

Package ‘Rmach’

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Title Provides machine learning algorythm
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Description Provides these algorythms: coefficient finder for regression functions
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| | |
|------------|-------------------|
| best_model | <i>best_model</i> |
|------------|-------------------|

Description

Returns the best input models. The coefficient of the best model can be found with the poly_model function

Usage

```
best_model(
  inpt_datf,
  Degree,
  Coeff_v = NA,
  Powers = NA,
  Mth_symb,
  Numrtr_v = NA
)
```

Arguments

| | |
|------------------------|---|
| <code>inpt_datf</code> | is the input dataframe, first column for the x values and second column for the y values |
| <code>Degree</code> | is a vector containing all the degrees. Each degree represents how many coefficients the model has. |
| <code>Coeff_v</code> | is a list containing the vector containing the coefficients for each model. The first value of each coefficient vector is always the constant, so it is not linked to any math symbol |
| <code>Powers</code> | is a list containing all the values associated with the math symbols of <code>mth_symb</code> list for each model. Because you can have multiple models in the function, so <code>Powers</code> is separated with the "-" separator between the different powers values for each model like in the examples |
| <code>Mth_symb</code> | is a list containing the vector of the different math symbols linked to the coefficients from the second value |
| <code>Numrtr_v</code> | is a list containing the different numerator values for each math symbol for each model, see examples |

Examples

```
print(best_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), Degree=c(2, 2), Coeff_v=c("1", "x", "x^2", "y", "y^2"), Numrtr_v=c("1", "x", "x^2", "y", "y^2"), Mth_symb=c("x", "y"), Powers=c("x", "y")))
[1] 2

print(best_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), Degree=c(2, 2), Coeff_v=c("1", "x", "x^2", "y", "y^2"), Numrtr_v=c("1", "x", "x^2", "y", "y^2"), Mth_symb=c("x", "y"), Powers=c("x", "y")))
[1] 1

print(best_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), Degree=c(2, 2), Coeff_v=c("1", "x", "x^2", "y", "y^2"), Numrtr_v=c("1", "x", "x^2", "y", "y^2"), Mth_symb=c("x", "y"), Powers=c("x", "y")))
[1] 1

print(best_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), Degree=c(2, 2), Coeff_v=c("1", "x", "x^2", "y", "y^2"), Numrtr_v=c("1", "x", "x^2", "y", "y^2"), Mth_symb=c("x", "y"), Powers=c("x", "y")))
#' [1] 1
```

calcall

*calcall***Description**

Takes a formula as a character as an input and makes the calculation. Accepts also variables, in this case the part of the formula that contains the variable wont be calculated, but the others part will be as usual.

Usage

```
calcall(inpt)
```

Arguments

inpt is the input formula as a character

Examples

```
print(calcall(inpt="ze+(yu*((fgf)-(-12+8-Y+4-T+4+97+a))+tt))")
```

```
[1] "ze+(yu*(fgf-(-4-Y+4-T+101+a))+tt)"
```

```
print(calcall(inpt="ze+(yu*((fgf)-(-12+8-7+3-67+4+97+1))+tt))")
```

```
[1] "ze+(yu*(fgf-27+tt))"
```

```
print(calcall(inpt="ze+(yu*((fgf)+(12*3/2+4))+tt))")
```

```
[1] "ze+(yu*(fgf+22+tt))"
```

```
print(calcall(inpt="1+3*2+(-2/-3*-3*((fgf)-(--12-6)+2))+5-3*5")
```

```
[1] "7+(-2*(fgf-4))+20"
```

```
print(calcall(inpt="1+3*2+(-2/-3*-3*((fgf)-(--12-6)+2))+(-log_e_1_e_2+t+2^3)+m-log_e_1_e_2")
```

```
[1] "7+(-2*(fgf-4))+(-2+t+8)+m+6-m-12+(e_ii-8+log_im_4-67)-4+(y+2)"
```

```
print(calcall("(6+4*(-4-5))+3/3"))
```

```
[1] "11"
```

```
print(calcall(inpt="1+3*2+(-2/-3*-3*((fgf)-(--12-6)+2))+(-log_e_1_e_2+t+2^3)+m-log_e_1_e_2")
```

```
[1] "7+(-2*(fgf-4))+(-2+t+8)+m+6-m-16"
```

```
print(calcall(inpt="(log_5_Z-2-6+5)+-6+2"))
```

```
[1] "(log_5_Z-3)-4"
```

```
print(calcall(inpt="m--2+-5"))
```

```
[1] "m-3"
```

```
print(calcall(inpt="(-2-6)+-6+2"))

[1] "-12"

print(calcall(inpt="m-6"))

[1] "m-6"

print(calcall(inpt="--6"))

[1] "6"
```

| | |
|-------------|--------------------|
| calcall_var | <i>calcall_var</i> |
|-------------|--------------------|

Description

Does the same thing as calcall function but calculates the formula that have variables. The values of the variables have to be given in a list of vectors, see examples.

Usage

```
calcall_var(inpt, var_name_v, var_val_l)
```

Arguments

| | |
|------------|---|
| inpt | is the input formula, with the variables |
| var_name_v | is the vector that contains the variables name in the order of apparition in the formula. If the variable appears multiple times in the formula, it has to be specified in this vector, see examples. |
| var_val_l | is the list containing the vectors containing the values of each variable, for each point you want to calculate. The vectors has to be given in the same order has the variable in var_name_v. |

Examples

```
print(calcall_var(inpt="(6+m*-(4-imp))+3/jp", var_name_v=c("m", "imp", "jp"),
  var_val_l=list(
    c(1:6),
    c(3, 4, 2, 5, 6, 1),
    c(6:1)))

[1] "5.5" "6.6" "0.75" "11" "17.5" "-9"

print(calcall_var(inpt="(6+m*-(4-imp))+3/jp+jp", var_name_v=c("m", "imp", "jp", "jp"),
  var_val_l=list(
    c(1:6),
```

```

c(3, 4, 2, 5, 6, 1),
c(6:1)))

[1] "11.5" "11.6" "4.75" "14" "19.5" "-8"

```

| | |
|------------------|-------------------------|
| individual_route | <i>individual_route</i> |
|------------------|-------------------------|

Description

From a time serie, allow to get the most common route for each individual at a given depth (time - 1). Access the frequency value as an element from the output vector and the value itself (the path) as a name of its element, see examples.

Usage

```
individual_route(inpt_datf, col_target, id_col, untl_last = 2)
```

Arguments

| | |
|------------|--|
| inpt_datf | is the input time serie as a dataframe |
| col_target | is the column name or number that refers to the value of each individual |
| id_col | is the column name or number that refers to the individual (ids) |
| untl_last | is the depth value |

Examples

```

datf_test <- data.frame("id" = c(1, 1, 1, 2, 2, 3, 3, 3, 4, 4, 5, 5, 5, 5),
                        "city" = c("A", "C", "B", "B", "A", "C", "A", "C", "A", "C", "A", "C", "B", "B"))

print(individual_route(inpt_datf = datf_test,
                      col_target = "city",
                      id_col = "id",
                      untl_last = 2))

AC CA BA
2 1 2

print(individual_route(inpt_datf = datf_test,
                      col_target = "city",
                      id_col = "id",
                      untl_last = 3))

ACB AC CAC BA BAA
1 2 1 2 1

```

| | |
|-----------|------------------|
| knn_Rmach | <i>knn_Rmach</i> |
|-----------|------------------|

Description

KNN algorith, see example

Usage

```
knn_Rmach(train, test, k, col_vars_train = c(), col_vars_test = c(), class_col)
```

Arguments

| | |
|-----------------------------|---|
| <code>train</code> | is a dataframe with the known individual and their variadbles and classification columns |
| <code>test</code> | is a dataframe with the new individuals with ich e do not know the class, only the variables |
| <code>k</code> | is the number of neighbours |
| <code>col_vars_train</code> | is a vector containing the column names or column numbers of the variables in train, if empty all column are considered as a variable apart from the last one that is considered as the classification column |
| <code>col_vars_test</code> | is a vector containing the column names or column numbers of the variables in test, if empty all column are considered as a variable |
| <code>class_col</code> | is the column name or column number of the classification column in train |

Examples

```
cur_ids <- round(runif(n = 45, min = 1, max = 150))

vec <- knn_Rmach(train = iris[-cur_ids,],
  test = iris[cur_ids, 1:4],
  col_vars_train = c(1:4),
  col_vars_test = c(1:4),
  class_col = 5,
  k = 3
)

sum(vec == iris[cur_ids, 5]) / 45

[1] 0.9555556
```

```
knn_Rmach_cross_validation
      knn_Rmach_cross_validation
```

Description

Allow to perform knn with cross validation for the optimal value of k neighbours used, see examples and parameters.

Usage

```
knn_Rmach_cross_validation(
  inpt_datf,
  train_prop,
  knn_v = c(),
  n_fold = 5,
  col_vars = c(),
  class_col
)
```

Arguments

| | |
|-------------------------|---|
| <code>inpt_datf</code> | is the input dataset as a ddataframe |
| <code>train_prop</code> | is the training proportion |
| <code>knn_v</code> | is a vector containing the values of k neighbours to test |
| <code>n_fold</code> | is the number of fold used for each value of k, the higher this value is, the more accurate the result will be but the higher the amount of time it will take |
| <code>col_vars</code> | is a vector containing the column names or numbers of the variables in the input dataframe |
| <code>class_col</code> | is the column names or number of the variable to predict in the input dataframe |

Examples

```
iris[, 5] <- as.character(iris[, 5])
print(knn_Rmach_cross_validation(
  inpt_datf = iris,
  col_vars = c(1:4),
  n_fold = 5,
  knn_v = c(3, 5, 7, 9, 11),
  class_col = 5,
  train_prop = 0.7
))

[1] 0.1303704 0.1303704 0.1333333 0.1288889 0.1259259

# here the optimal k value is 7
```

poly_model

*Rmach poly_model***Description**

Take a datasets of x and y values and a function tha could fit all the data with the missing coefficients, and returns a list containing the coefficients that fit the best the data for a given function, as a vector for the first index, and at the second index, the actual sum of difference between each data point and the function at the same x values.

Usage

```
poly_model (
  inpt_datf,
  degree,
  twk_val = NA,
  sensi_val = twk_val,
  coeff_v = NA,
  powers = NA,
  mth_symb = c("x"),
  numrtr_v = NA
)
```

Arguments

| | |
|-----------|--|
| inpt_datf | is the input data as a dataframe, first column is the x values and the second is the y values |
| degree | is how many coefficients will be involved (each coefficient multiplies either an x to the power of something, an exponential of something or a base something logarithm for a something value) |
| twk_val | is the value used for finding the best coefficients, it is directly linked to the accuracy of the coefficients, see the description for more information. Defaults to $(\max(yval) - \min(yval)) / n$ |
| sensi_val | is the value from which two variations of a coefficient brings a so small accuracy contribution that the algorithme does not continue to find better coefficients. For example, if i set <code>sensi_val = 0.001</code> , so if coefficients <code>alpha1</code> and <code>beta1</code> brings a total difference between the function and the actual data of 10.8073 and then the algorithme find <code>alpha2</code> and <code>beta1</code> that brings a total difference equal to 10.8066, so the algorithme will stop running. But the coefficients returned will still be the best, that is <code>alpha2</code> and <code>beta1</code> |
| coeff_v | is a vector containing the original coefficients for the function, so the closest those are from the best one, the fastest the algorithme will compute the best coefficients. The first value of <code>coeff</code> is always the constant. |
| powers | is a vector containing the exponent, or related value to <code>mth_symb</code> . powers can be a vector if those values are constants or it could be a list of vectors the length of observed individuals, if those values varies like in the examples. Notthat if you use variables in powers (list), each values of a vector from this list has to be at the exact same x coordinates of each observed individuals in the input dataframe. Ex: <code>datf <- data.frame("x"=c(4, 4, 3, 2, 1, 1), "y"=c(1:6))</code> , so vector(s) from |

powers that contain varying value must be of length 4. Also, the values are not ascendly sorted, don't worry values are ascendly sorted under the hood, so fill your powers vectors in the intuitive ascendly way

| | |
|----------|---|
| mth_symb | is a vector containing the elemnts linked to the coefficients from the second element. It can be x, e (exp(x)) or log-X (log(x)-base), and their reverse like 1/x. If the numerator varies the element should be entered like tis list/x, list/e or list/log-base. See numtr_v for the values related to list |
| numtr_v | is a vector containing the values for the numerator related to mth_symb if on element is like this: list/x or list/e |

Examples

```
print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=2, coeff_v=c(32.5, -
numrtr_v=NA))

[[1]]
[1] 33.234375 -4.265625

[[2]]
[1] 74.78275

print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=2, coeff_v=c(32.5, -
numrtr_v=NA))

[[1]]
[1] 31.765625 -3.734375

[[2]]
[1] 80.36228

print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=2, coeff_v=c(32.5, -
numrtr_v=NA))

[[1]]
[1] 32.5 -3.0

[[2]]
[1] 1.067436e+24

print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=2, coeff_v=c(32.5, -
numrtr_v=list(c(length(mtcars$wt):1))))

[[1]]
[1] 19.28125 -0.06250

[[2]]
[1] 35839.44

print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=2, coeff_v=c(32.5, -
numrtr_v=NA))

[[1]]
```

```

[1] 27.359375 -8.140625

[[2]]
[1] 160.2263

print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=1, coeff_v=c(32.5),
                                     numrtr_v=NA))

[[1]]
[1] 19.28125

[[2]]
[1] 148.7625

print(poly_model(inpt_datf=data.frame(mtcars$wt, mtcars$mpg), degree=2, coeff_v=c(32.5, -
                                     numrtr_v=NA))

[[1]]
[1] 0.921875 -5.203125 2.000000

[[2]]
[1] 455.6017

```

sample_Rmach-class *v_Rmach_fold*

Description

Allow to create uniform sampling dataset for cross validation, train and test, see examples and variables

Arguments

inpt_datf is the input dataframe
train_prop is the training proportion
n_fold is the number of distinct pair of training and test dataset that will be outputted

Examples

```

lst_test <- v_Rmach_fold(inpt_datf = iris[1:25,],
                        train_prop = 0.7,
                        n_fold = 4)

print(lst_test)

$sample1
An object of class "sample_Rmach"
Slot "train":
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
4           4.6           3.1           1.5           0.2   setosa           0

```

| | | | | | | |
|------|-----|-----|-----|-----|--------|---|
| 7 | 4.6 | 3.4 | 1.4 | 0.3 | setosa | 0 |
| 19 | 5.7 | 3.8 | 1.7 | 0.3 | setosa | 0 |
| 10 | 4.9 | 3.1 | 1.5 | 0.1 | setosa | 0 |
| 23 | 4.6 | 3.6 | 1.0 | 0.2 | setosa | 0 |
| 20 | 5.1 | 3.8 | 1.5 | 0.3 | setosa | 0 |
| 1 | 5.1 | 3.5 | 1.4 | 0.2 | setosa | 0 |
| 9 | 4.4 | 2.9 | 1.4 | 0.2 | setosa | 0 |
| 4.1 | 4.6 | 3.1 | 1.5 | 0.2 | setosa | 0 |
| 10.1 | 4.9 | 3.1 | 1.5 | 0.1 | setosa | 0 |
| 7.1 | 4.6 | 3.4 | 1.4 | 0.3 | setosa | 0 |
| 17 | 5.4 | 3.9 | 1.3 | 0.4 | setosa | 0 |
| 22 | 5.1 | 3.7 | 1.5 | 0.4 | setosa | 0 |
| 15 | 5.8 | 4.0 | 1.2 | 0.2 | setosa | 0 |
| 23.1 | 4.6 | 3.6 | 1.0 | 0.2 | setosa | 0 |
| 17.1 | 5.4 | 3.9 | 1.3 | 0.4 | setosa | 0 |
| 15.1 | 5.8 | 4.0 | 1.2 | 0.2 | setosa | 0 |
| 13 | 4.8 | 3.0 | 1.4 | 0.1 | setosa | 0 |

Slot "test":

| | Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species | test_status |
|-----|--------------|-------------|--------------|-------------|---------|-------------|
| 7 | 4.6 | 3.4 | 1.4 | 0.3 | setosa | 1 |
| 12 | 4.8 | 3.4 | 1.6 | 0.2 | setosa | 1 |
| 10 | 4.9 | 3.1 | 1.5 | 0.1 | setosa | 1 |
| 7.1 | 4.6 | 3.4 | 1.4 | 0.3 | setosa | 1 |
| 5 | 5.0 | 3.6 | 1.4 | 0.2 | setosa | 1 |
| 22 | 5.1 | 3.7 | 1.5 | 0.4 | setosa | 1 |
| 20 | 5.1 | 3.8 | 1.5 | 0.3 | setosa | 1 |

Slot "train_ids":

```
[1] 3 11 19 22 13 22 16 21 2 25 12 24 11 18 8 18 6 10
```

Slot "test_ids":

```
[1] 13 15 4 12 14 7 8
```

\$sample2

An object of class "sample_Rmach"

Slot "train":

| | Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species | test_status |
|------|--------------|-------------|--------------|-------------|---------|-------------|
| 24 | 5.1 | 3.3 | 1.7 | 0.5 | setosa | 0 |
| 1 | 5.1 | 3.5 | 1.4 | 0.2 | setosa | 0 |
| 8 | 5.0 | 3.4 | 1.5 | 0.2 | setosa | 0 |
| 16 | 5.7 | 4.4 | 1.5 | 0.4 | setosa | 0 |
| 13 | 4.8 | 3.0 | 1.4 | 0.1 | setosa | 0 |
| 9 | 4.4 | 2.9 | 1.4 | 0.2 | setosa | 0 |
| 6 | 5.4 | 3.9 | 1.7 | 0.4 | setosa | 0 |
| 22 | 5.1 | 3.7 | 1.5 | 0.4 | setosa | 0 |
| 10 | 4.9 | 3.1 | 1.5 | 0.1 | setosa | 0 |
| 21 | 5.4 | 3.4 | 1.7 | 0.2 | setosa | 0 |
| 22.1 | 5.1 | 3.7 | 1.5 | 0.4 | setosa | 0 |
| 16.1 | 5.7 | 4.4 | 1.5 | 0.4 | setosa | 0 |
| 15 | 5.8 | 4.0 | 1.2 | 0.2 | setosa | 0 |
| 5 | 5.0 | 3.6 | 1.4 | 0.2 | setosa | 0 |
| 15.1 | 5.8 | 4.0 | 1.2 | 0.2 | setosa | 0 |
| 16.2 | 5.7 | 4.4 | 1.5 | 0.4 | setosa | 0 |
| 8.1 | 5.0 | 3.4 | 1.5 | 0.2 | setosa | 0 |
| 10.1 | 4.9 | 3.1 | 1.5 | 0.1 | setosa | 0 |

```
Slot "test":
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
13           4.8         3.0         1.4         0.1  setosa           1
23           4.6         3.6         1.0         0.2  setosa           1
24           5.1         3.3         1.7         0.5  setosa           1
11           5.4         3.7         1.5         0.2  setosa           1
9            4.4         2.9         1.4         0.2  setosa           1
22           5.1         3.7         1.5         0.4  setosa           1
10           4.9         3.1         1.5         0.1  setosa           1
```

```
Slot "train_ids":
[1] 22 12 19 5 18 6 6 1 19 5 13 15 1 12 10 8 9 6
```

```
Slot "test_ids":
[1] 15 9 22 7 15 2 3
```

```
$sample3
```

```
An object of class "sample_Rmach"
```

```
Slot "train":
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
19           5.7         3.8         1.7         0.3  setosa           0
5            5.0         3.6         1.4         0.2  setosa           0
7            4.6         3.4         1.4         0.3  setosa           0
1            5.1         3.5         1.4         0.2  setosa           0
15           5.8         4.0         1.2         0.2  setosa           0
22           5.1         3.7         1.5         0.4  setosa           0
14           4.3         3.0         1.1         0.1  setosa           0
23           4.6         3.6         1.0         0.2  setosa           0
11           5.4         3.7         1.5         0.2  setosa           0
11.1         5.4         3.7         1.5         0.2  setosa           0
17           5.4         3.9         1.3         0.4  setosa           0
4            4.6         3.1         1.5         0.2  setosa           0
9            4.4         2.9         1.4         0.2  setosa           0
4.1          4.6         3.1         1.5         0.2  setosa           0
4.2          4.6         3.1         1.5         0.2  setosa           0
12           4.8         3.4         1.6         0.2  setosa           0
5.1          5.0         3.6         1.4         0.2  setosa           0
14.1         4.3         3.0         1.1         0.1  setosa           0
```

```
Slot "test":
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
22           5.1         3.7         1.5         0.4  setosa           1
1            5.1         3.5         1.4         0.2  setosa           1
19           5.7         3.8         1.7         0.3  setosa           1
4            4.6         3.1         1.5         0.2  setosa           1
5            5.0         3.6         1.4         0.2  setosa           1
24           5.1         3.3         1.7         0.5  setosa           1
22.1         5.1         3.7         1.5         0.4  setosa           1
```

```
Slot "train_ids":
[1] 14 5 2 21 6 19 8 4 9 7 5 2 3 19 3 24 10 17
```

```
Slot "test_ids":
[1] 6 11 9 20 15 5 25
```

```

$sample4
An object of class "sample_Rmach"
Slot "train":
      Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
15           5.8         4.0         1.2         0.2  setosa           0
23           4.6         3.6         1.0         0.2  setosa           0
24           5.1         3.3         1.7         0.5  setosa           0
22           5.1         3.7         1.5         0.4  setosa           0
20           5.1         3.8         1.5         0.3  setosa           0
8            5.0         3.4         1.5         0.2  setosa           0
21           5.4         3.4         1.7         0.2  setosa           0
14           4.3         3.0         1.1         0.1  setosa           0
3            4.7         3.2         1.3         0.2  setosa           0
6            5.4         3.9         1.7         0.4  setosa           0
9            4.4         2.9         1.4         0.2  setosa           0
12           4.8         3.4         1.6         0.2  setosa           0
2            4.9         3.0         1.4         0.2  setosa           0
22.1         5.1         3.7         1.5         0.4  setosa           0
8.1          5.0         3.4         1.5         0.2  setosa           0
12.1         4.8         3.4         1.6         0.2  setosa           0
18           5.1         3.5         1.4         0.3  setosa           0
15.1         5.8         4.0         1.2         0.2  setosa           0

Slot "test":
      Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
16           5.7         4.4         1.5         0.4  setosa           1
14           4.3         3.0         1.1         0.1  setosa           1
8            5.0         3.4         1.5         0.2  setosa           1
9            4.4         2.9         1.4         0.2  setosa           1
20           5.1         3.8         1.5         0.3  setosa           1
11           5.4         3.7         1.5         0.2  setosa           1
18           5.1         3.5         1.4         0.3  setosa           1

Slot "train_ids":
[1] 8 2 7 24 21 17 14 22 14 23 19 8 21 20 17 7 13 6

Slot "test_ids":
[1] 10 12 17 9 3 19 1

print(lst_test$sample4$train) # to display the 4th train sample

      Sepal.Length Sepal.Width Petal.Length Petal.Width Species test_status
15           5.8         4.0         1.2         0.2  setosa           0
23           4.6         3.6         1.0         0.2  setosa           0
24           5.1         3.3         1.7         0.5  setosa           0
22           5.1         3.7         1.5         0.4  setosa           0
20           5.1         3.8         1.5         0.3  setosa           0
8            5.0         3.4         1.5         0.2  setosa           0
21           5.4         3.4         1.7         0.2  setosa           0
14           4.3         3.0         1.1         0.1  setosa           0
3            4.7         3.2         1.3         0.2  setosa           0
6            5.4         3.9         1.7         0.4  setosa           0
9            4.4         2.9         1.4         0.2  setosa           0
12           4.8         3.4         1.6         0.2  setosa           0
2            4.9         3.0         1.4         0.2  setosa           0
22.1         5.1         3.7         1.5         0.4  setosa           0

```

| | | | | | | |
|------|-----|-----|-----|-----|--------|---|
| 8.1 | 5.0 | 3.4 | 1.5 | 0.2 | setosa | 0 |
| 12.1 | 4.8 | 3.4 | 1.6 | 0.2 | setosa | 0 |
| 18 | 5.1 | 3.5 | 1.4 | 0.3 | setosa | 0 |
| 15.1 | 5.8 | 4.0 | 1.2 | 0.2 | setosa | 0 |

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