knitr document

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1 Statistical Model

The statistical model I use is a GAM which stand for generalized additive model. The model can be written as

$$g(E(Y)) = \beta_0 + f_1(x_1) + f_2(x_2) + \ldots + f_m(x_m)$$

2 Properties

There are two properties we might know from other models

Generalized The $g()$ is the link function we know from generalised linear models

Additive The predictor is a linear combination of smooth functions $f_x()$ The smooth function makes GAM more general than generalized linear models but they do not allow automatically for interactions (no curse of dimensionality).
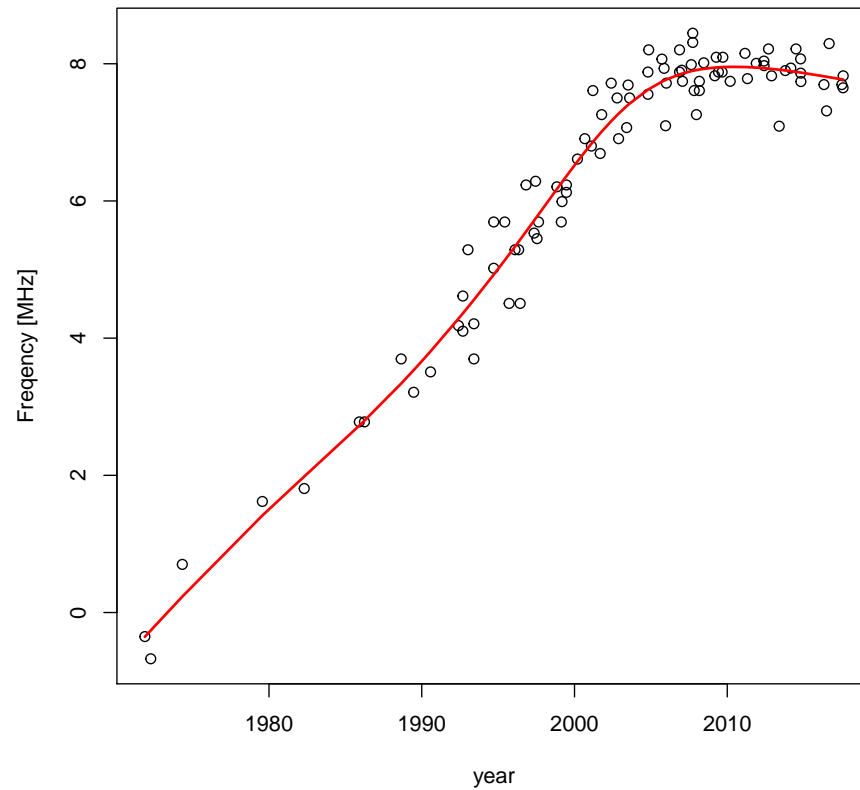
3 Illustrate

```
data <- read.table("frequency.dat")
names(data) <- c("year", "freq")
plot(log(freq) ~ year, data = data, ylab = "Freqency [MHz]")
```
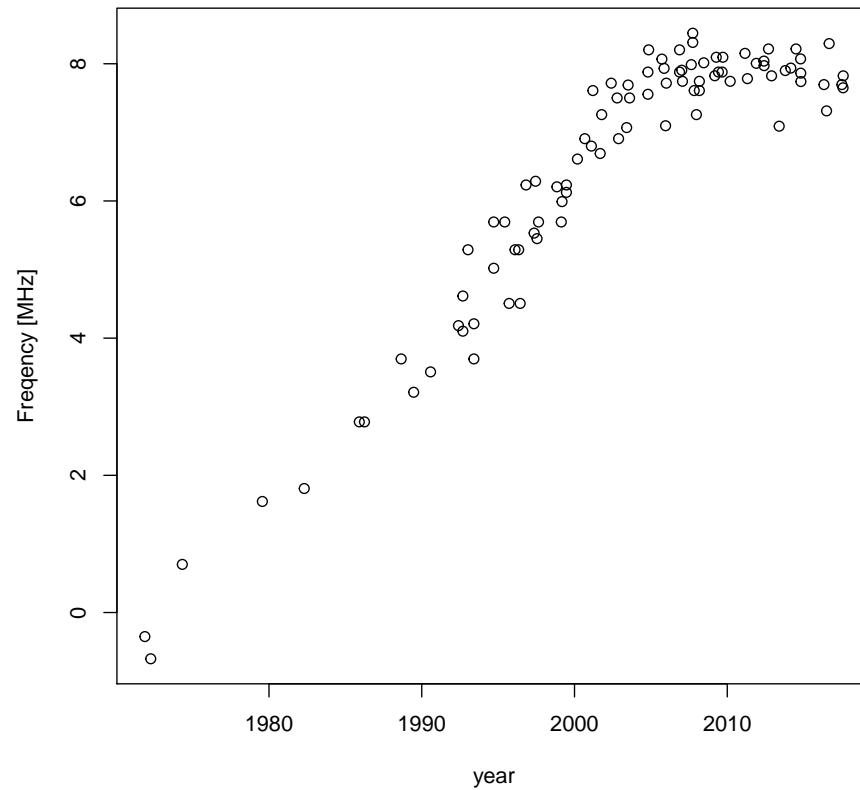
```
library(mgcv)

## Loading required package:  nlme
## This is mgcv 1.8-29.  For overview type 'help("mgcv-package")'.

fit <- gam(log(freq) ~ s(year), data = data)
plot(log(freq) ~ year, data = data, ylab = "Freqency [MHz]")
lines(data$year,predict(fit), col = "red", lwd = 2)
```

```
summary(fit)

##
## Family: gaussian
## Link function: identity
##
## Formula:
## log(freq) ~ s(year)
##
## Parametric coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  6.45383    0.03913     165   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Approximate significance of smooth terms:
```

```
##            edf Ref.df      F p-value
## s(year) 5.266  6.378 413.3  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## R-sq.(adj) =  0.967   Deviance explained = 96.9%
## GCV = 0.14808  Scale est. = 0.13777   n = 90
```