

Create a Biplot in R to Visualize PCA Results How to create a biplot in R to visualize PCA results?

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A biplot is a graphical representation of PCA results which shows the relative contribution of each variable to the total variance of the data. It also shows the relationships between the variables and the principal components. To create a biplot in R, it is necessary to use the `prcomp()` and `biplot()` functions. The `prcomp()` function is used to perform the PCA and the `biplot()` function is used to generate the biplot. The `biplot()` function provides the ability to customize the biplot to show only the variables and principal components that are of interest.

Principal components analysis (PCA) is an unsupervised machine learning technique that seeks to find principal components that explain a large portion of the variation in a dataset.

To visualize the results of PCA for a given dataset we can create a **biplot**, which is a plot that displays every observation in a dataset on a plane that is formed by the first two principal components.

We can use the following basic syntax in R to create a biplot:

```
#perform PCA  
results <- princomp(df)
```

```
#create biplot to visualize results of PCA  
biplot(results)
```

The following example shows how to use this syntax in practice.

Example: How to Create a Biplot in R

For this example we'll use the built-in R dataset called **USArrests**:

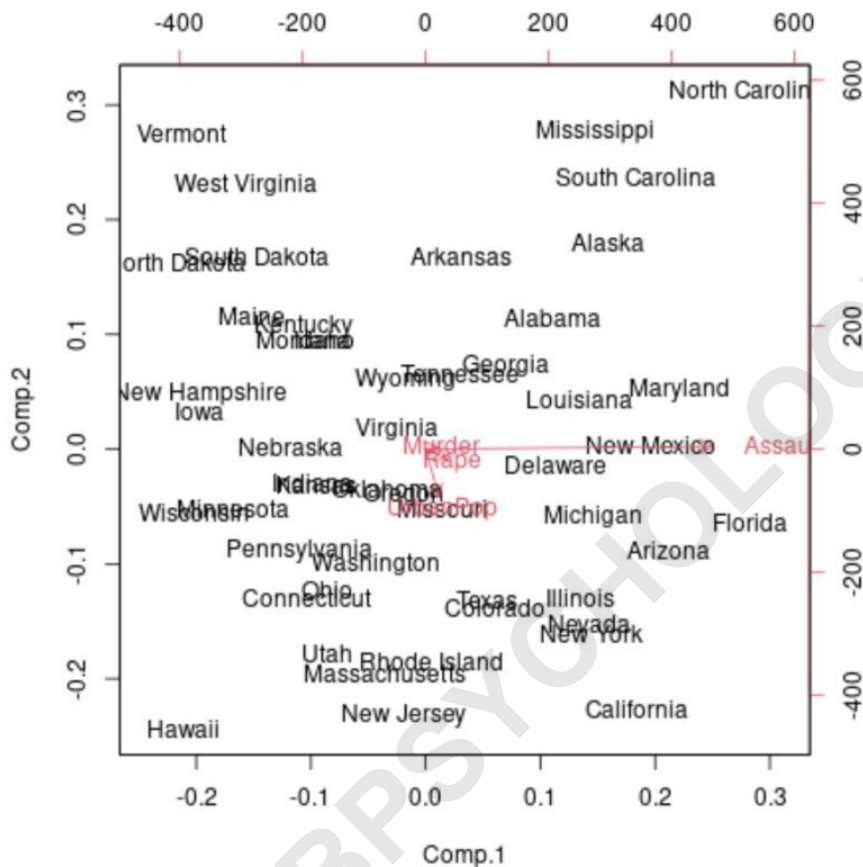
```
#view first six rows of USArrests dataset  
head(USArrests)
```

```
Murder Assault UrbanPop Rape  
Alabama 13.2 236 58 21.2  
Alaska 10.0 263 48 44.5  
Arizona 8.1 294 80 31.0  
Arkansas 8.8 190 50 19.5  
California 9.0 276 91 40.6  
Colorado 7.9 204 78 38.7
```

We can use the following code to perform PCA and visualize the results in a biplot:

```
#perform PCA
results <- princomp(USArrests)

#visualize results of PCA in biplot
biplot(results)
```



The x-axis displays the first principal component, the y-axis displays the second principal component, and the individual from the dataset are shown inside the plot along with the four variables shown in red.

Note that there are several arguments we can use within the **biplot** function to modify the appearance of the plot.

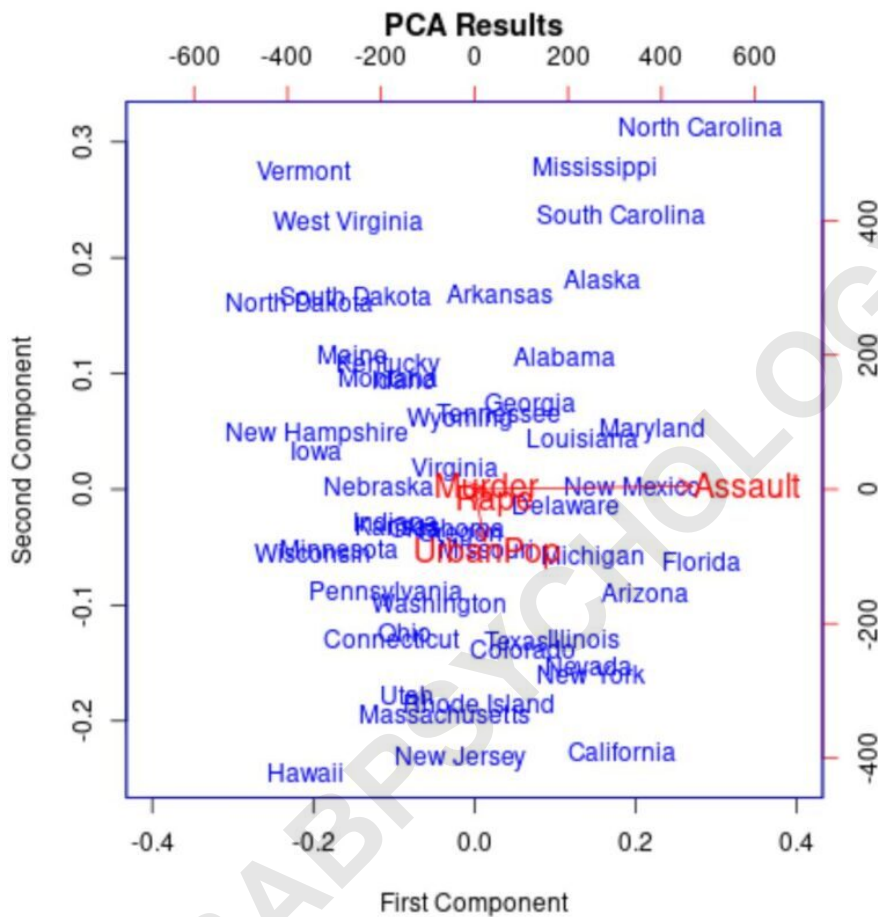
For example, we can use the following code to modify the colors, font size, axis limits, plot title, axis titles, and size of the arrows in the plot:

```
#create biplot with custom appearance
biplot(results,
col=c('blue', 'red'),
```

```

cex=c(1, 1.3),
xlim=c(-.4, .4),
main='PCA Results',
xlab='First Component',
ylab='Second Component',
expand=1.2)

```



This biplot is a bit easier to read than the previous one.

The following tutorials provide additional information about principal components analysis: