About the transformation - minmax: linearly rescales numeric attributes to a target range (default [0, 1]). Useful for scale-sensitive algorithms and models that expect bounded inputs.

Method - For each numeric column j: (x - min\_j) / (max\_j - min\_j) to map to [0, 1]. - Constant columns (where max\_j == min\_j) map to 0 to avoid division by zero.

When to use - Recommended for distance-based methods (e.g., k-NN), gradient methods sensitive to feature scales, or when features have different units.

Environment setup.

# installation   
#install.packages("daltoolbox")  
  
# loading DAL  
library(daltoolbox)

Context and sample data (iris) to illustrate normalization.

# Normalization  
  
# Normalization is a technique used to equal strength among variables.   
  
# It is also important to apply it as an input for some machine learning methods.   
  
# Example  
  
iris <- datasets::iris   
summary(iris)

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species   
## Min. :4.300 Min. :2.000 Min. :1.000 Min. :0.100 setosa :50   
## 1st Qu.:5.100 1st Qu.:2.800 1st Qu.:1.600 1st Qu.:0.300 versicolor:50   
## Median :5.800 Median :3.000 Median :4.350 Median :1.300 virginica :50   
## Mean :5.843 Mean :3.057 Mean :3.758 Mean :1.199   
## 3rd Qu.:6.400 3rd Qu.:3.300 3rd Qu.:5.100 3rd Qu.:1.800   
## Max. :7.900 Max. :4.400 Max. :6.900 Max. :2.500

Apply Min-Max and inspect the resulting scale.

# Min-Max   
# Adjust numeric values to 0 (minimum value) - 1 (maximum value).  
  
norm <- minmax()  
norm <- fit(norm, iris)  
ndata <- transform(norm, iris)  
summary(ndata)

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species   
## Min. :0.0000 Min. :0.0000 Min. :0.0000 Min. :0.00000 setosa :50   
## 1st Qu.:0.2222 1st Qu.:0.3333 1st Qu.:0.1017 1st Qu.:0.08333 versicolor:50   
## Median :0.4167 Median :0.4167 Median :0.5678 Median :0.50000 virginica :50   
## Mean :0.4287 Mean :0.4406 Mean :0.4675 Mean :0.45806   
## 3rd Qu.:0.5833 3rd Qu.:0.5417 3rd Qu.:0.6949 3rd Qu.:0.70833   
## Max. :1.0000 Max. :1.0000 Max. :1.0000 Max. :1.00000

Inverse transform (denormalize) to verify integrity.

ddata <- inverse\_transform(norm, ndata)  
summary(ddata)

## Sepal.Length Sepal.Width Petal.Length Petal.Width Species   
## Min. :4.300 Min. :2.000 Min. :1.000 Min. :0.100 setosa :50   
## 1st Qu.:5.100 1st Qu.:2.800 1st Qu.:1.600 1st Qu.:0.300 versicolor:50   
## Median :5.800 Median :3.000 Median :4.350 Median :1.300 virginica :50   
## Mean :5.843 Mean :3.057 Mean :3.758 Mean :1.199   
## 3rd Qu.:6.400 3rd Qu.:3.300 3rd Qu.:5.100 3rd Qu.:1.800   
## Max. :7.900 Max. :4.400 Max. :6.900 Max. :2.500

References - Han, J., Kamber, M., Pei, J. (2011). Data Mining: Concepts and Techniques. (Normalization section)