```
R version 4.1.1 (2021-08-10) -- "Kick Things"
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Platform: x86_64-w64-mingw32/x64 (64-bit)

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  Natural language support but running in an English locale

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> #File name:  JRodoni_HW07_script.R
> #Path:  "C:/Users/jackr/OneDrive/Desktop/Graduate School Courses/STAT 604 - STAT Computation/Ho
meworks/JRodoni_HW07_script"
> #Created by Jack Rodoni
> #Creation Date:  10/10/2021
> #Purpose: creating a function
> #Last executed:
> Sys.time()
[1] "2021-10-12 13:04:27 CDT"
>
> #housekeeping functions
> ls()
character(0)
> library()
> search()
[1] ".GlobalEnv"        "package:stats"     "package:graphics"
[4] "package:grDevices" "package:utils"     "package:datasets"
[7] "package:methods"   "Autoloads"         "package:base"
>
> #1 load workspace
>
> load("C:/Users/jackr/OneDrive/Desktop/Graduate School Courses/STAT 604 - STAT Computation/RData
/HW05.RData")
> ls()
[1] "CovidTexas" "Sep12"
> str(CovidTexas)
'data.frame':   153255 obs. of  12 variables:
 $ COUNTY_NAME  : chr  "Anderson" "Anderson" "Anderson" "Anderson" ...
 $ REPORT_DATE  : chr  "2021-02-06" "2021-03-17" "2021-03-16" "2020-11-10" ...
 $ NEW_CASES    : int  2 0 0 7 17 -12 7 4 9 40 ...
 $ TOTAL_CASES  : int  5968 6089 6089 3028 4236 6077 3035 6089 6085 4276 ...
 $ NEW_DEATHS   : int  1 0 0 1 0 0 0 0 1 0 ...
 $ TOTAL_DEATHS : int  93 112 112 42 57 112 42 112 112 57 ...
 $ POPULATION   : int  57735 57735 57735 57735 57735 57735 57735 57735 57735 57735 ...
 $ Date         : Date, format: "2021-02-06" "2021-03-17" ...
 $ CASE_PCT     : num  0.1034 0.1055 0.1055 0.0524 0.0734 ...
 $ NEW_CASE_PCT : num  3.46e-05 0.00 0.00 1.21e-04 2.94e-04 ...
 $ DEATH_PCT    : num  0.001611 0.00194 0.00194 0.000727 0.000987 ...
 $ NEW_DEATH_PCT: num  1.73e-05 0.00 0.00 1.73e-05 0.00 ...
>
> #2(a) creating a new data frame from Texas data
> Bexar_data <- CovidTexas[which(CovidTexas$COUNTY_NAME == "Bexar"),c(2,3)]
> str(Bexar_data)
'data.frame':   601 obs. of  2 variables:
 $ REPORT_DATE: chr  "2020-02-19" "2021-06-12" "2020-02-18" "2021-06-11" ...
 $ NEW_CASES  : int  0 0 0 0 0 0 0 0 0 2544 ...
>
> #2(b) ordering data frame by date, finding first case
> Bexar_data <- Bexar_data[order(Bexar_data$REPORT_DATE, decreasing = FALSE),]
> first_case <- match(TRUE, Bexar_data$NEW_CASES > 0)
> first_case
```

```
[1] 23
>
> #2(c) assigning a value for alpha component
> a <- 2/31
>
> #2(d) creating a vector of zeros
> ema <- rep.int(0,length(Bexar_data$NEW_CASES))
>
> #2(e) averaging first 30 days
> first_30 <- Bexar_data[1:30,]
> ema[30] <- mean(first_30$NEW_CASES)
> ema[30]
[1] 0.06666667
>
> #2(f) using a loop to run ema formula
> count <- 0
> for (i in Bexar_data$NEW_CASES[31:length(Bexar_data$NEW_CASES)]) {
+   ema[31+count] <- i*a+ema[31+count-1]*(1-a)
+   count <- count + 1
+ }
>
> #2(g) creating a plot for new cases
> par(bg="grey90")
> Bexar_data$REPORT_DATE<- as.Date(Bexar_data$REPORT_DATE)
> plot(Bexar_data$REPORT_DATE[first_case:601],Bexar_data$NEW_CASES[first_case:601],
+      type = "l",xlab = "Date",ylab = "New Cases",col = "blue",
+      main = "Bexar County 30 Day EMA and Daily Cases")
>
> #2(h) adding a red line for ema values
> lines(Bexar_data$REPORT_DATE,ema,col = "red")
>
> #2(i) adding ema formula to graph
> text(Bexar_data[23,], .95*max(Bexar_data$NEW_CASES),
+      expression(EMA['i'] == (P['i']%*%alpha)+(EMA['i-1']%*%(1-alpha))~"where"~
+                 alpha == frac(2,1+30)),
+      adj = 0,cex = 0.8)
>
> #3 removing all objects except the two data frames
> ls()
[1] "a"          "Bexar_data" "count"      "CovidTexas" "ema"
[6] "first_30"   "first_case" "i"          "Sep12"
> rm(a,Bexar_data,count,ema,first_30,first_case,i)
> ls()
[1] "CovidTexas" "Sep12"
>
> #4 using the function for texas covid data
> func <- function(county_name,n=30,df=CovidTexas){
+   county_data <- CovidTexas[which(CovidTexas$COUNTY_NAME == county_name),c(2,3)]
+   county_data <- county_data[order(county_data$REPORT_DATE, decreasing = FALSE),]
+   first_case <- match(TRUE, county_data$NEW_CASES > 0)
+   a <- 2 / (1+n)
+   l <- length(county_data$NEW_CASES)
+   ema <- rep(0,times=l)
+   ema[1:n] <- sum(county_data$NEW_CASES[c(1:n)])/n
+   count <- 0
+   for (i in county_data$NEW_CASES[n+1:l]) {
+     ema[n+1+count] <- i*a+ema[n+count]*(1-a)
+     count <- count + 1
+   }
+
+   par(bg="grey90")
+   county_data$REPORT_DATE<- as.Date(county_data$REPORT_DATE)
+   plot(county_data$REPORT_DATE[first_case:l],
+        county_data$NEW_CASES[first_case:l],
+        type = "l",xlab = "Date",ylab = "New Cases",col = "blue",
+        main = paste(county_name,n, "Day EMA and Daily Cases"))
+   lines(county_data$REPORT_DATE[first_case:l],ema[first_case:l],col = "red")
+   text(county_data[first_case,], .95*max(county_data$NEW_CASES),
+        expression(EMA['i'] == (P['i']%*%alpha)+(EMA['i-1']%*%(1-alpha))~"where"~
+                     alpha == frac(2,1+30)),
```

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+        adj = 0,cex = 0.8)
+
+ }
>
> #5 sending graphics to pdf file
> pdf("C:/Users/jackr/OneDrive/Desktop/Graduate School Courses/STAT 604 - STAT Computation/Homewo
rks/JRodoni_HW07_graphics.pdf",11,8.5)
>
> #6 setting up 2 rows for graphics
> par(mfrow=c(2,1))
> par(mar=c(4,4,4,0))
> par(omi=c(0,1,.5,0))
>
> #7 calling the function twice
> func("Bexar")
> func("Bexar",7)
> ls()
[1] "CovidTexas" "func"       "Sep12"
>
> #8 writing system time in plot
> mtext(Sys.time(),1,adj = 0)
>
> #9 creating a vector of random samples
> set.seed(20210911)
> samp_data <- sample(Sep12[,1],2)
>
> #10 creating a loop to call function
> for (i in samp_data) {
+   func(i)
+ }
>
> #12a 601
>
> #12b as N increases, the peaks on red line become smoother
>
> #12c we created another object in our workspace
>
> #12d Bexar had the most covid cases, followed by Brazos then Eastland
>
> graphics.off()
>
```