Rcpp Portfolio

Rachel Wood

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For this portfolio, we use Rcpp to fit an adaptive kernel smoothing regression model.

We first generate data according to the model

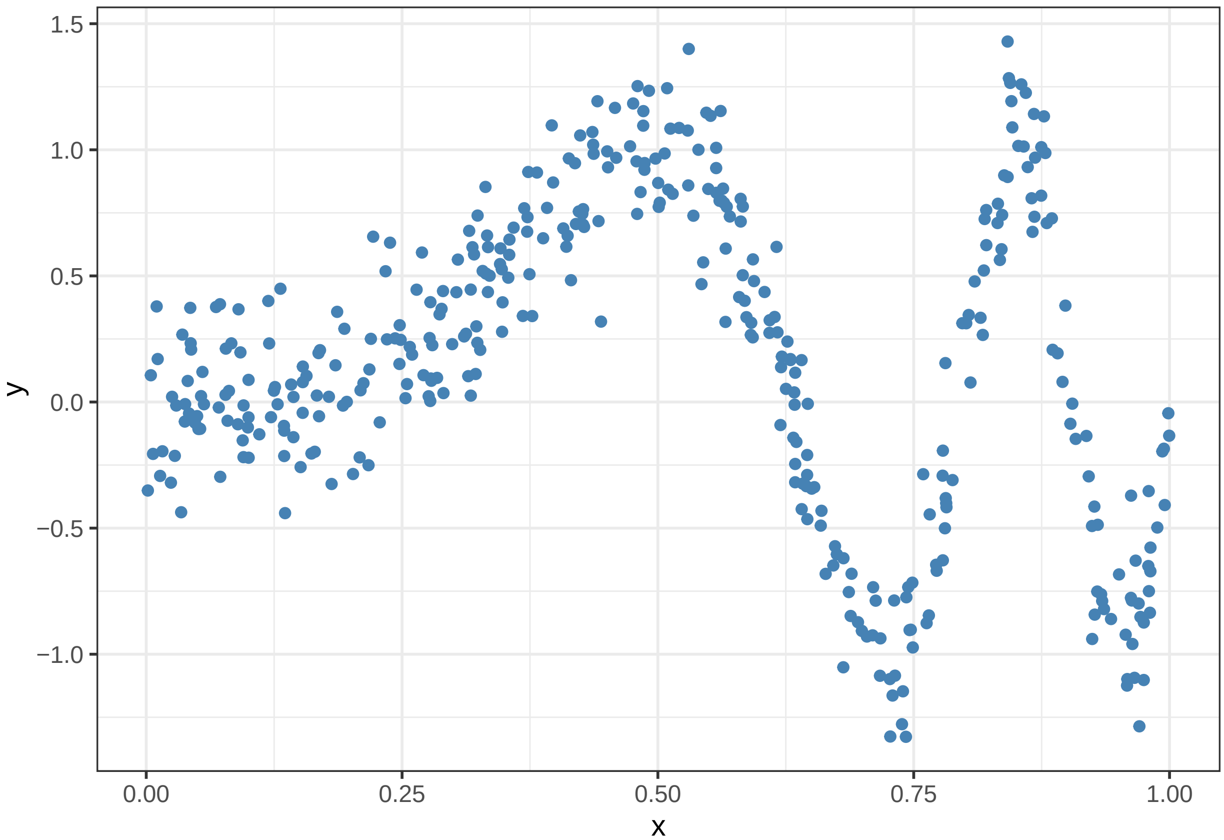
$$y_i = \sin(\alpha \pi x^3) + z_i \quad \text{with} \quad z_i \sim \mathcal{N}(0, \sigma^2)$$

In this case we take $\alpha = 4$ and $\sigma = 0.2$.

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
n <- 400
alpha <- 4
sigma <- 0.2

x <- runif(n)
y <- sin(alpha * pi * x^3) + rnorm(n, sd = sigma)

data <- tibble(x = x, y =y)

ggplot(data = data, aes(x, y))+
  geom_point(color = "steelblue")
```



The Kernel Smoother

We model $\mu(x) = \mathbb{E}(y|x)$ by

$$\hat{\mu}(x) = \frac{\sum_{i=1}^{n} \kappa_\lambda(x, x_i) y_i}{\sum_{i=1}^{n} \kappa_\lambda(x, x_i)}$$

where we take κ_λ to be a Gaussian kernel with variance λ^2.

We implement this with the following function:

```
meanKRS <- function(y, x, xnew, lambda){
  n <- length(x)
  nnew <- length(xnew)

  mu <- numeric(nnew)

  for (i in 1:nnew){

  }
}
```