```
> #HW13
> if (FALSE)
+ {"
+ Use the presidents data set (presidents.csv, found in Files: presidents.csv  ) that shows
quarterly approval ratings of US presidents during 30 years starting in 1945.
+ a) Generate two lowess plots using spans that you choose between 0.05 and 1.
+ b) Provide 1 or 2 sentences describing the pattern for the span you choose.
+ c) Generate two smoothing plots with normal kernel density standard deviation h between .2 and .8
+ d) Provide 1 or 2 sentences describing the pattern for the h you choose.
+ "}
> #See useful R code below.
>
> #read in the data which is in a csv file
> presidents <- read.csv(file="C:/Users/jmard/OneDrive/Desktop/Computing and Graphics in Applied
Statistics2020/Homework/presidents.csv",header = TRUE)
>
> library(faraway)
> library(psych)
> library(sm) #install if not already installed
>
> head(presidents,1L)
  quarter presidents
1       1         83
> str(presidents)
'data.frame':   120 obs. of  2 variables:
 $ quarter   : int  1 2 3 4 5 6 7 8 9 10 ...
 $ presidents: int  83 87 82 75 63 50 43 32 35 60 ...
> describe(presidents)
           vars   n  mean    sd median trimmed   mad min max range  skew kurtosis   se
quarter       1 120 60.50 34.79   60.5   60.50 44.48   1 120   119  0.00    -1.23 3.18
presidents    2 120 56.33 15.65   59.0   57.03 17.05  23  87    64 -0.36    -0.71 1.43
>
> windows(7,7)
> #save graph(s) in pdf
>  pdf(file="C:/Users/jmard/OneDrive/Desktop/Computing and Graphics in Applied
Statistics2020/Homework/HW13_Figures.pdf")
>
>
> #code to use for different spans. The one below uses a span of 0.20
> with(presidents,{
+ plot(presidents ~ quarter, col=gray(0.1))
+ f <- loess(presidents ~ quarter,span=0.20)
+ i <- order(quarter)
+ lines(f$x[i],f$fitted[i])
+ })
```

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>
> #code to use for different choices of h. The one below uses an h
> library(sm) #install if not already installed
> with(presidents,sm.regression(x=quarter,y=presidents,h=.1))
> ##-------------------------------------------------------------------------##
> #code to use for different spans. The one below uses a span of 0.05
> with(presidents,{
+ plot(presidents ~ quarter, col=gray(0.1))
+ f <- loess(presidents ~ quarter,span=0.05)
+ i <- order(quarter)
+ lines(f$x[i],f$fitted[i])
+ })
Warning message:
In simpleLoess(y, x, w, span, degree = degree, parametric = parametric,  :
  k-d tree limited by memory. ncmax= 200
>
> #code to use for different spans. The one below uses a span of 1.0
> with(presidents,{
+ plot(presidents ~ quarter, col=gray(0.1))
+ f <- loess(presidents ~ quarter,span=1)
+ i <- order(quarter)
+ lines(f$x[i],f$fitted[i])
+ })
>
> #code to use for different choices of h. The one below uses an h of 0.1
> with(presidents,sm.regression(x=quarter,y=presidents,h=.1))
> with(presidents,sm.regression(x=quarter,y=presidents,h=.2))
> with(presidents,sm.regression(x=quarter,y=presidents,h=.3))
> with(presidents,sm.regression(x=quarter,y=presidents,h=.4))
> with(presidents,sm.regression(x=quarter,y=presidents,h=.5))
>
> #Extension of HW Exercise
>
> #We can use cross-validation to choose the best h to use for the normal kernel function standard
deviation.
>
usecv<-with(presidents,sm.regression(x=quarter,y=presidents,h=h.select(presidents,quarter,method="cv
")))
> usecv$h
[1] 8.549704
>
> # Assuming the X-values are spread out then the rough approximation of span can be converted to

> # a rough approximation of h equal to [span*(maximum(x's) - minimum(x's))]/6.
> CVspan <- usecv$h/((120 - 1)/6)
```

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> CVspan  #also will try this span value
[1] 0.4310775
>
> #code to use for different spans. The one below uses a span ~ derived from the optimal h that is
chosen
> with(presidents,{
+ plot(presidents ~ quarter, col=gray(0.1))
+ f <- loess(presidents ~ quarter,span=CVspan)
+ i <- order(quarter)
+ lines(f$x[i],f$fitted[i])
+ })
>
> #Another extension of HW Exercise
> #Fit a smoothed curve using lowess to the ozone data.frame.
>
> # ozone data.frame consists of results from a study on the relationship between atmospheric ozone
concentration
> # and meteorology in the Los Angeles Basin in 1976 (n=330 observations)
> # O3 - Ozone concentration, ppm, at Sandburg Air Force Base
> # temp - temperature F
>
> data(ozone)
> head(ozone,5L)
  O3   vh wind humidity temp  ibh dpg ibt vis doy
1  3 5710    4       28   40 2693 -25  87 250  33
2  5 5700    3       37   45  590 -24 128 100  34
3  5 5760    3       51   54 1450  25 139  60  35
4  6 5720    4       69   35 1568  15 121  60  36
5  4 5790    6       19   45 2631 -33 123 100  37
>
> plot(x=ozone$temp,y=ozone$O3)
> with(ozone,sm.regression(x=ozone$temp,y=ozone$O3,h=.2))  #recall h is the smoothing fraction
>
> plot(x=ozone$temp,y=ozone$O3)
> with(ozone,sm.regression(x=ozone$temp,y=ozone$O3,h=1))  #recall h is the smoothing fraction
>
>
usecv<-with(ozone,sm.regression(x=ozone$temp,y=ozone$O3,h=h.select(ozone$temp,ozone$O3,method="cv"))
)
> usecv$h
[1] 6.288193
>
>
> ##------------------------------------------------------------##
> dev.off()
```

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null device
          1
>
```