

What is the process of detrending data and can you provide some examples?

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Detrending data is a statistical process that involves removing any underlying trend or pattern from a dataset in order to better analyze the data and make accurate predictions. This technique is commonly used in time series analysis, where there may be a trend or seasonal component present in the data that can skew the results.

The process of detrending involves identifying and removing the trend component from the data using various statistical methods. This can include techniques such as differencing, where the data is transformed by taking the difference between consecutive observations, or fitting a regression model to the data and removing the trend component from the residuals.

Detrending is important because it allows for a better understanding of the underlying patterns and relationships within the data. By removing the trend component, the remaining data can be analyzed more accurately and any significant changes or anomalies can be identified.

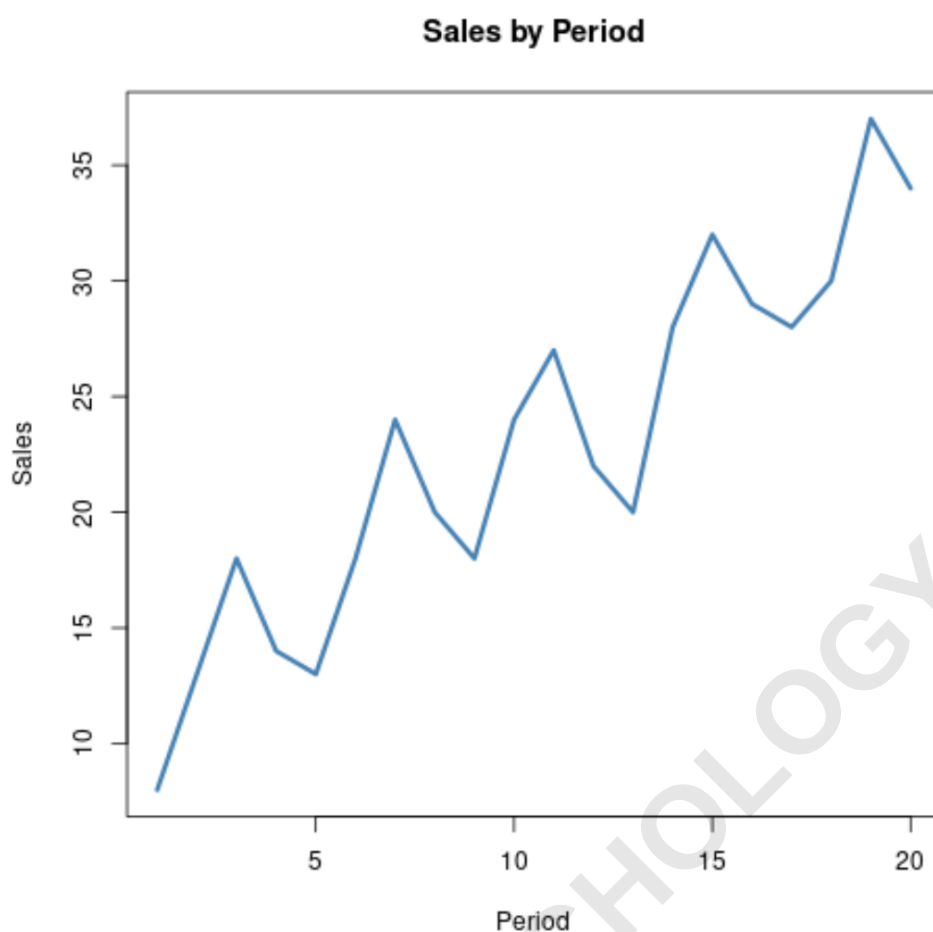
Some examples of when detrending may be useful include analyzing stock market data, where there may be a long-term upward or downward trend that needs to be removed in order to identify short-term fluctuations, or in climate data, where seasonal trends may need to be removed to accurately assess long-term climate patterns.

In summary, detrending data is a valuable tool in statistical analysis that helps to remove any underlying trends or patterns and allows for a more accurate interpretation of the data.

Detrend Data (With Examples)

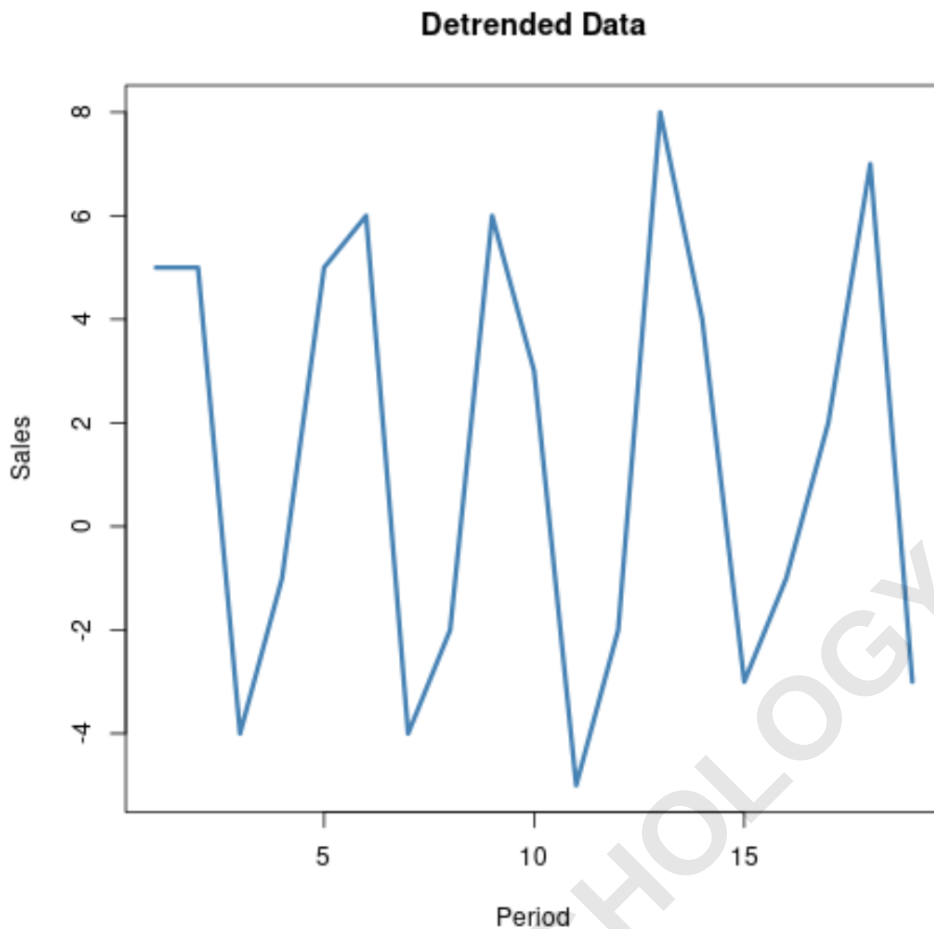
To "detrend" time series data means to remove an underlying trend in the data. The main reason we would want to do this is to more easily see subtrends in the data that are seasonal or cyclical.

For example, consider the following time series data that represents the total sales for some company during 20 consecutive periods:



Clearly the sales is trending upwards over time, but there also appears to be a cyclical or seasonal trend in the data, which can be seen by the tiny "hills" that occur over time.

To gain a better view of this cyclical trend, we can detrend the data. In this case, this would involve removing the overall upward trend over time so that the resulting data represents just the cyclical trend.



There are two common methods used to detrend time series data:

1. Detrend by Differencing

2. Detrend by Model Fitting

This tutorial provides a brief explanation of each method.

Method 1: Detrend by Differencing

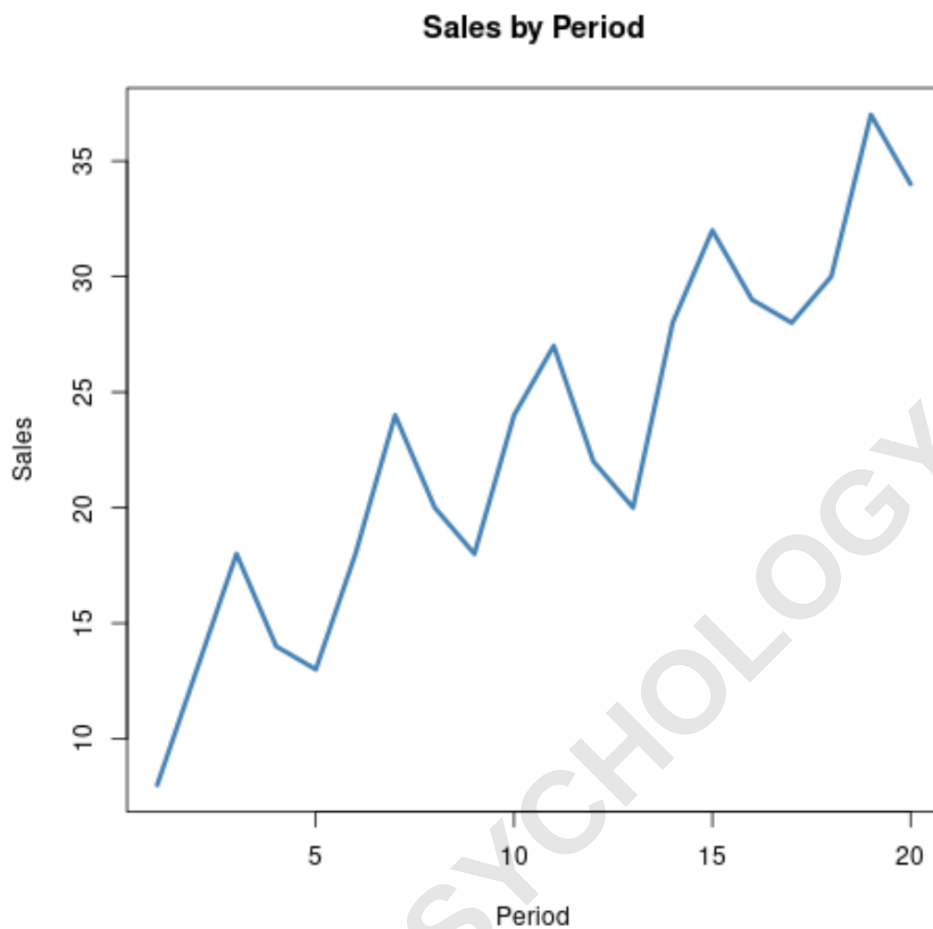
One way to detrend time series data is to simply create a new dataset where each observation is the difference between itself and the previous observation.

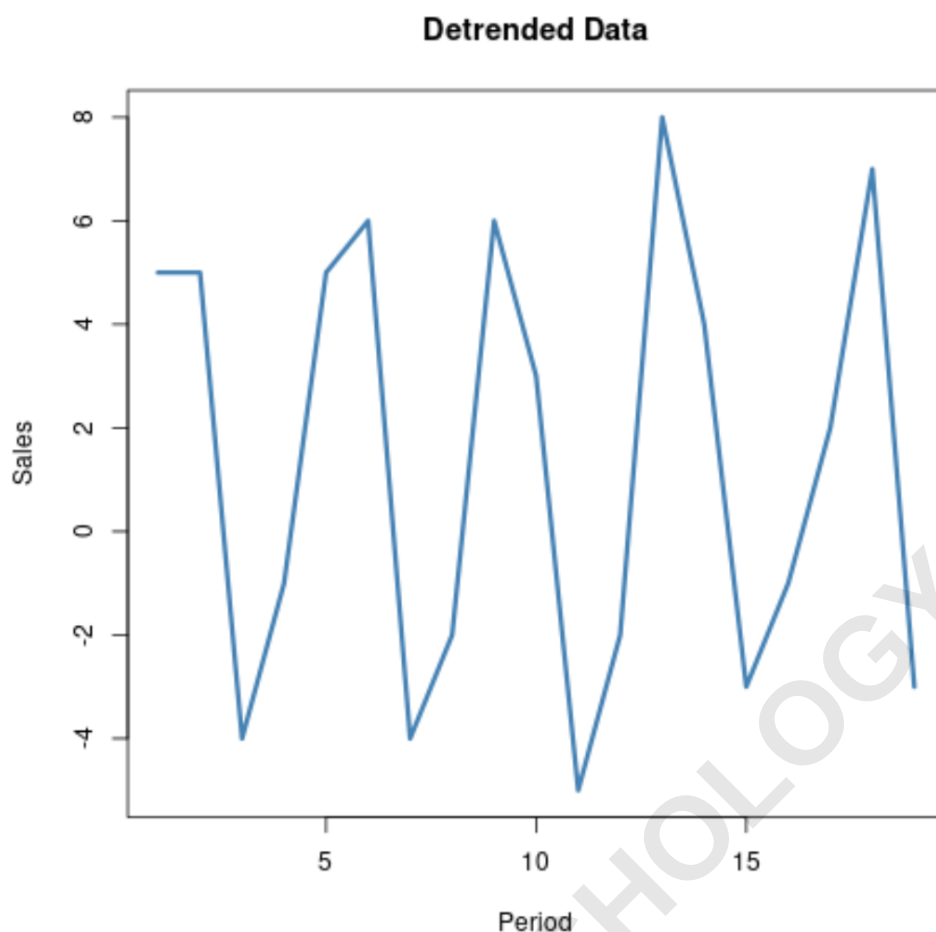
For example, the following image shows how to use differencing to detrend a data series.

To obtain the first value of the detrended time series data, we calculate $13 - 8 = 5$. Then to obtain the next value we calculate $18 - 13 = 5$, and so on.

Original Data	Detrended Data
8	
13	5
18	5
14	-4
13	-1
18	5
24	6
20	-4
18	-2
24	6
27	3
22	-5
20	-2
28	8
32	4
29	-3
28	-1
30	2
37	7
34	-3

The following plot shows the original time series data:





Notice how it's much easier to see the seasonal trend in the time series data in this plot because the overall upward trend has been removed.

Method 2: Detrend by Model Fitting

Another way to detrend time series data is to fit a regression model to the data and then calculate the difference between the observed values and the predicted values from the model.

For example, suppose we have the same dataset:

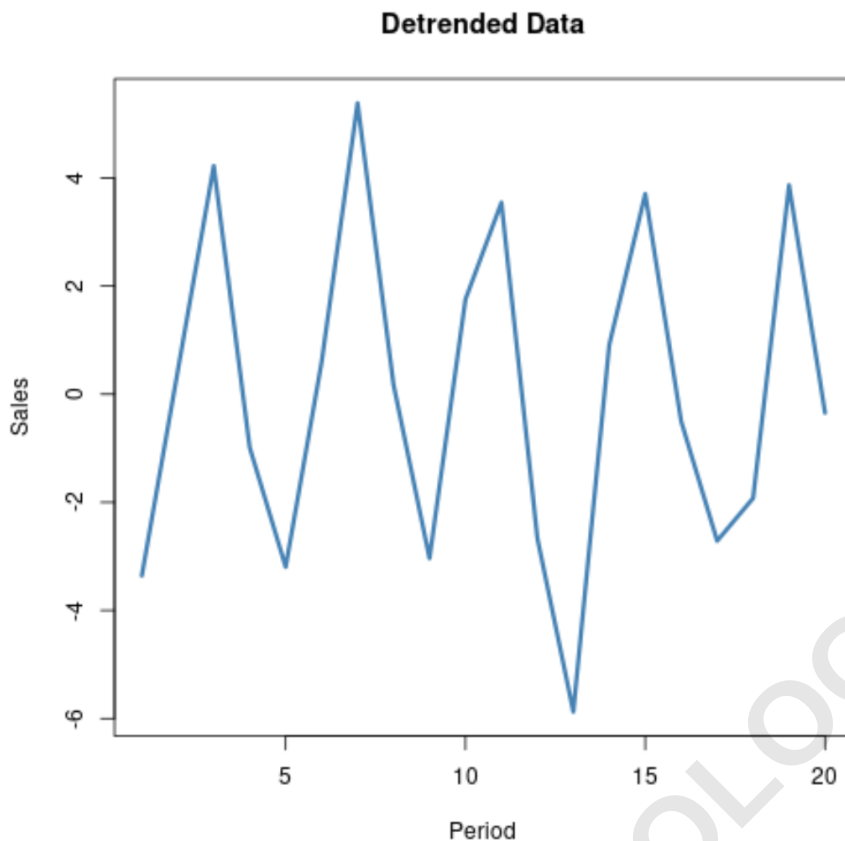
Original Data
8
13
18
14
13
18
24
20
18
24
27
22
20
28
32
29
28
30
37
34

If we fit a to the data, we can obtain a predicted value for each in the dataset.

We can then find the difference between the actual value and the predicted value for each observation. These differences represent the detrended data.

Original Data	Predicted Value	Detrended Data
8	11.4	-3.4
13	12.6	0.4
18	13.8	4.2
14	15.0	-1.0
13	16.2	-3.2
18	17.4	0.6
24	18.6	5.4
20	19.8	0.2
18	21.0	-3.0
24	22.2	1.8
27	23.5	3.5
22	24.7	-2.7
20	25.9	-5.9
28	27.1	0.9
32	28.3	3.7
29	29.5	-0.5
28	30.7	-2.7
30	31.9	-1.9
37	33.1	3.9
34	34.3	-0.3

If we create a plot of the detrended data, we can visualize the seasonal or cyclical trend in the data much more easily:



Note that we used linear regression in this example, but it's possible to use a more complex method like exponential regression if there is more of an exponentially increasing or decreasing trend in the data.