Correspondence Analysis (CA)

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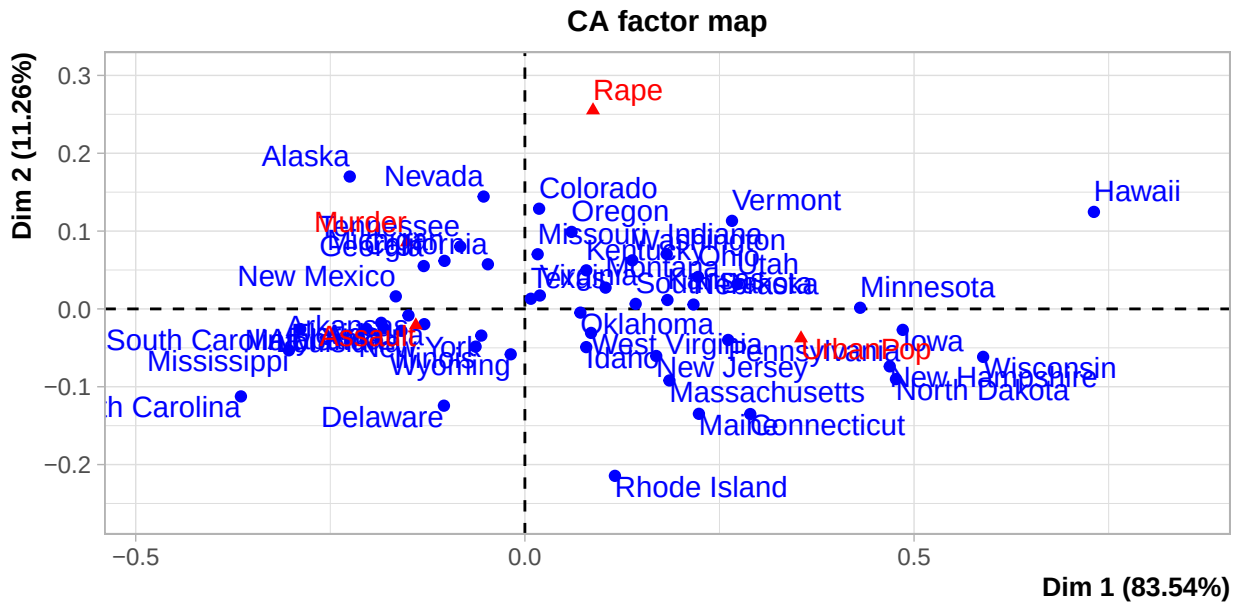
#Step 1. Load Required Packages and Load Dataset

```
#install.packages(c("FactoMineR", "factoextra", "ca"))

library(FactoMineR)   # For CA function
library(factoextra)   # For visualization
library(ca)           # For correspondence analysis

data("USArrests")  # Built-in dataset
head(USArrests)    # Preview first few rows
```

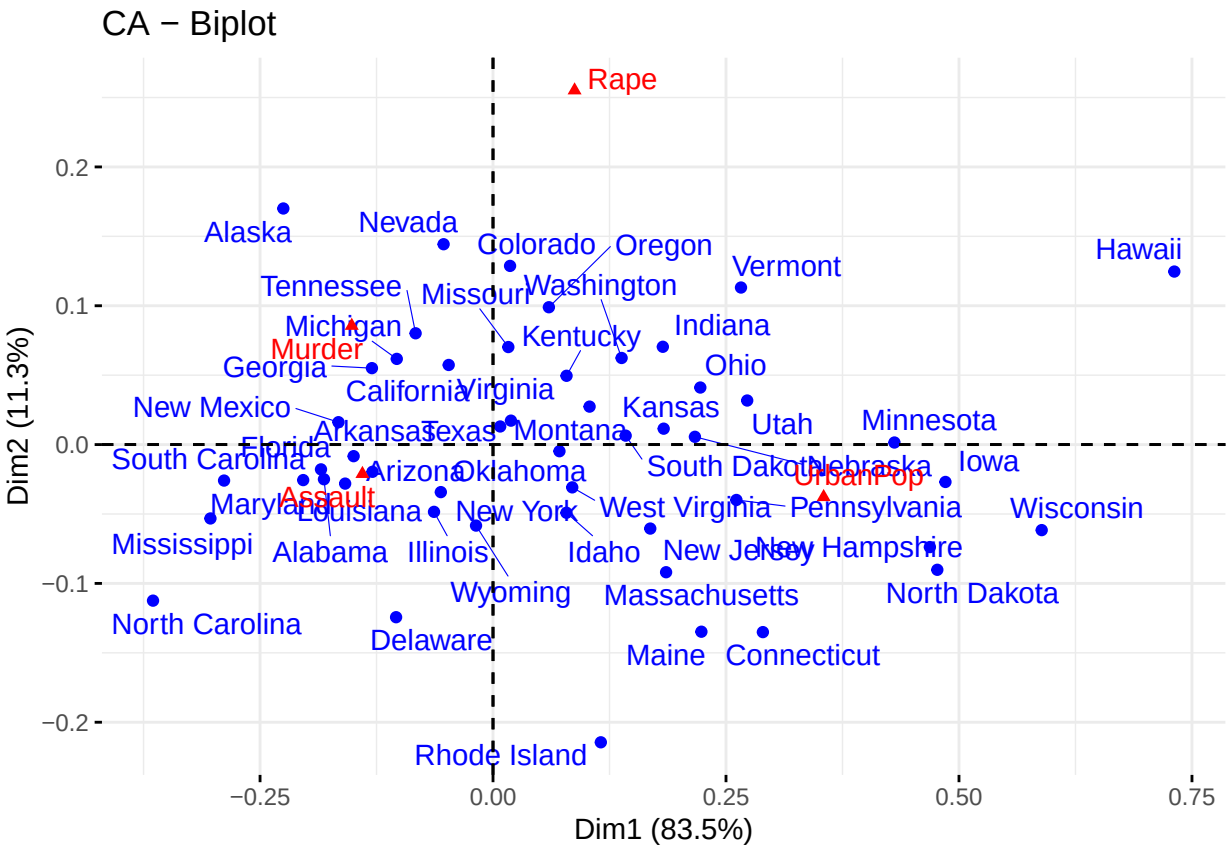
```
##            Murder Assault UrbanPop Rape
## Alabama      13.2     236       58 21.2
## Alaska       10.0     263       48 44.5
## Arizona       8.1     294       80 31.0
## Arkansas      8.8     190       50 19.5
## California    9.0     276       91 40.6
## Colorado      7.9     204       78 38.7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

#Step 2. Correspondence Analysis using FactoMineR

```
ca_result_facto <- CA(USArrests)  # Perform CA
```




```r
# Visualization: Biplot
fviz_ca_biplot(ca_result_facto, repel = TRUE)
```



#Step 3. Correspondence Analysis using 'ca' package

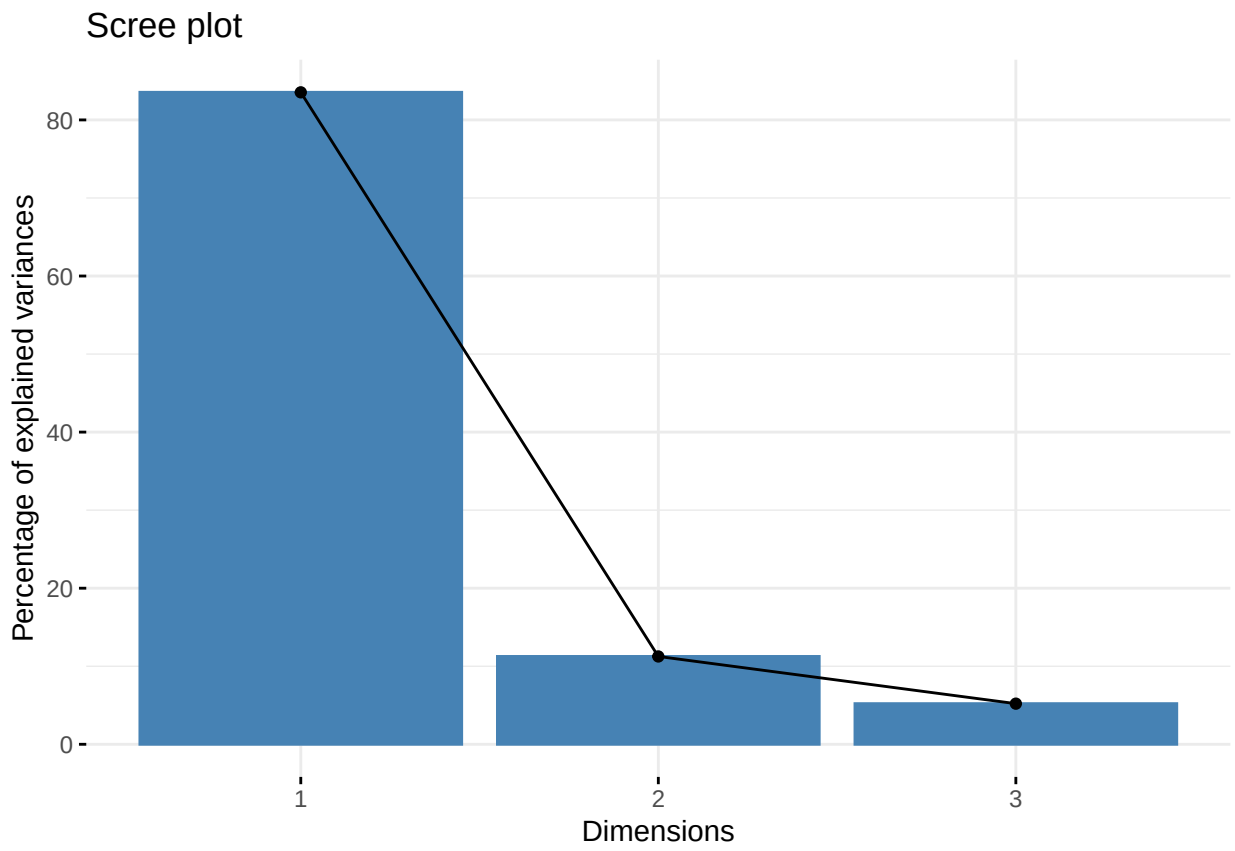
```
ca_result <- ca(USArrests, graph = FALSE)  # Perform CA
```

#Step 4. Eigenvalues & Scree Plot

```
eig_values <- get_eigenvalue(ca_result)
print(eig_values)          # Display eigenvalues
```

```
##        eigenvalue variance.percent cumulative.variance.percent
## Dim.1 0.045013566        83.535466                    83.53547
## Dim.2 0.006065461        11.256188                    94.79165
## Dim.3 0.002806548         5.208347                   100.00000
```

```
fviz_eig(ca_result)        # Scree plot
```



#Step 5. Row & Column Profiles

```
row_profiles <- get_ca_row(ca_result)
print(row_profiles)
```

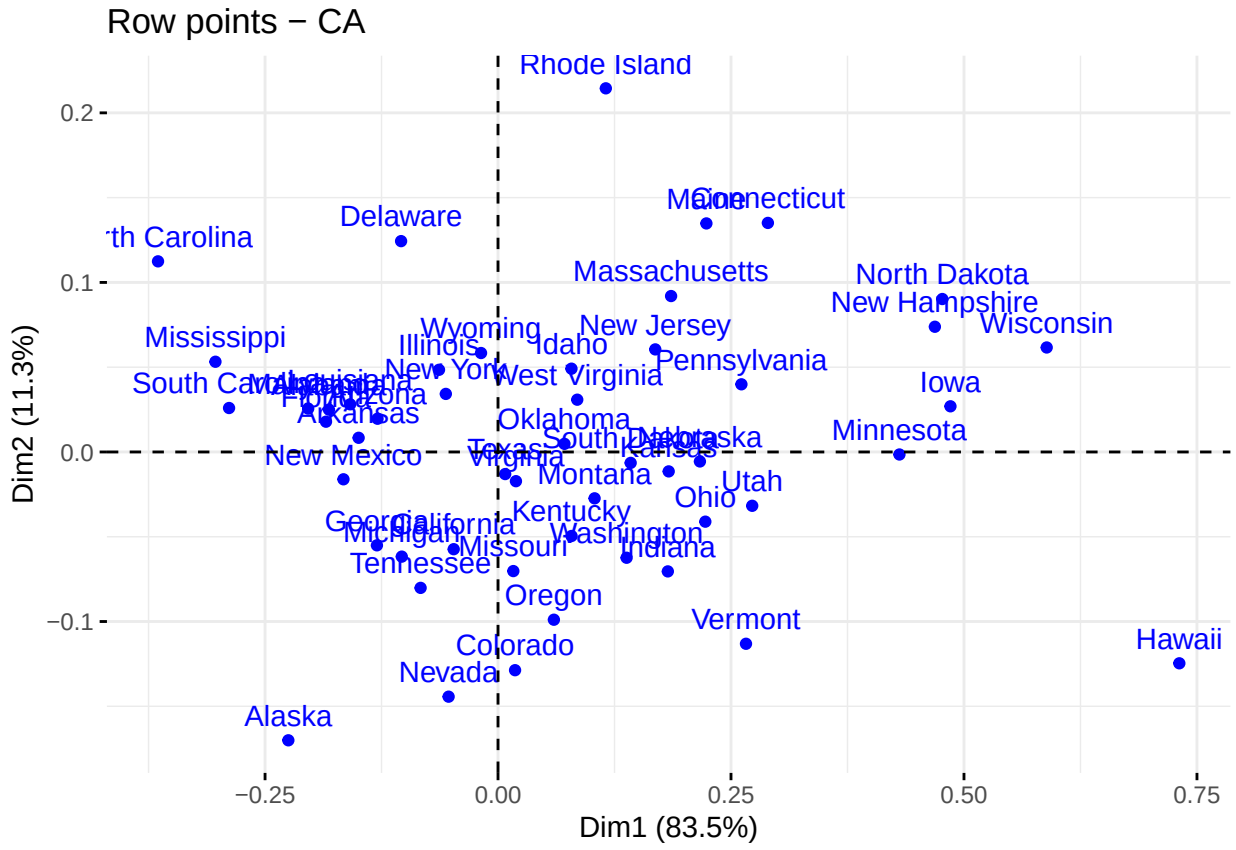
```
## Correspondence Analysis - Results for rows
##  ===================================================
##   Name       Description
## 1 "$coord"   "Coordinates for the rows"
## 2 "$cos2"    "Cos2 for the rows"
## 3 "$contrib" "contributions of the rows"
## 4 "$inertia" "Inertia of the rows"
```

```
col_profiles <- get_ca_col(ca_result)
print(col_profiles)
```

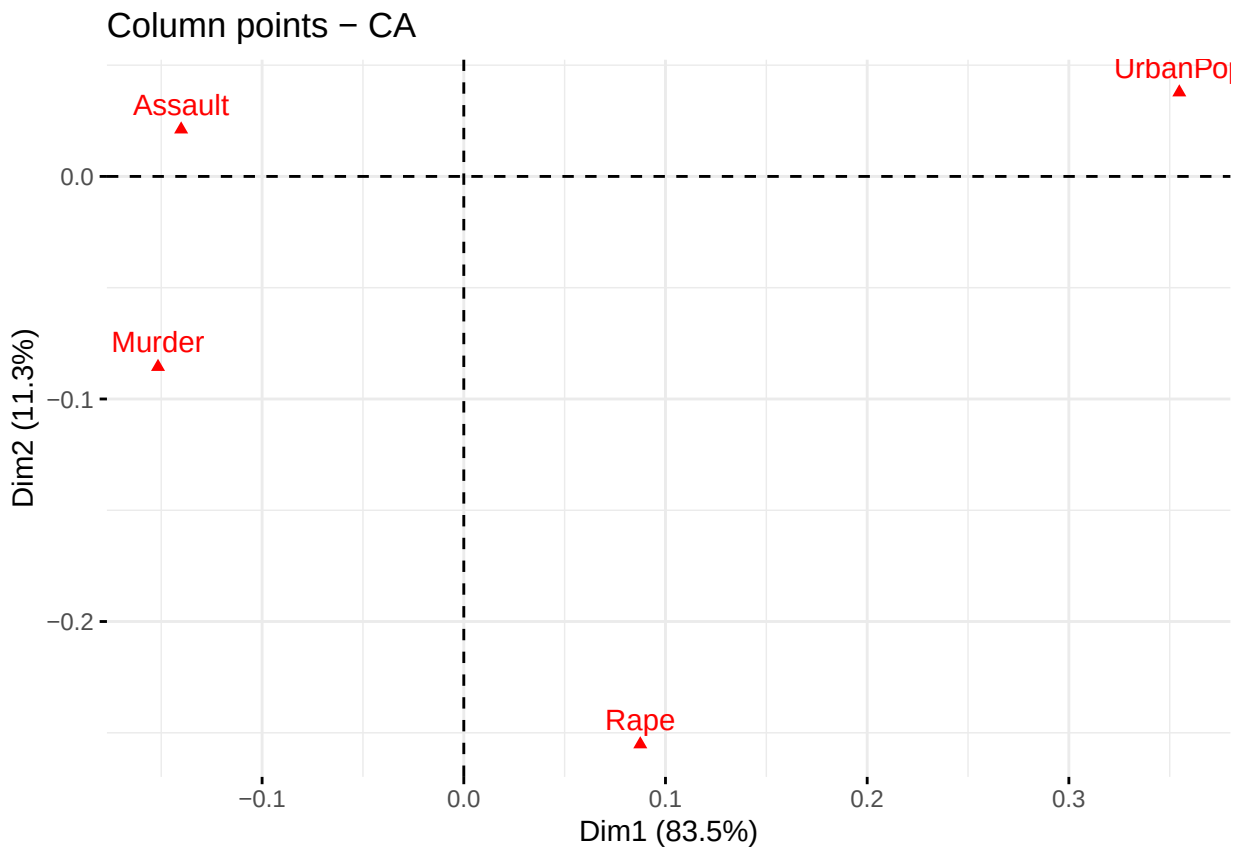
```
## Correspondence Analysis - Results for columns
##  ===================================================
##   Name       Description
## 1 "$coord"   "Coordinates for the columns"
## 2 "$cos2"    "Cos2 for the columns"
## 3 "$contrib" "contributions of the columns"
## 4 "$inertia" "Inertia of the columns"
```

#Step 6. Visualize Row & Column Profiles

```
fviz_ca_row(ca_result)     # Row profiles
```

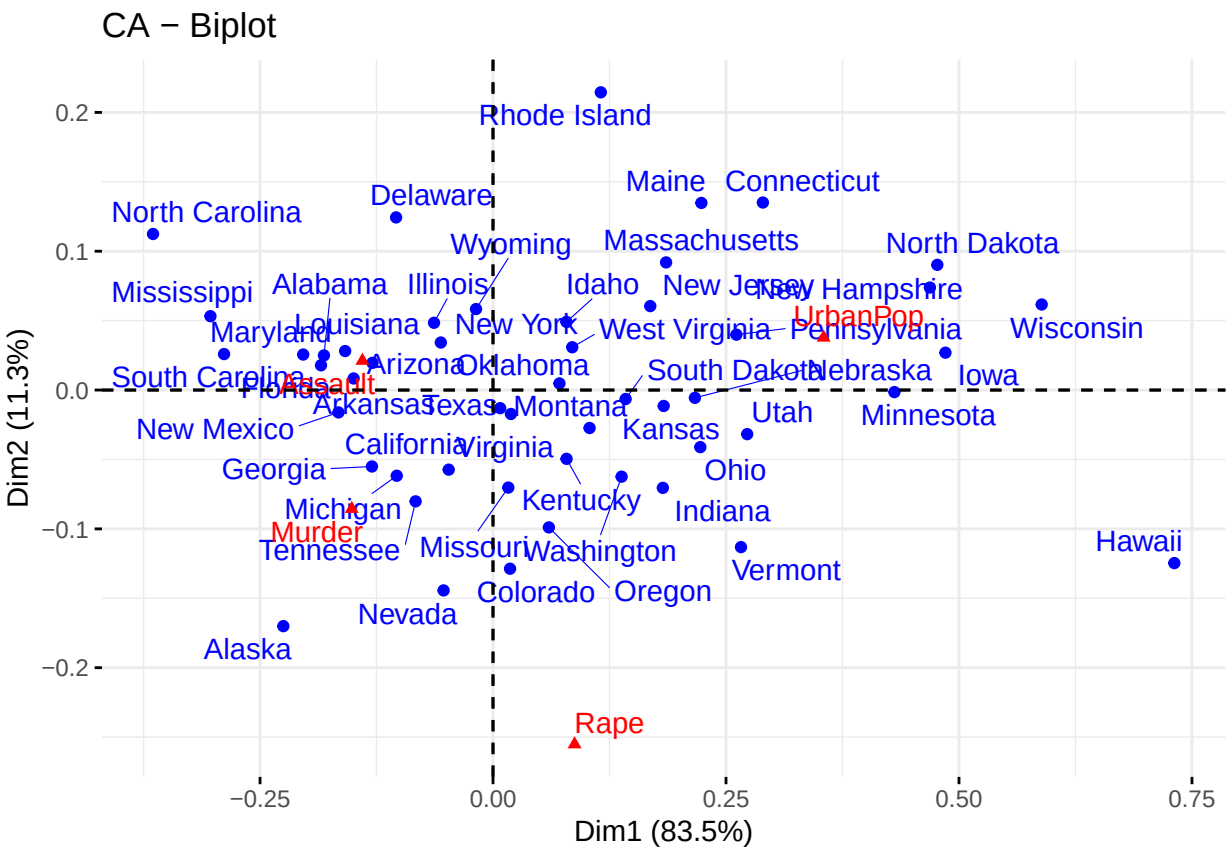



```
fviz_ca_col(ca_result)     # Column profiles
```



#Step 7. Biplot (Rows & Columns)

```
fviz_ca_biplot(ca_result, repel = TRUE)
```


CA − Biplot
Rhode Island
Maine
Connecticut
Delaware
North Carolina
Wyoming
Massachusetts
North Dakota
Mississippi
Alabama
Illinois
Idaho
New Jersey
New Hampshire
Maryland
Louisiana
New York
West Virginia
UrbanPop
Pennsylvania
Wisconsin
Arizona
Oklahoma
South Dakota
Nebraska
Iowa
South Carolina
Assault
Arkansas
Texas
Montana
Utah
Minnesota
New Mexico
California
Virginia
Kansas
Georgia
Ohio
Kentucky
Michigan
Indiana
Murder
Tennessee
Missouri
Washington
Hawaii
Vermont
Colorado
Oregon
Nevada
Alaska
Rape
0.2
0.1
0.0
−0.1
−0.2
−0.25
0.00
0.25
0.50
0.75
Dim2 (11.3%)
Dim1 (83.5%)