

# Generalized additive Models

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The `gam` package makes it easy to work with multiple nonlinear terms. In addition it knows how to plot these functions and their standard errors.

```
library(ISLR)
attach(Wage)
library(gam)
```

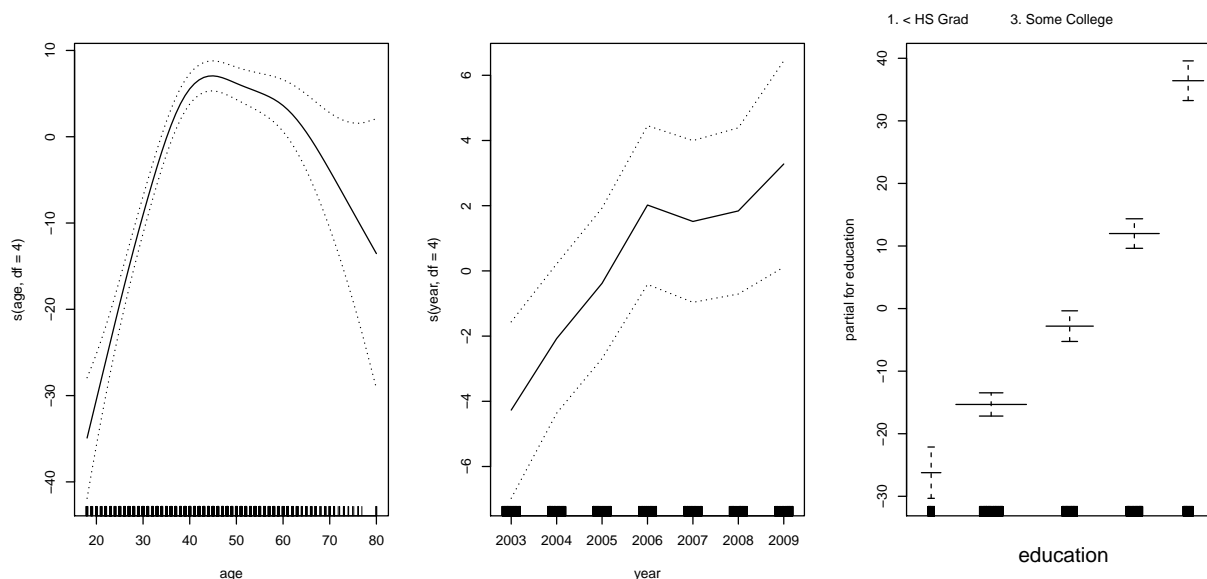
```
## Warning: package 'gam' was built under R version 3.2.4
```

```
## Loading required package: splines
```

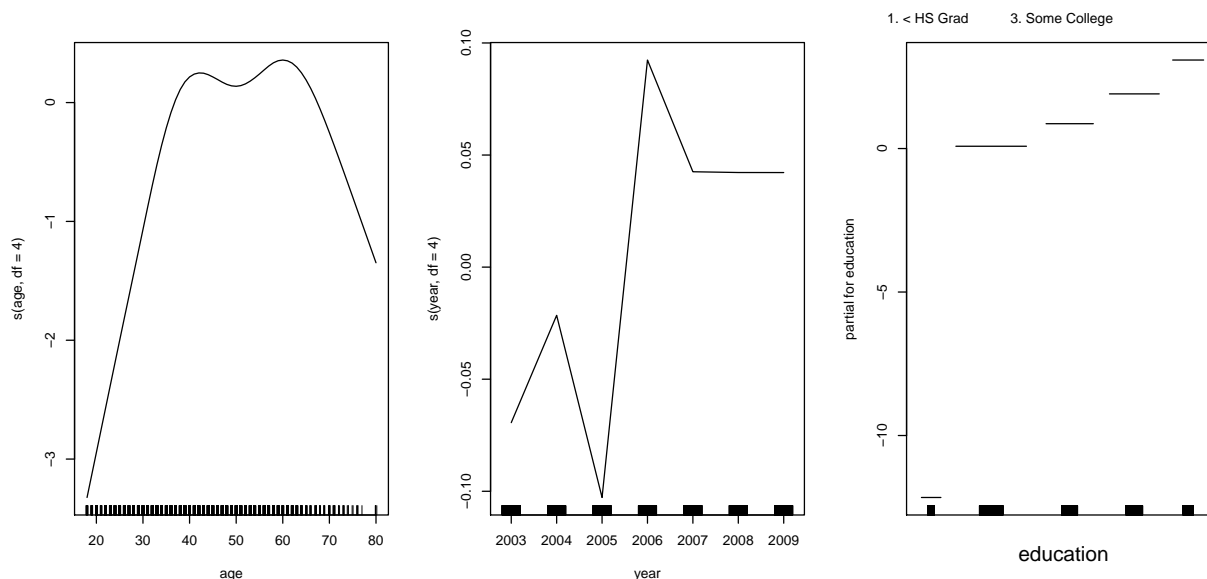
```
## Loading required package: foreach
```

```
## Loaded gam 1.12
```

```
gam1=gam(wage~s(age, df=4) +s(year, df=4)+ education, data=Wage)
par(mfrow=c(1,3))
plot(gam1, se=TRUE)
```



```
gam2=gam(I(wage>250)~s(age, df=4) +s(year, df=4)+education, family = binomial, data=Wage)
plot(gam2)
```



Lets see if we need a nonlinear term for year

```
gam2a=gam(I(wage>250)~s(age, df=4) +year+education, data=Wage,family=binomial)
anova(gam2, gam2a, test="Chisq")
```

```
## Analysis of Deviance Table
##
## Model 1: I(wage > 250) ~ s(age, df = 4) + s(year, df = 4) + education
## Model 2: I(wage > 250) ~ s(age, df = 4) + year + education
##   Resid. Df Resid. Dev Df Deviance Pr(>Chi)
## 1      2987      602.87
## 2      2990      603.78 -3  -0.90498   0.8242
```

One nice feature of the `gam` packages is that it knows how to plot the function nicely, even for models fit by `lm` and `glm`.

```
par(mfrow=c(1,3))
lm1=lm(wage~ns(age,df=4)+ns(year,df=4)+education, data=Wage)
plot.gam(lm1,se=TRUE)
```

