

How can I create a biplot in R to visualize the results of a PCA analysis?

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A biplot in R is a graphical representation of the results of a Principal Component Analysis (PCA) that allows for the visualization of the relationship between variables and observations in a dataset. To create a biplot in R, one must first perform a PCA analysis on the dataset using the "prcomp" function. This will generate a set of principal components that explain the variation in the data. The biplot can then be created using the "biplot" function, which plots the principal components as vectors and the observations as points on a scatterplot. This allows for the identification of patterns and relationships between variables and observations, making it a useful tool for data analysis and interpretation.

Create a Biplot in R to Visualize PCA Results

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

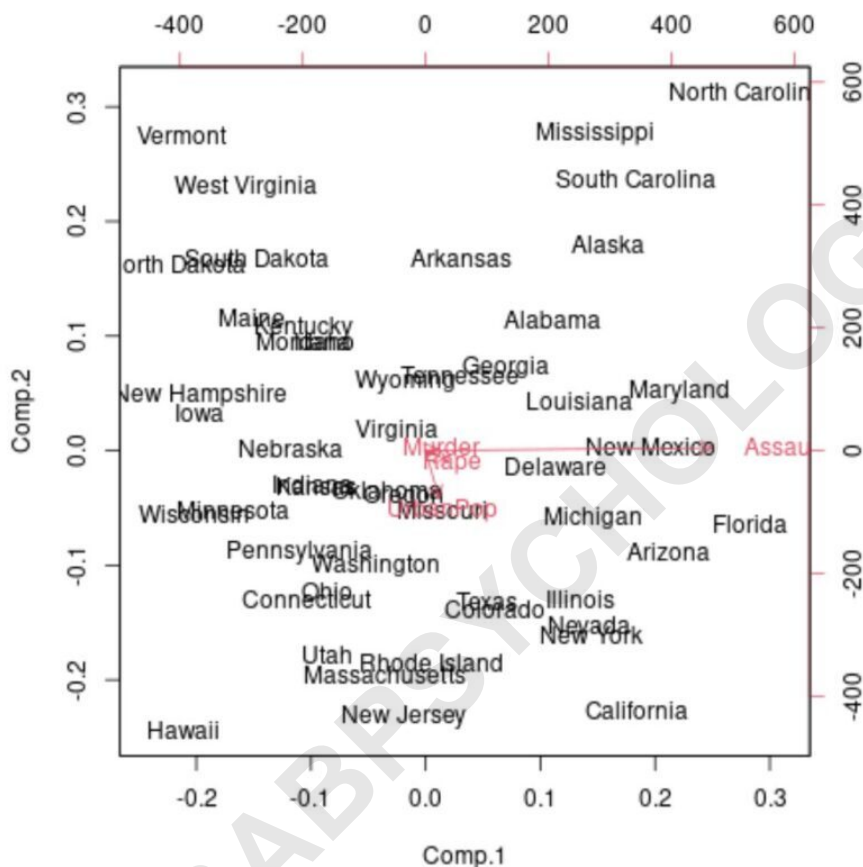
We can use the following code to perform PCA and visualize the results in a biplot:

```
#perform PCA
```

```
results <- princomp(USArrests)
```

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

```
biplot(results)
```



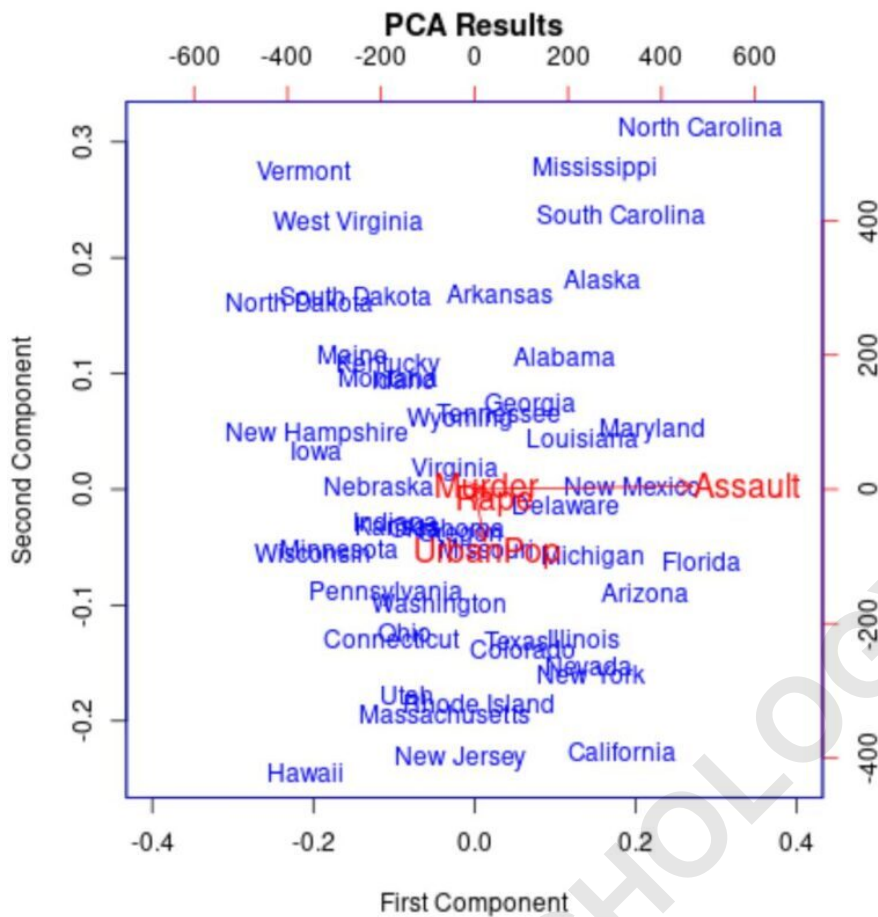
The x-axis displays the first principal component, the y-axis displays the second principal component, and the individual from the dataset are shown inside the plot along with the four variables shown in red.

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.

Additional Resources

The following tutorials provide additional information about principal components analysis: