How can I calculate DFFITS in R?

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DFFITS, also known as the Differential Finite Factor Influence on the Total Sum of Squares, is a statistical measure used to identify influential data points in a regression model. In order to calculate DFFITS in R, one must first fit the regression model using the lm() function. Then, the influence.measures() function can be used to obtain the DFFITS values for each data point. These values can also be visualized using the plot() function. By calculating DFFITS, one can determine which data points have the most impact on the overall regression model and potentially identify outliers or influential observations.

Calculate DFFITS in R

In statistics, we often want to know how influential different are in regression models.

One way to calculate the influence of observations is by using a metric known as DFFITS, which stands for "difference in fits."

This metric tells us how much the predictions made by a regression model change when we leave out an individual observation.

This tutorial shows a step-by-step example of how to calculate and visualize DFFITS for each observation in a model in R.

Step 1: Build a Regression Model

First, we'll build a using the built-in mtcars dataset in R:

```
#load the dataset
data(mtcars)

#fit a regression model
model <- lm(mpg~disp+hp, data=mtcars)

#view model summary
summary(model)

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 30.735904 1.331566 23.083 < 2e-16 ***
disp -0.030346 0.007405 -4.098 0.000306 ***
hp -0.024840 0.013385 -1.856 0.073679 .
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.127 on 29 degrees of freedom
Multiple R-squared: 0.7482, Adjusted R-squared: 0.7309
F-statistic: 43.09 on 2 and 29 DF, p-value: 2.062e-09
```

Step 2: Calculate DFFITS for each Observation

Next, we'll use the built-in dffits() function to calculate the DFFITS value for each observation in the model:

#calculate DFFITS for each observation in the model

dffits <- as.data.frame(dffits(model))

#display DFFITS for each observation

dffits

dffits(model)

Mazda RX4 -0.14633456

Mazda RX4 Wag -0.14633456

Datsun 710 -0.19956440

Hornet 4 Drive 0.11540062

Hornet Sportabout 0.32140303

Valiant -0.26586716

Duster 360 0.06282342

Merc 240D -0.03521572

Merc 230 -0.09780612

Merc 280 -0.22680622

Merc 280C -0.32763355

Merc 450SE -0.09682952

Merc 450SL -0.03841129

Merc 450SLC -0.17618948

Cadillac Fleetwood -0.15860270

Lincoln Continental -0.15567627

Chrysler Imperial 0.39098449

Fiat 128 0.60265798

Honda Civic 0.35544919

Toyota Corolla 0.78230167

Toyota Corona -0.25804885

Dodge Challenger -0.16674639

AMC Javelin -0.20965432

Camaro Z28 -0.08062828

Pontiac Firebird 0.67858692

Fiat X1-9 0.05951528

Porsche 914-2 0.09453310

Lotus Europa 0.55650363

Ford Pantera L 0.31169050

Ferrari Dino -0.29539098

Maserati Bora 0.76464932

Volvo 142E -0.24266054

Typically we take a closer look at observations that have DFFITS values greater than a threshold of $2\sqrt{p/n}$ where:

p: Number of predictor variables used in the modeln: Number of observations used in the model

In this example, the threshold would be 0.5:

```
#find number of predictors in model
p <- length(model$coefficients)-1

#find number of observations
n <- nrow(mtcars)

#calculate DFFITS threshold value
thresh <- 2*sqrt(p/n)

thresh

0.5
```

We can sort the observations based on their DFFITS values to see if any of them exceed the threshold:

```
#sort observations by DFFITS, descending
dffits), ]

0.78230167  0.76464932  0.67858692  0.60265798
0.55650363 0.39098449
0.35544919  0.32140303  0.31169050  0.11540062
0.09453310 0.06282342
0.05951528  -0.03521572  -0.03841129  -0.08062828
-0.09682952 -0.09780612
-0.14633456  -0.14633456  -0.15567627  -0.15860270
```

-0.16674639 -0.17618948

-0.19956440 -0.20965432 -0.22680622 -0.24266054

-0.25804885 -0.26586716

-0.29539098 -0.32763355

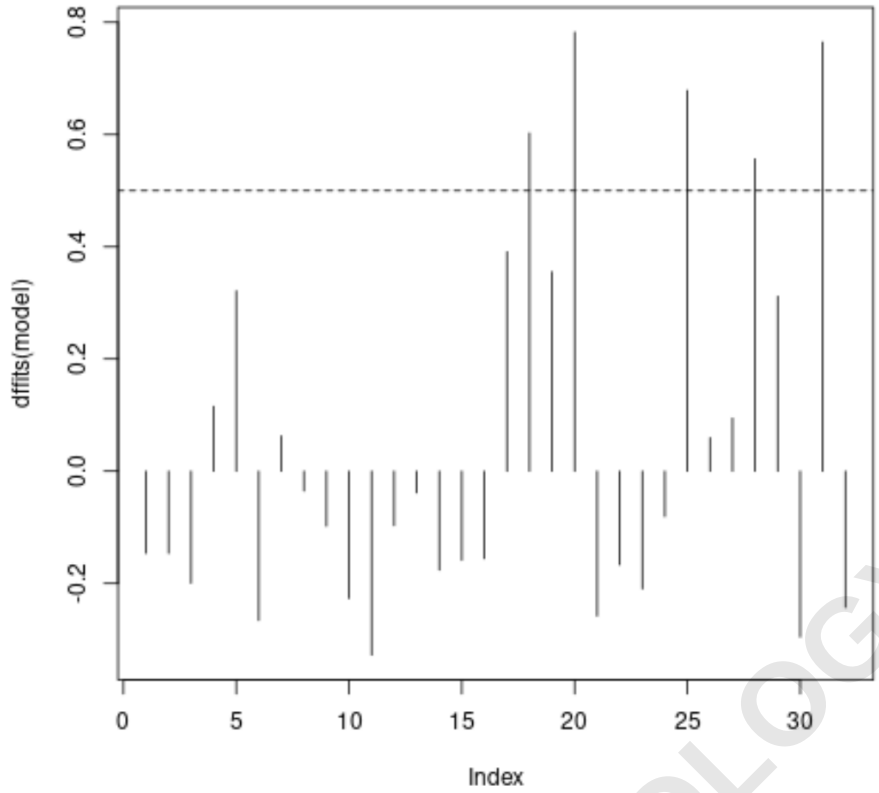
We can see that the first five observations have a DFFITS value greater than 0.5, which means we may want to investigate these observations closer to determine if they're highly influential in the model.

Step 3: Visualize the DFFITS for each Observation

Lastly, we can create a quick plot to visualize the DFFITS for each observation:

```
#plot DFFITS values for each observation
plot(dffits(model), type = 'h')

#add horizontal lines at absolute values for threshold
abline(h = thresh, lty = 2)
abline(h = -thresh, lty = 2)
```



The x-axis displays the index of each observation in the dataset and the y-value displays the corresponding DFFITS value for each observation.