Local Poisson regression

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1. Bandwidth choice for the local Poisson regression

In this section, we have modify the *h.cv.sm.binomial* (now *h.cv.sm.poisson*) and the *loglik.CV* functions in order to be able to use it for the local Poisson regression. We have simplified the code to have less parameters.

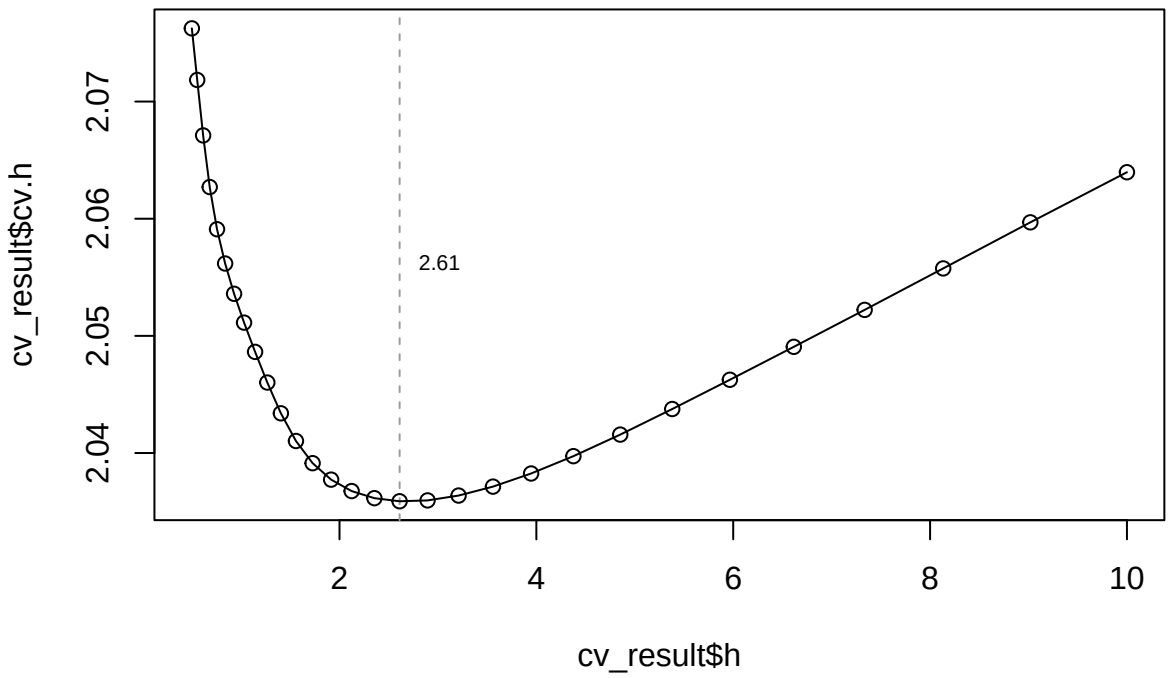
```
h.cv.sm.poisson <- function(x, y, rg.h = NULL, l.h = 10) {
  cv.h <- numeric(l.h)

  if (is.null(rg.h)) {
    hh <- c(h.select(x, y, method = "cv"), h.select(x, y, method = "aicc"))
    rg.h <- range(hh) * c(1/1.1, 1.5)
  }

  gr.h <- exp(seq(log(rg.h[1]), log(rg.h[2]), length.out = l.h))

  for (i in 1:length(gr.h)) {
    cv.h[i] <- loglik.CV(x, y, gr.h[i])
  }

  return(list(h = gr.h, cv.h = cv.h, h.cv = gr.h[which.min(cv.h)]))
}
```

```
loglik.CV <- function(x, y, h) {
    n <- length(x)

    lambda <- sapply(1:n,
                 function(i, x, y, h) {
        sm.poisson(x = x[-i], y = y[-i], h = h,
                   eval.points = x[i], display = "none")$estimate
    }, x, y, h)

    return(-sum(-lambda + y*log(lambda) -log(factorial(y)) )/n )
}
```

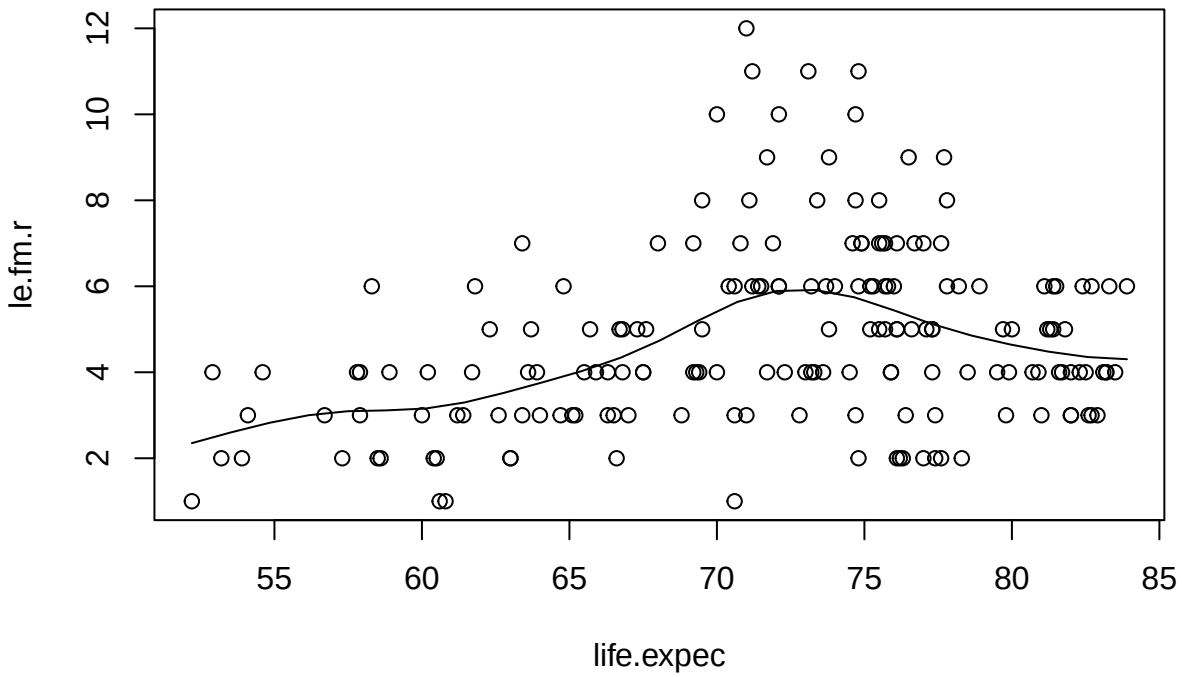
2. Local Poisson regression for Country Development Data

With our new function, we can acquire an optimal bandwidth for fitting our model.

```
countries <- read.csv2(file="HDI.2017.subset.csv",row.names = 1)

life.expec <- countries$Life.expec
le.fm.r <- round(countries$le.fm)

cv_result <- h.cv.sm.poisson(life.expec, le.fm.r, rg.h=c(0.5,10), l.h = 30)

plot(cv_result$h, cv_result$cv.h)
selected.bandwidth <- cv_result$h.cv
abline(v = selected.bandwidth, col="8", lty=2)
mid.point <- (max(cv_result$cv.h)+min(cv_result$cv.h))/2
text(selected.bandwidth, mid.point,
     round(selected.bandwidth*100)/100,cex=0.65, pos=4,col=1)
lines(cv_result$h, cv_result$cv.h)
```




```
model <- sm.poisson(x = life.expec, y = le.fm.r, h = selected.bandwidth, col=1)
```



The leave-one-out cross-validation determines 2.61 as optimal bandwidth. The obtained fit of the local Poisson regression model looks reasonable.