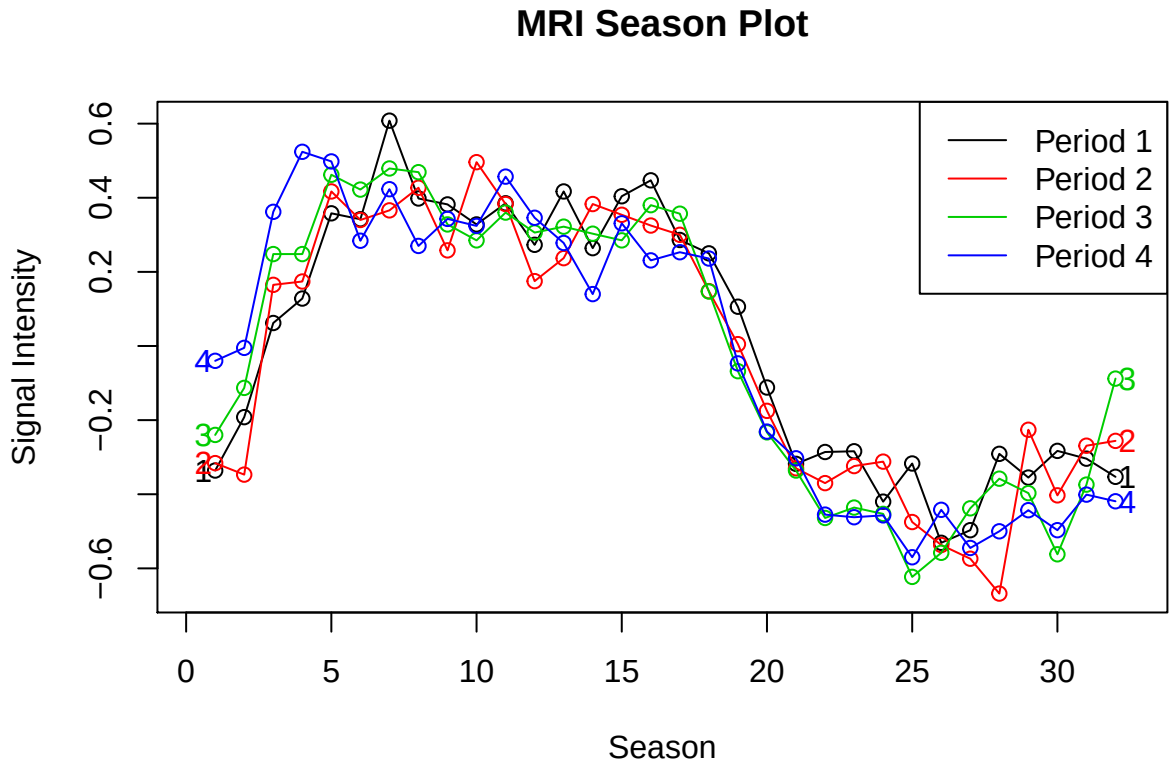
Question 2: Discussion

The data exhibits strong seasonal patterns every 32 seconds, which corresponds to the time where stimualtes are set in or taken away.

Question 3: Season plot

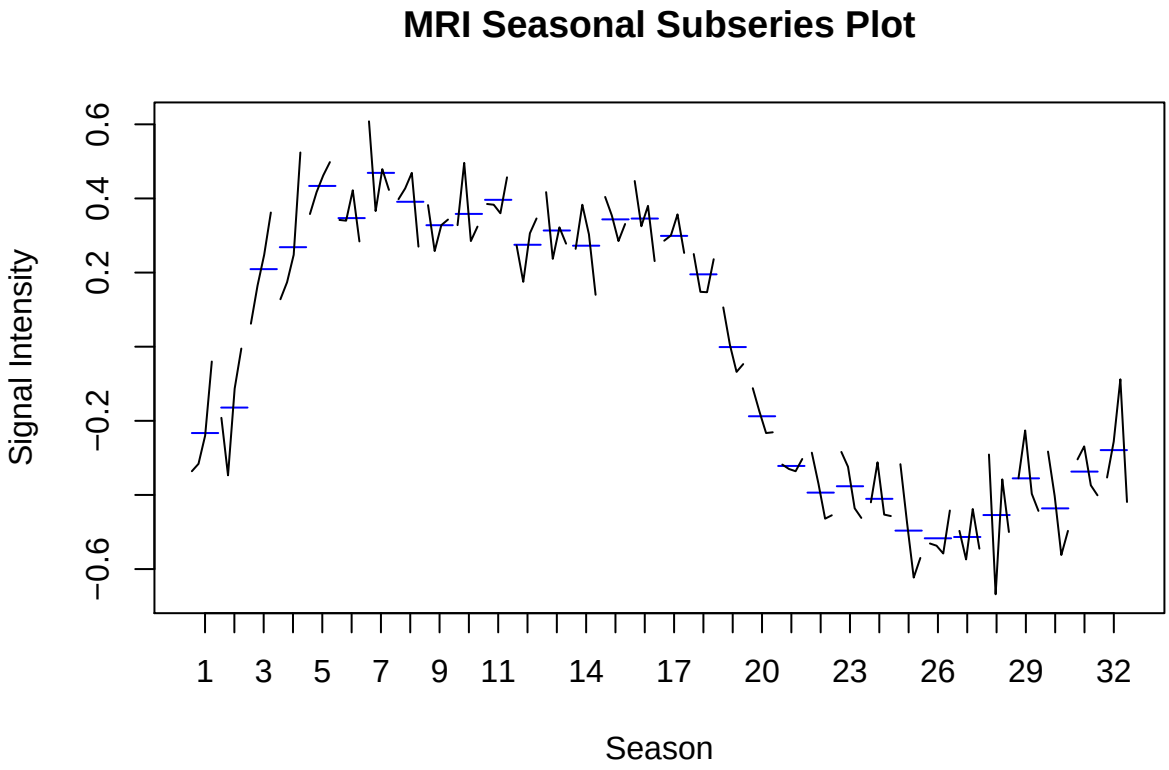
```
seasonplot(fmri_ts, s=32, main="MRI Season Plot", xlab="Season", ylab="Signal Intensity",
           col=1:4, year.labels.left=TRUE, year.labels=TRUE)

legend("topright",legend=paste("Period ", 1:4, sep=""), col=1:4, lwd=TRUE)
```



Question 4: Seasonal subseries plot

```
fmri_ts = ts(fmri_data[,2], start=1, frequency=32)
monthplot(fmri_ts, main="MRI Seasonal Subseries Plot", ylab="Signal Intensity",
          xlab="Season", col.base='blue')
```



Matching Time Plots to Lag Plots

- The data has no apparent trend as a whole.
- It exhibits some seasonal patterns especially when time is less than 200 seconds, where x reaches the crest in approximately equal time interval.
- The value of x reaches its peak when time is approximately 270, and a clear downward trend is observed when $270 < \text{time} < 370$.
- Overall x would be more similar to the pattern of a Random Walk model, where each time the change in value of x would be correlated to the previous one plus a residual that follows the distribution of a White Noise.
- The value of y exhibits characteristics of White Noise.
- Hence a would be referring to y, where b is referring to x.