Part i

Local regression (1 var)
Local logistic regression (1 var)

Wage Example – local regression

Basic Implementation

Local regression can be performed by the following code. The larger the span, the smoother the curve is.

Func in R: loess

Span: equivalent to λ, value > 0 (bias-var tradeoff)

```
#fit local regression
fit<-loess(wage~ age , span = .2 , data = Wage )
fit2 <- loess(wage~age,span =.5 ,data = Wage )
#plot graph
plot(age,wage,xlim = agelims,cex=.5 ,col ="darkgrey")
title("Local Regression")
lines (age.grid,predict(fit,data.frame(age=age.grid)),
col="red",lwd=2)
lines(age.grid,predict(fit2,data.frame(age=age.grid)) ,
col="blue",lwd=2)
legend("topright",legend=c("Span = 0.2","Span =0.5") ,
col=c("red","blue"),lty = 1,lwd = 2,cex =.8)
```

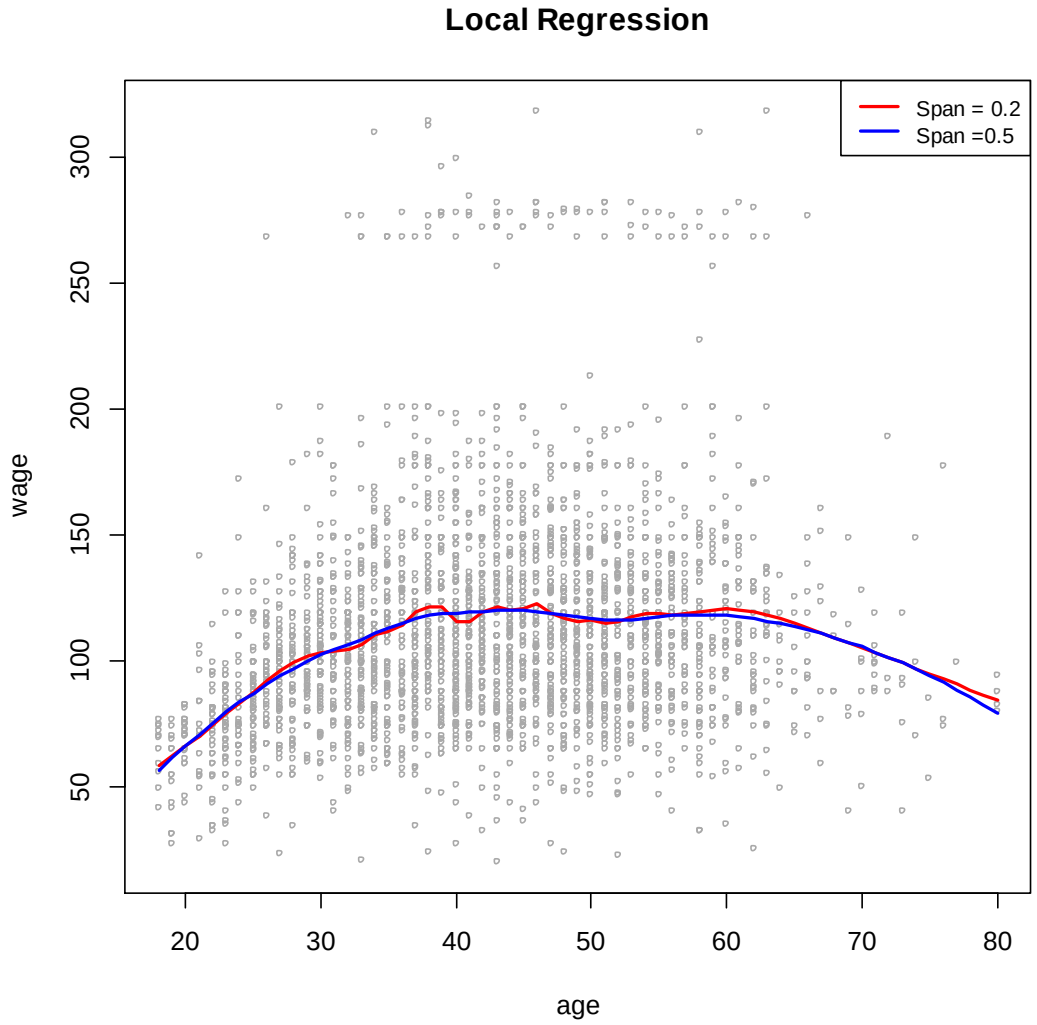
Wage Example – local regression

Basic Implementation

Blue curve: span (or λ) larger

Red curve: span (or λ) smaller

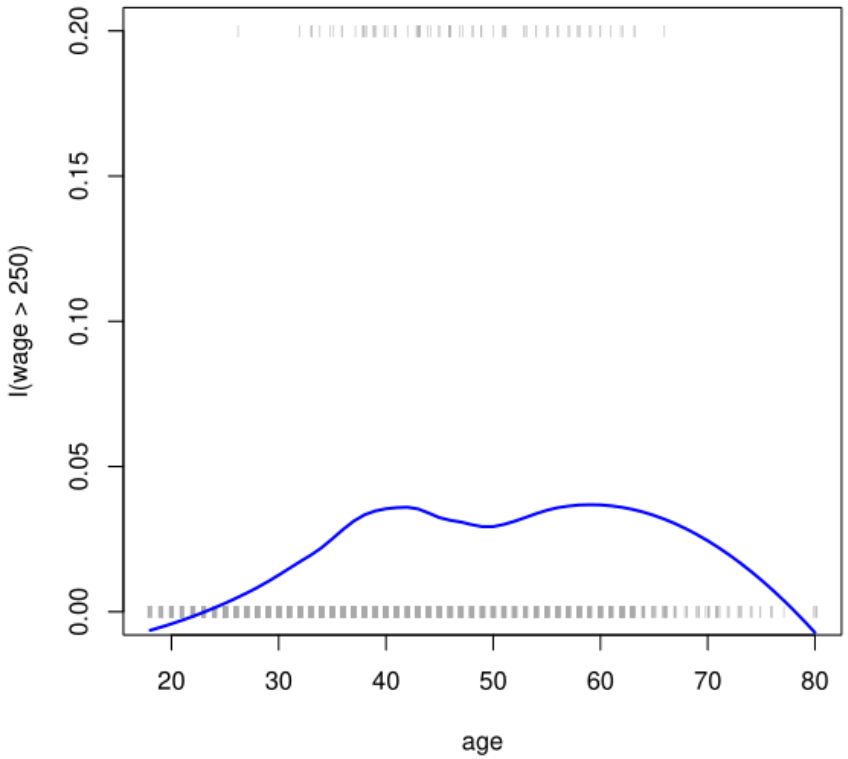
Recall: $\lambda \downarrow$, variance $\uparrow$



Wage Example – local logistic regression

Basic Implementation

```
#local logistic regression
fit4<-loess(I(wage>250)~ age, span = 0.75, data = Wage)
plot(age,I(wage>250),xlim=agelims,type="n",ylim=c(0,0.2))
points(jitter(age),I((wage>250)/5),cex=0.5,pch="|",col="darkgrey")
lines(age.grid, predict(fit4,data.frame(age=age.grid)), lwd=2,col='blue')
```



Part ii

Local regression (2 var)
Local logistic regression (2 var)

Wage Example – local regression (2 var)

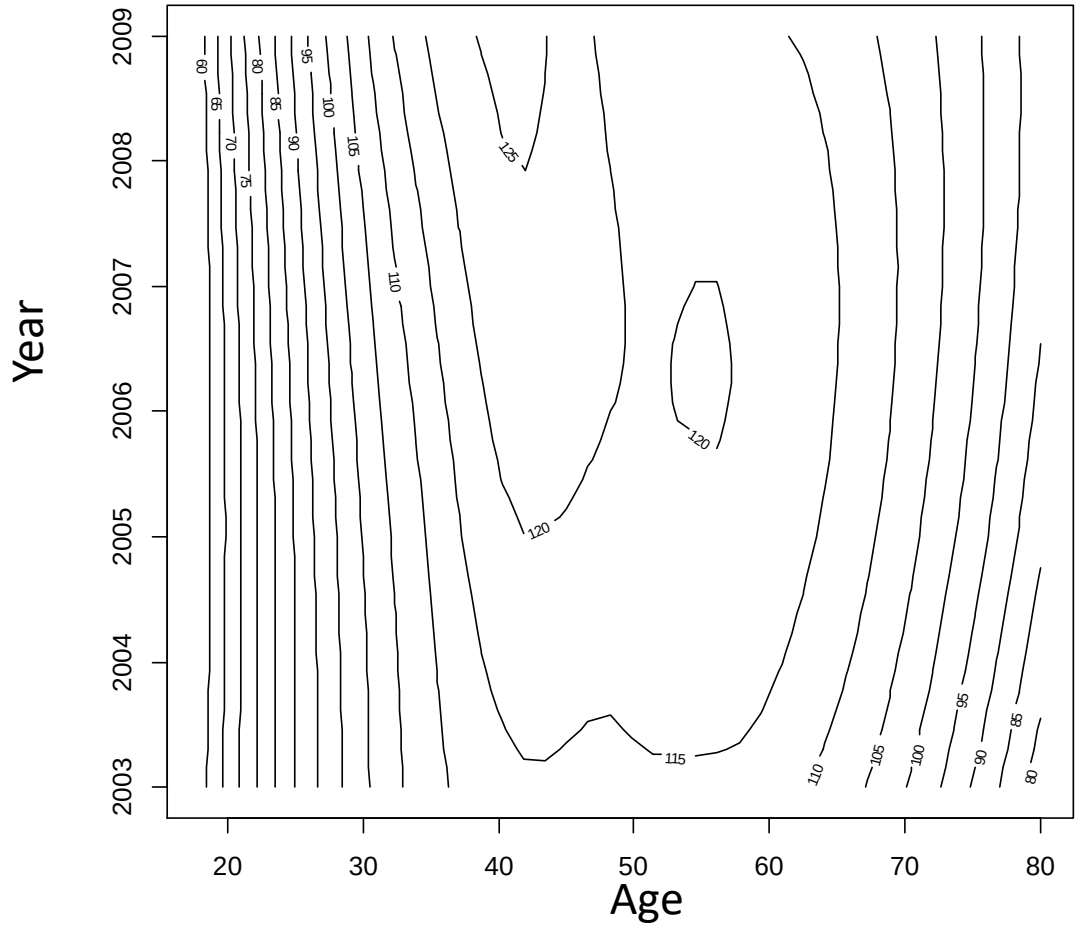
Basic Implementation

```
#Local polynomial with two predictors
library(locfit)
fit5<-locfit(wage~lp(age,year,nn=0.7), data=Wage)
plot(fit5)
```

nn: equivalent to λ, value > 0

Default kernel: tricube

There are interaction effects between Year and Age, why?



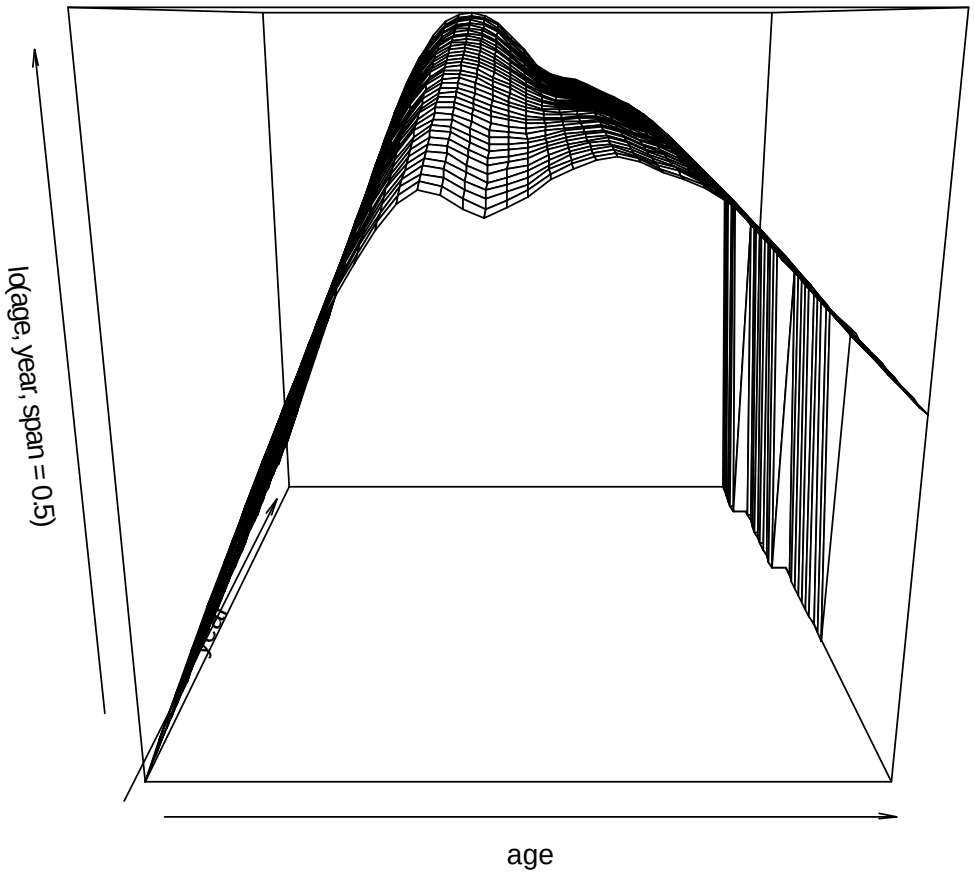
Wage Example – local regression (2 var)

Basic Implementation

3D-plot (using akima package)

Can see clearly: year 2003 has two peaks, year 2009 has one peak only

```
library(akima)
gam.lo.i<-gam(wage~lo(age,year,span=0.5)+education,
data = Wage)
plot(gam.lo.i)
```



Wage Example – local logistic regression (2 var)

Basic Implementation

```
#Local logistic with two predictors
fit6<-locfit(I(wage>250)~lp(age,year,nn=0.7), data=Wage)
plot(fit6)
```