Homework due May 9, 2021 07:01 +03

Make sure that you are using the correct random number generator (RNG) settings by calling the following command:

```
RNGkind("Mersenne-Twister", "Inversion", "Rejection")
```

Smoothing Exercises #1

1/1 point (graded)

Use the data generated in a previous question about men's and women's heights:

```
n = 10000
set.seed(1)
men = rnorm(n,176,7) #height in centimeters
women = rnorm(n,162,7) #height in centimeters
y = c(rep(0,n),rep(1,n))
x = round(c(men,women))
##mix it up
ind = sample(seq(along=y))
y = y[ind]
x = x[ind]
```

Set the seed at 5, `set.seed(5)`, and take a random sample of 250 individuals from the population like this:

```
set.seed(5)
N = 250
ind = sample(length(y),N)
Y = y[ind]
X = x[ind]
```

Use `loess()` to estimate $f(x) = E(Y|X = x)$ using the default parameters. What is the predicted $f(168)$?

0.5480233

✔ **Answer:** 0.5480233

0.5480233

Explanation

```
fit=loess(Y~X)
predict(fit,newdata=data.frame(X=168))

##Here is a plot
xs = seq(160,178)
Pr =sapply(xs,function(x0) mean(Y[X==x0]))
plot(xs,Pr)
fitted=predict(fit,newdata=data.frame(X=xs))
lines(xs,fitted)
```

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You have used 1 of 5 attempts

Answers are displayed within the problem

Smoothing Exercises #2

1/1 point (graded)

The loess estimate above is a random variable thus we should compute its standard error. Use Monte Carlo simulation to compute the standard error of your estimate of $f\,(168)$.

Set the seed to 5, `set.seed(5)`, and perform 1000 simulations of the computations performed in question 2.7.1. Report the the SE of the loess based estimate.

0.05755689

✔ **Answer:** 0.05755689

0.05755689

Explanation

```r
##plot plots are optional
set.seed(5)
B = 1000
N = 250
xs = seq(160,178)
plot(xs,xs,ylim=c(0,1),type="l")
res = replicate(B,{
  ind = sample(length(y),N)
  Y = y[ind]
  X = x[ind]
  fit=loess(Y~X)
  ##optional plots
  fitted=predict(fit,newdata=data.frame(X=xs))
  lines(xs,fitted)
  estimate = predict(fit,newdata=data.frame(X=168))
  return(estimate)
  })
library(rafalib)
popsd(res)
```

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You have used 1 of 5 attempts

Answers are displayed within the problem