

AlarmFatigue

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5/31/2019

Take patient 2221 as example. First we load the dataset.

```
patient2221 <- read.csv("~/Desktop/DSI Project/2221.csv")
time21 <- patient2221$ParTime
p21 <- data.frame(time21, patient2221$AR1.D, patient2221$AR1.M, patient2221$AR1.S,
                    patient2221$AR2.D, patient2221$HR)
colnames(p21) <- c("time", "AR1D", "AR1M", "AR1S", "AR2D", "HR")

#remove all NA data for AR1D and AR1M
p21.clean <- p21[!is.na(p21$AR1D) & ! is.na(p21$AR1M) ,]
summary(p21.clean)

##          time            AR1D           AR1M           AR1S
##  Min.   : 820385   Min.   :-17.00   Min.   :-11.0   Min.   : -9.0
##  1st Qu.: 930806   1st Qu.: 68.00   1st Qu.:103.0   1st Qu.:146.0
##  Median :1038690   Median : 78.00   Median :115.0   Median :168.0
##  Mean   :1048447   Mean   : 86.83   Mean   :117.6   Mean   :163.7
##  3rd Qu.:1171048   3rd Qu.: 99.00   3rd Qu.:127.0   3rd Qu.:185.0
##  Max.   :1278000   Max.   :338.00   Max.   :342.0   Max.   :350.0
##                               NA's   :3
##          AR2D           HR
##  Min.   : NA      Min.   : 56.00
##  1st Qu.: NA      1st Qu.: 72.00
##  Median : NA      Median : 80.00
##  Mean   :NaN      Mean   : 79.81
##  3rd Qu.: NA      3rd Qu.: 87.00
##  Max.   : NA      Max.   :144.00
##  NA's   :85239    NA's   :38
```

Kalman Filter

First implement function for one-variable predictor

```
my_kalman <- function(df, v=1, q=0.1, p=100, pred=df$AR1D){
  df$est <- NA
  est.minus <- 0
  p.minus <- 0
  df$est[1] <- est.minus

  for (i in 2:nrow(df)){
    p.minus <- p+q
    k <- p.minus/(p.minus+v)
    df$est[i] <- est.minus + k*(pred[i]-est.minus)
    p <- (1-k)*p.minus
    est.minus <- df$est[i]
  }
}
```

```

    return(df)
}

```

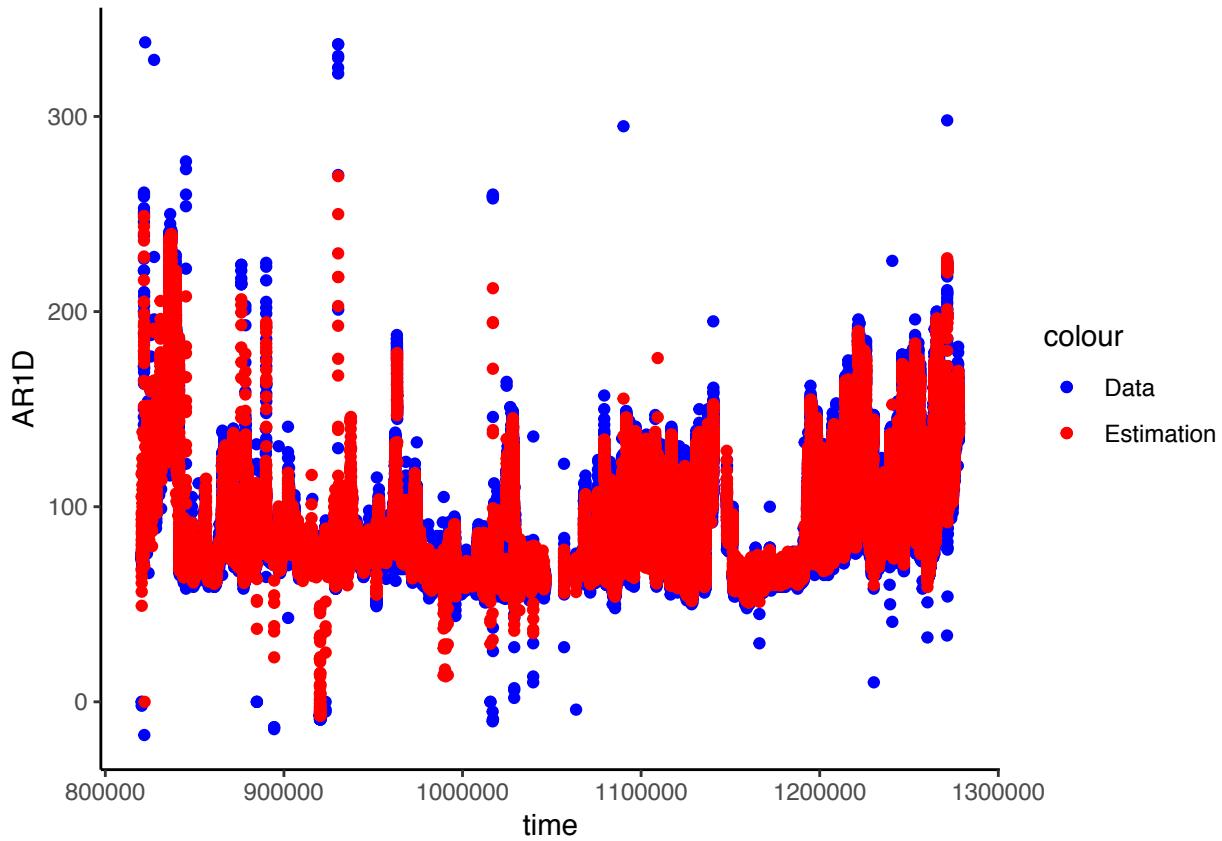
Now apply it to predict AR1D and AR1M, separately.

For AR1D, we get

```

est.AR1D <- my_kalman(p21.clean)
ggplot(data=est.AR1D,aes(x=time)) + geom_point(aes(y=AR1D,colour="Data")) +
  geom_point(aes(y=est,colour="Estimation")) +
  scale_color_manual(values = c('Data' = 'blue', 'Estimation' = 'red'))+
  theme_classic()

```



For AR1M, we get

```

est.AR1M <- my_kalman(p21.clean,pred=p21.clean$AR1M)
ggplot(est.AR1M) + geom_point(aes(x=time, y=AR1M,colour="Data")) +
  geom_point(aes(x=time, y=est,colour="Estimation")) +
  scale_color_manual(values = c('Data' = 'blue', 'Estimation' = 'red'))+
  theme_classic()

```