

prac1_acid.R

statisticallyfit

Sat Mar 3 07:21:48 2018

```
setwd("/datascience/projects/statisticallyfit/github/R/RStatistics/STAT210 Statistical Modelling and Ex  
source('/datascience/projects/statisticallyfit/github/R/RStatistics/PLOTTING.R')  
source('/datascience/projects/statisticallyfit/github/R/RStatistics/FORMULAS_noerrors.R')
```

```
library(ggplot2)
```

```
# setting digits options:
```

```
options(digits=3, show.signif.stars = FALSE)
```

```
## Getting data
```

```
acidData <- read.table("acid.txt", header=TRUE)
```

```
acidData
```

```
##      acid fungus  
## 1      0   33.3  
## 2      0   31.0  
## 3      3   29.8  
## 4      3   27.8  
## 5      6   28.0  
## 6      6   29.0  
## 7     10   25.5  
## 8     10   23.8  
## 9     20   12.5  
## 10    20   15.5  
## 11    30   11.7  
## 12    30   10.0
```

```
## Listing names of variables
```

```
m = print(names(acidData)); m
```

```
## [1] "acid"  "fungus"
```

```
## [1] "acid"  "fungus"
```

```
names(acidData)
```

```
## [1] "acid"  "fungus"
```

```
## Listing first 3 lines
```

```
head(acidData, 3)
```

```
##      acid fungus  
## 1      0   33.3  
## 2      0   31.0  
## 3      3   29.8
```

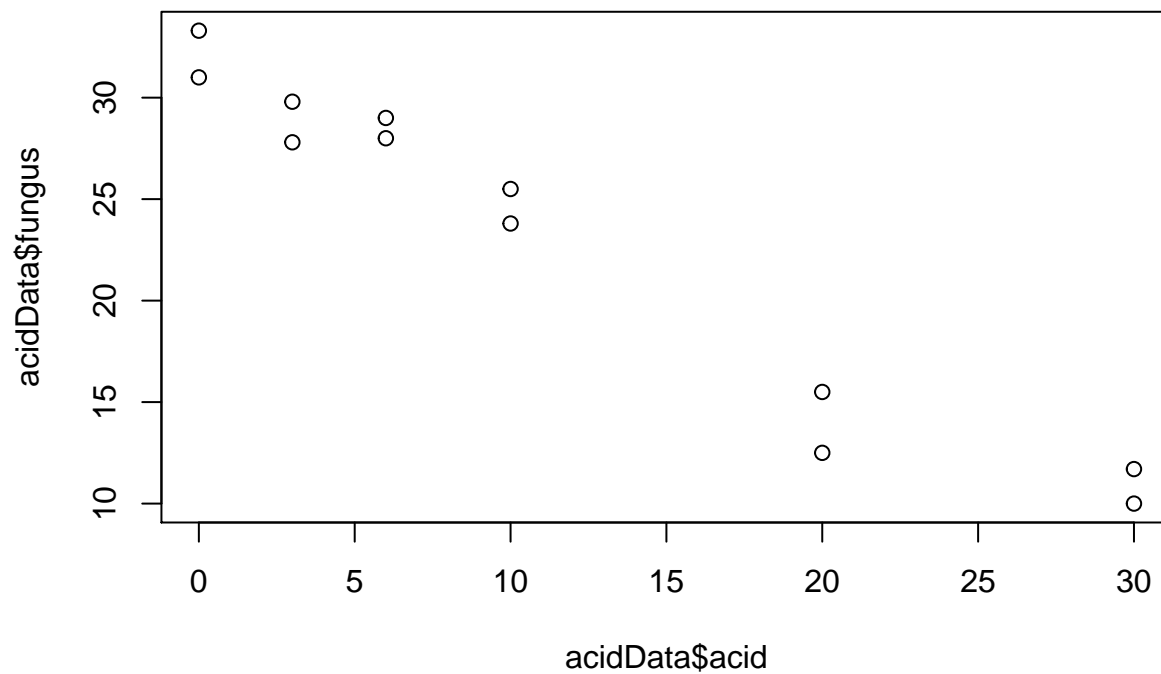
```
## Fitting Linear Model with Y = fungus, X = acid
acid.lm <- lm(fungus ~ acid, data=acidData)
summary(acid.lm)
```

```
##
## Call:
## lm(formula = fungus ~ acid, data = acidData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.285 -0.907  0.491  1.292  2.414
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  31.7816     0.8327   38.2 3.6e-12
## acid        -0.7498     0.0537  -14.0 6.9e-08
##
## Residual standard error: 1.94 on 10 degrees of freedom
## Multiple R-squared:  0.951, Adjusted R-squared:  0.946
## F-statistic: 195 on 1 and 10 DF, p-value: 6.89e-08
```

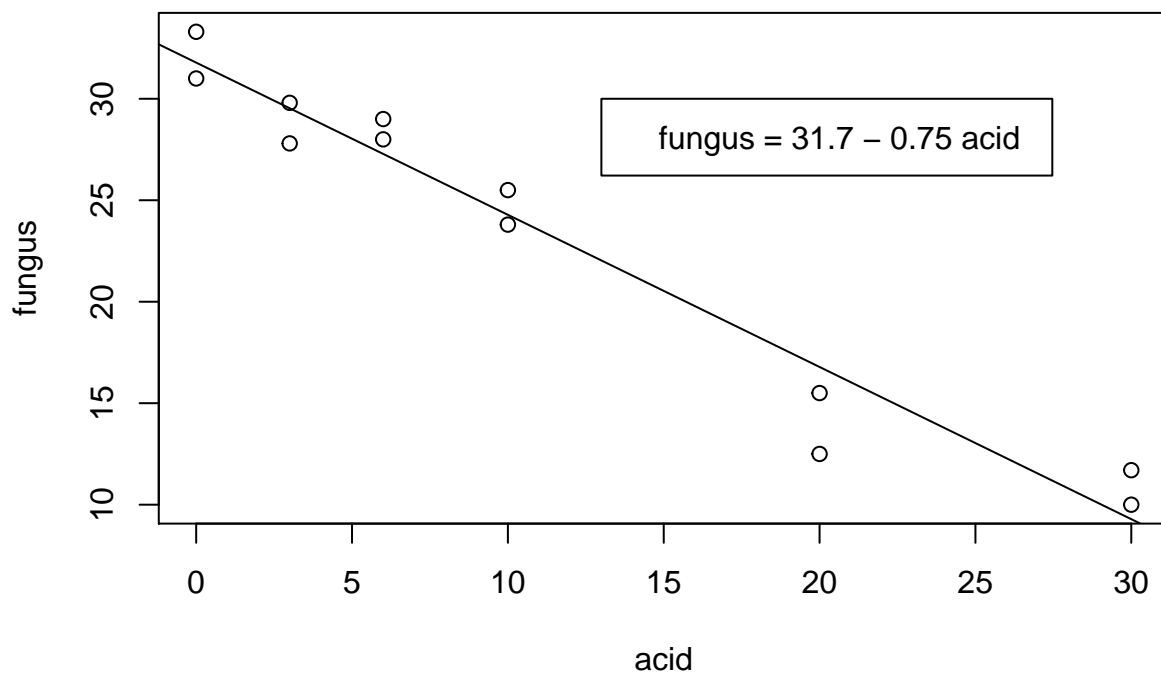
```
## Anova table
anova(acid.lm)
```

```
## Analysis of Variance Table
##
## Response: fungus
##           Df Sum Sq Mean Sq F value    Pr(>F)
## acid       1     733      733    195 6.9e-08
## Residuals 10       38        4
```

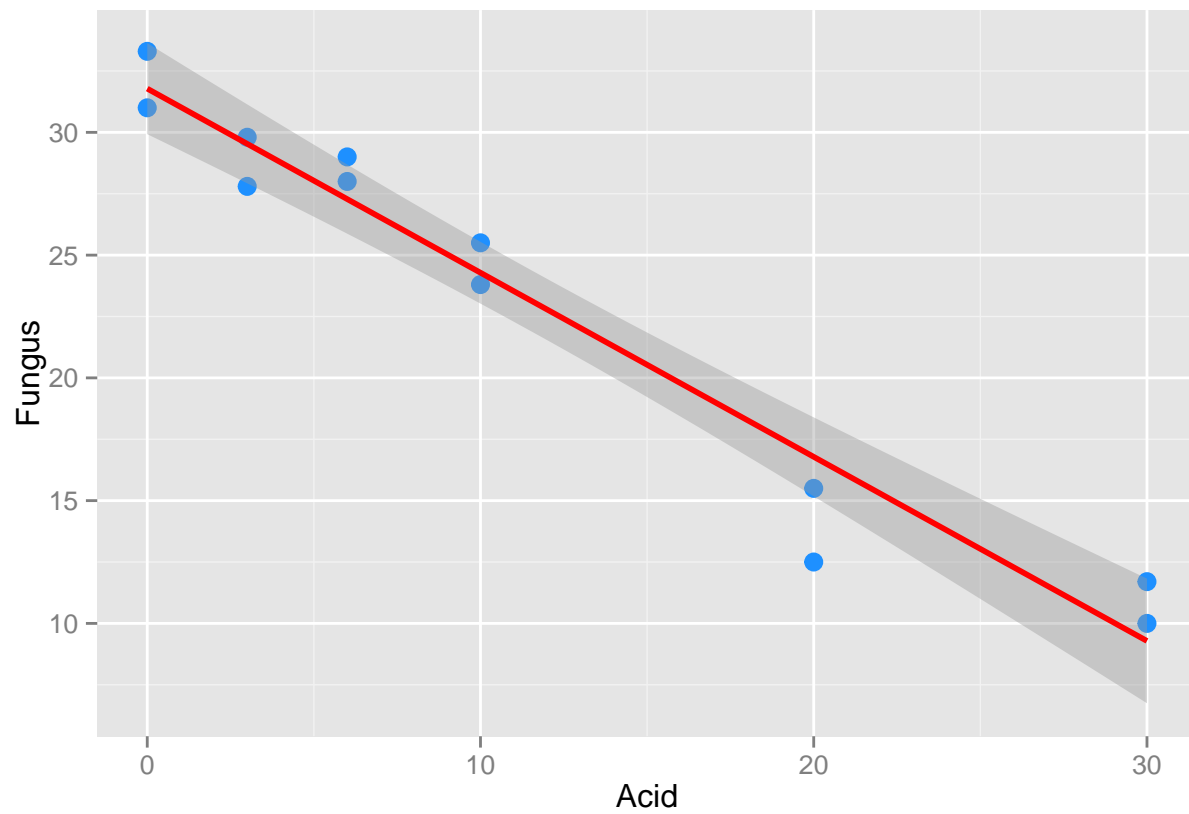
```
## Plotting
# same thing (plotting fungus ~ acid means plotting fungus as function of acid = plot(y ~ x))
## Adding the least squares line to the plot
plot(acidData$acid, acidData$fungus)
```



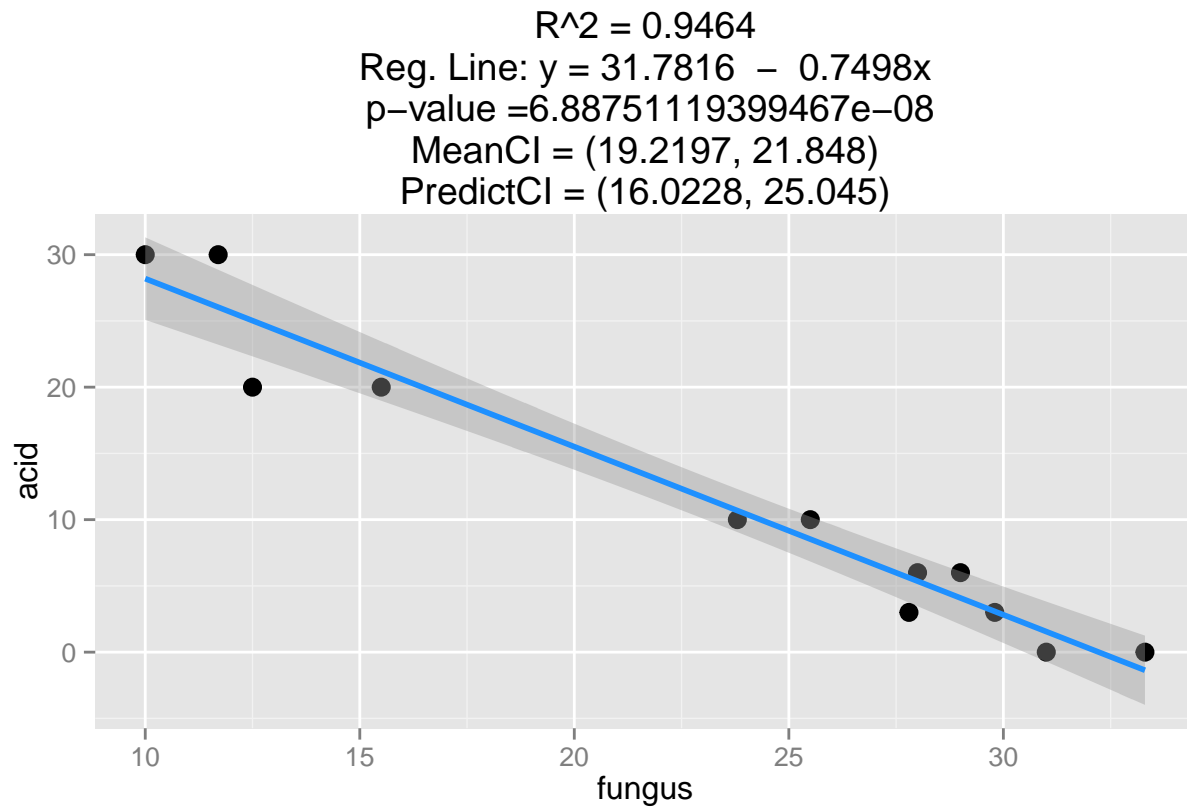
```
plot(fungus ~ acid, data=acidData)
abline(acid.lm)
legend(13, 30, legend="fungus = 31.7 - 0.75 acid ") # coeffs of reg.line
```



```
# Plot with ggplot
g <- ggplot(acidData, aes(x = acid, y = fungus))
g + geom_point(shape=19, color="dodgerblue", size=3) +
  labs(x="Acid", y="Fungus") +
  stat_smooth(method="lm", col="red", lwd=1)
```



```
#geom_smooth(method="lm", lwd=1, alpha=0.1, fill="red")  
  
# Easier way, all set out  
ggplotRegression(acid.lm, x.value=15)
```



```
## Prediction intervals
meanCI(acid.lm, x.value=15, level=0.95)
```

```
## [1] 19.2 21.8
```

```
predict(acid.lm, new=data.frame(acid=15), interval="confidence", level=0.95)
```

```
##      fit lwr upr
## 1 20.5 19.2 21.8
```

```
predictCI(acid.lm, x.value=15, level=0.95)
```

```
## [1] 16 25
```

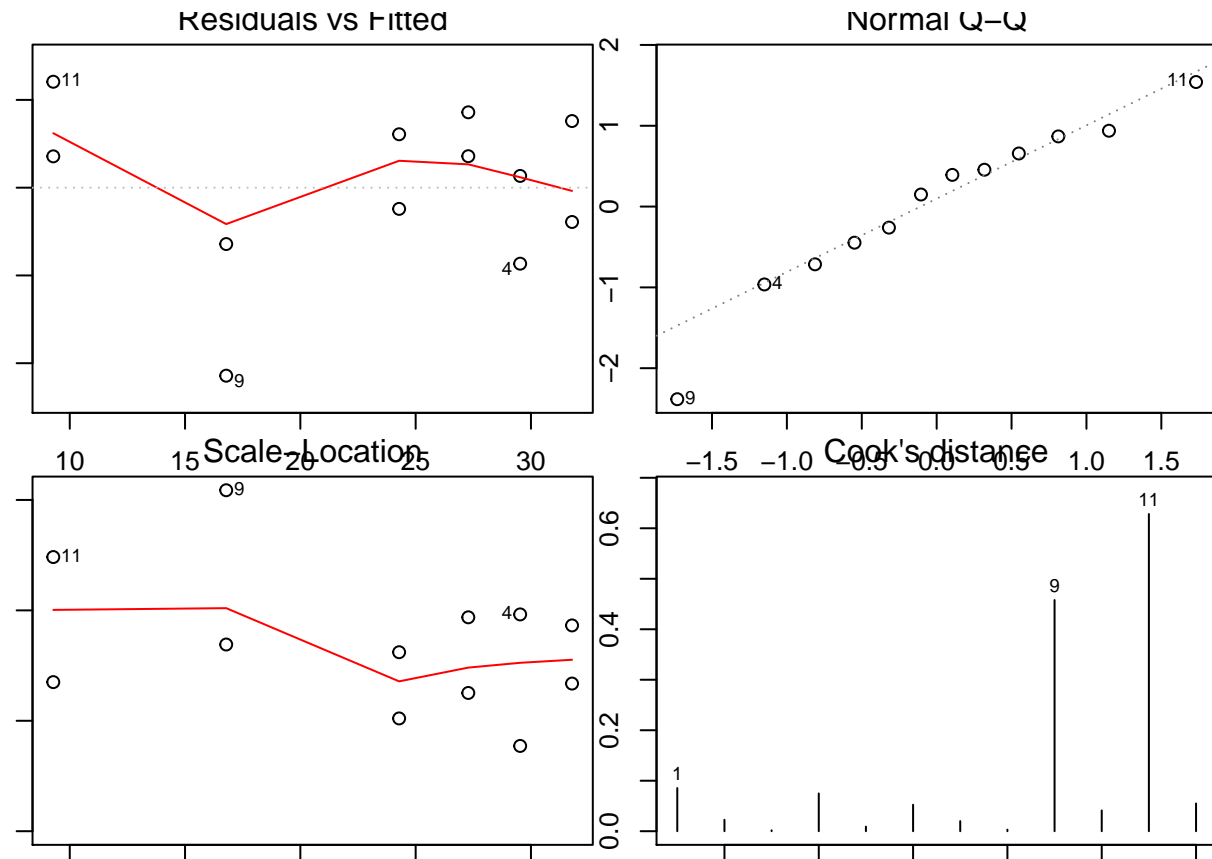
```
predict(acid.lm, new=data.frame(acid=15), interval="prediction", level=0.95)
```

```
##      fit lwr upr
## 1 20.5 16 25
```

```
# Confidence intervals for regression parameters
confint(acid.lm, level=0.95)
```

```
##              2.5 % 97.5 %
## (Intercept) 29.926 33.64
## acid        -0.869 -0.63
```

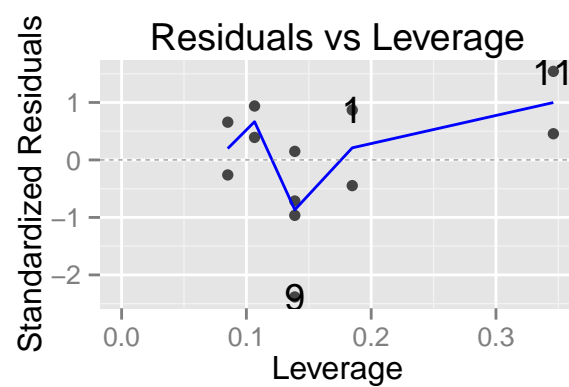
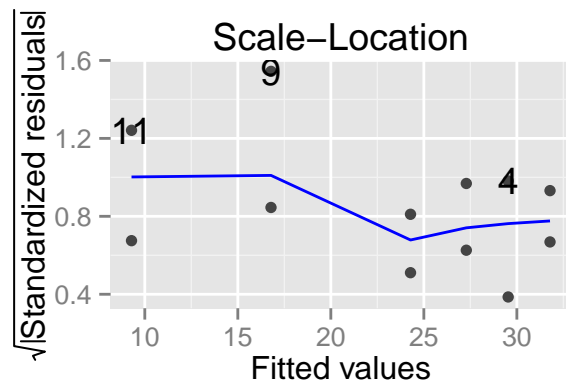
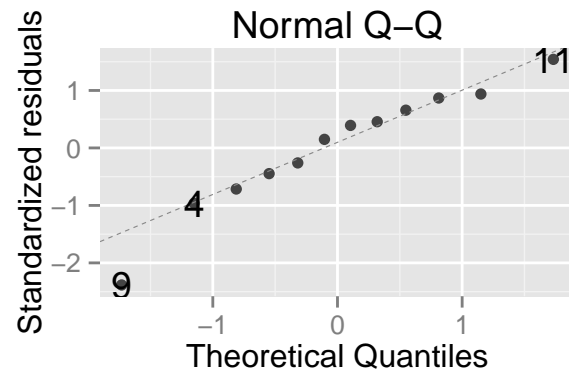
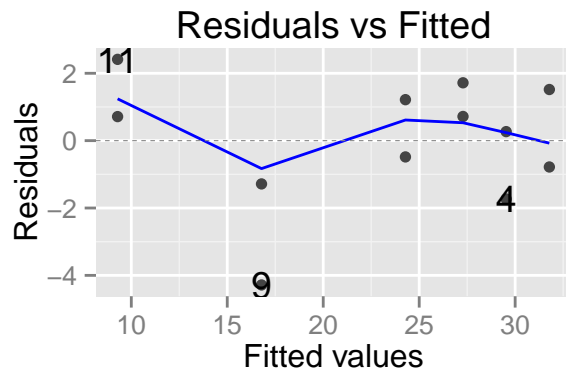
```
# Diagnostic plots to check model assumptions
par(mar=c(1,1,1,1)) # to avoid the figure margin error
par(mfrow=c(2,2))
plot(acid.lm, which=1:4)
```



```
# Diagnostics with ggplot
library(ggfortify)
```

```
## Loading required package: grid
## Loading required package: scales
## Loading required package: proto
```

```
autoplot(acid.lm) # don't even need par(mfrow) setting
```



```
# Shapiro wilk tests normality of residuals
shapiro.test(acid.lm$residuals)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  acid.lm$residuals
## W = 0.9, p-value = 0.4
```