Data Manipulation with dplyr (With 50 Examples)

The dplyr package is one of the most powerful and popular package in R. This package was written by the most popular R programmer Hadley Wickham who has written many useful R packages such as ggplot2, tidyr etc. This post includes several examples and tips of how to use dplyr package for cleaning and transforming data. It's a complete tutorial on data manipulation and data wrangling with R.

What is dplyr?

The dplyr is a powerful R-package to manipulate, clean and summarize unstructured data. In short, it makes data exploration and data manipulation easy and fast in R.

What's special about dplyr?

The package "dplyr" comprises many functions that perform mostly used data manipulation operations such as applying filter, selecting specific columns, sorting data, adding or deleting columns and aggregating data. Another most important advantage of this package is that it's very easy to learn and use dplyr functions. Also easy to recall these functions. For example, **filter()** is used to filter rows.

dplyr Tutorial

dplyr vs. Base R Functions

dplyr functions process faster than base R functions. It is because dplyr functions were written in a computationally efficient manner. They are also more stable in the syntax and better supports data frames than vectors.

SQL Queries vs. dplyr

People have been utilizing SQL for analyzing data for decades. Every modern data analysis software such as Python, R, SAS etc supports SQL commands. But SQL was never designed to perform data analysis. It was rather designed for querying and managing data. There are many data analysis operations where SQL fails or makes simple things difficult. For example, calculating median for multiple variables, converting wide format data to long format etc. Whereas, dplyr package was designed to do data analysis.

> The names of dplyr functions are similar to SQL commands such as **select()** for selecting variables, **group_by()** - group data by grouping variable, join() - joining two data sets. Also includes **inner_join()** and **left_join()**. It also supports sub queries for which SQL was popular for.

How to install and load dplyr package

To install the dplyr package, type the following command.

> install.packages("dplyr")

To load dplyr package, type the command below

> library(dplyr)

Important dplyr Functions to remember

dplyr Function	Description	Equivalent SQL
select()	Selecting columns (variables)	SELECT
filter()	Filter (subset) rows.	WHERE
group_by()	Group the data	GROUP BY
summarise()	Summarise (or aggregate) data	-
arrange()	Sort the data	ORDER BY
join()	Joining data frames (tables)	JOIN
mutate()	Creating New Variables	COLUMN ALIAS

Data : Income Data by States

In this tutorial, we are using the following data which contains income generated by states from year 2002 to 2015. **Note :** This data do not contain actual income figures of the states. This dataset contains 51 observations (rows) and 16 variables (columns). The snapshot of first 6 rows of the dataset is shown below.

```
  Index      State   Y2002   Y2003   Y2004   Y2005   Y2006   Y2007   Y2008   Y2009
1     A    Alabama 1296530 1317711 1118631 1492583 1107408 1440134 1945229 1944173
2     A     Alaska 1170302 1960378 1818085 1447852 1861639 1465841 1551826 1436541
3     A    Arizona 1742027 1968140 1377583 1782199 1102568 1109382 1752886 1554330
4     A   Arkansas 1485531 1994927 1119299 1947979 1669191 1801213 1188104 1628980
5     C California 1685349 1675807 1889570 1480280 1735069 1812546 1487315 1663809
6     C   Colorado 1343824 1878473 1886149 1236697 1871471 1814218 1875146 1752387
    Y2010   Y2011   Y2012   Y2013   Y2014   Y2015
1 1237582 1440756 1186741 1852841 1558906 1916661
2 1629616 1230866 1512804 1985302 1580394 1979143
3 1300521 1130709 1907284 1363279 1525866 1647724
4 1669295 1928238 1216675 1591896 1360959 1329341
5 1624509 1639670 1921845 1156536 1388461 1644607
6 1913275 1665877 1491604 1178355 1383978 1330736
```

Download the Dataset

How to load Data

Submit the following code. ***Change the file path in the code below.***

```
mydata = read.csv("C:\\Users\\Deepanshu\\Documents\\sampledata.csv")
```

Example 1 : Selecting Random N Rows

The **sample_n** function selects random rows from a data frame (or table). The second parameter of the function tells R the number of rows to select.

```
sample_n(mydata,3)
```

```
   Index    State   Y2002   Y2003   Y2004   Y2005   Y2006   Y2007   Y2008   Y2009
2      A   Alaska 1170302 1960378 1818085 1447852 1861639 1465841 1551826 1436541
8      D Delaware 1330403 1268673 1706751 1403759 1441351 1300836 1762096 1553585
33     N New York 1395149 1611371 1170675 1446810 1426941 1463171 1732098 1426216
     Y2010   Y2011   Y2012   Y2013   Y2014   Y2015
2  1629616 1230866 1512804 1985302 1580394 1979143
8  1370984 1318669 1984027 1671279 1803169 1627508
33 1604531 1683687 1500089 1718837 1619033 1367705
```

Example 2 : Selecting Random Fraction of Rows

The **sample_frac** function returns randomly N% of rows. In the example below, it returns randomly 10% of rows.

```
sample_frac(mydata,0.1)
```

Example 3 : Remove Duplicate Rows based on all the variables (Complete Row)

The **distinct function** is used to eliminate duplicates.

```
x1 = distinct(mydata)
```

In this dataset, there is not a single duplicate row so it returned same number of rows as in mydata.

Example 4 : Remove Duplicate Rows based on a variable

The **.keep_all** function is used to retain all other variables in the output data frame.

> x2 = distinct(mydata, Index, **.keep_all= TRUE**)

Example 5 : Remove Duplicates Rows based on multiple variables

In the example below, we are using two variables - **Index, Y2010** to determine uniqueness.

> x2 = distinct(mydata, **Index**, **Y2010**, .keep_all= TRUE)

select( ) Function

It is used to select only desired variables.

> **select() syntax :** select(data , ...)
> **data :** Data Frame
> **.... :** Variables by name or by function

Example 6 : Selecting Variables (or Columns)

Suppose you are asked to select only a few variables. The code below selects variables "Index", columns from "State" to "Y2008".

> mydata2 = select(mydata, Index, State:Y2008)

Example 7 : Dropping Variables

The **minus sign** before a variable tells R to drop the variable.

> mydata = select(mydata, -Index, -State)

The above code can also be written like :

> mydata = select(mydata, -c(Index,State))

Example 8 : Selecting or Dropping Variables starts with 'Y'

The **starts_with()** function is used to select variables starts with an alphabet.

> mydata3 = select(mydata, starts_with("Y"))

Adding a negative sign before starts_with() implies dropping the variables starts with 'Y'

> mydata33 = select(mydata, -starts_with("Y"))

The following functions helps you to select variables based on their names.

Helpers	Description
starts_with()	Starts with a prefix
ends_with()	Ends with a prefix

contains()	Contains a literal string
matches()	Matches a regular expression
num_range()	Numerical range like x01, x02, x03.
one_of()	Variables in character vector.
everything()	All variables.

Example 9 : Selecting Variables contain 'I' in their names

> mydata4 = select(mydata, contains("I"))

Example 10 : Reorder Variables

The code below keeps variable **'State'** in the front and the remaining variables follow that.

> mydata5 = select(mydata, State, everything())

New order of variables are displayed below -

```
 [1] "State" "Index" "Y2002" "Y2003" "Y2004" "Y2005" "Y2006" "Y2007" "Y2008"
"Y2009"
[11] "Y2010" "Y2011" "Y2012" "Y2013" "Y2014" "Y2015"
```

rename( ) Function

It is used to change variable name.

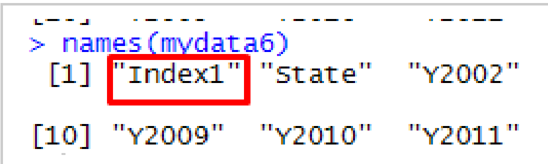
> **rename() syntax :** rename(data , new_name = old_name)
> **data :** Data Frame
> **new_name :** New variable name you want to keep
> **old_name :** Existing Variable Name

Example 11 : Rename Variables

The rename function can be used to rename variables.

In the following code, we are renaming **'Index'** variable to **'Index1'**.

> mydata6 = rename(mydata, Index1=Index)



Output

filter( ) Function

It is used to subset data with matching logical conditions.

> **filter() syntax :** filter(data , **....**)
> **data :** Data Frame
> **.... :** Logical Condition

Example 12 : Filter Rows

Suppose you need to subset data. You want to filter rows and retain only those values in which Index is equal to A.

```
mydata7 = filter(mydata, Index == "A")
```

```
 Index    State   Y2002   Y2003   Y2004   Y2005   Y2006   Y2007   Y2008   Y2009
1     A  Alabama 1296530 1317711 1118631 1492583 1107408 1440134 1945229 1944173
2     A   Alaska 1170302 1960378 1818085 1447852 1861639 1465841 1551826 1436541
3     A  Arizona 1742027 1968140 1377583 1782199 1102568 1109382 1752886 1554330
4     A Arkansas 1485531 1994927 1119299 1947979 1669191 1801213 1188104 1628980
    Y2010   Y2011   Y2012   Y2013   Y2014   Y2015
1 1237582 1440756 1186741 1852841 1558906 1916661
2 1629616 1230866 1512804 1985302 1580394 1979143
3 1300521 1130709 1907284 1363279 1525866 1647724
4 1669295 1928238 1216675 1591896 1360959 1329341
```

Example 13 : Multiple Selection Criteria

The **%in%** operator can be used to select multiple items. In the following program, we are telling R to select rows against 'A' and 'C' in column 'Index'.

```
mydata7 = filter(mydata6, Index %in% c("A", "C"))
```

Example 14 : 'AND' Condition in Selection Criteria

Suppose you need to apply 'AND' condition. In this case, we are picking data for 'A' and 'C' in the column 'Index' and income greater than 1.3 million in Year 2002.

```
mydata8 = filter(mydata6, Index %in% c("A", "C") & Y2002 >= 1300000 )
```

Example 15 : 'OR' Condition in Selection Criteria

The 'I' denotes OR in the logical condition. It means any of the two conditions.

```
mydata9 = filter(mydata6, Index %in% c("A", "C") | Y2002 >= 1300000)
```

Example 16 : NOT Condition

The "!" sign is used to reverse the logical condition.

```
mydata10 = filter(mydata6, !Index %in% c("A", "C"))
```

Example 17 : CONTAINS Condition

The **grepl function** is used to search for pattern matching. In the following code, we are looking for records wherein column **state** contains **'Ar'** in their name.

```
mydata10 = filter(mydata6, grepl("Ar", State))
```

summarise( ) Function

It is used to summarize data.

> **summarise() syntax :** summarise(data , **....**)
> **data :** Data Frame
> **..... :** Summary Functions such as mean, median etc

Example 18 : Summarize selected variables
In the example below, we are calculating mean and median for the variable Y2015.

```
summarise(mydata, Y2015_mean = mean(Y2015), Y2015_med=median(Y2015))
```

```
Y2015_mean Y2015_med
   1588297   1627508
```

Output

Example 19 : Summarize Multiple Variables
In the following example, we are calculating number of records, mean and median for variables Y2005 and Y2006. The **summarise_at** function allows us to select multiple variables by their names.

```
summarise_at(mydata, vars(Y2005, Y2006), funs(n(), mean, median))
```

```
Y2005_n Y2006_n Y2005_mean Y2006_mean Y2005_median Y2006_median
     51      51    1522064    1530969      1480280      1531641
```

Output

Example 20 : Summarize with Custom Functions

We can also use custom functions in the summarise function. In this case, we are computing the number of records, number of missing values, mean and median for variables Y2011 and Y2012. The **dot (.)** denotes each variables specified in the second argument of the function.

```
summarise_at(mydata, vars(Y2011, Y2012),
funs(n(), missing = sum(is.na(.)), mean(., na.rm = TRUE), median(.,na.rm = TRUE)))
```

```
Y2011_n Y2012_n Y2011_missing Y2012_missing Y2011_mean Y2012_mean Y2011_median
     51      51             0             0    1574968    1591135      1575533
Y2012_median
     1643855
```

Summarize : Output

How to apply Non-Standard Functions
Suppose you want to subtract mean from its original value and then calculate variance of it.

```
set.seed(222)
mydata <- data.frame(X1=sample(1:100,100), X2=runif(100))
summarise_at(mydata,vars(X1,X2), function(x) var(x - mean(x)))
```

```
        X1         X2
1 841.6667 0.08142161
```

Example 21 : Summarize all Numeric Variables

The **summarise_if** function allows you to summarise conditionally.

> summarise_if(mydata, is.numeric, funs(n(),mean,median))

Alternative Method :

First, store data for all the numeric variables

> numdata = mydata[sapply(mydata,is.numeric)]

Second, the **summarise_all** function calculates summary statistics for all the columns in a data frame

> summarise_all(numdata, funs(n(),mean,median))

Example 22 : Summarize Factor Variable

We are checking the **number of levels/categories** and **count of missing observations** in a categorical (factor) variable.

> summarise_all(mydata["Index"], funs(nlevels(.), nmiss=sum(is.na(.))))

```
  nlevels nmiss
1      19   0
```

arrange() function :
Use : Sort data

Syntax

> arrange(data_frame, variable(s)_to_sort)
> **or**
> data_frame **%>%** arrange(variable(s)_to_sort)

To sort a variable in descending order, use **desc(x)**.

Example 23 : Sort Data by Multiple Variables

The default sorting order of **arrange() function** is ascending. In this example, we are sorting data by multiple variables.

> arrange(mydata, Index, Y2011)

Suppose you need to sort one variable by descending order and other variable by ascending oder.

> arrange(mydata, **desc(Index)**, Y2011)

Pipe Operator %>%
It is important to understand the pipe (%>%) operator before knowing the other functions of dplyr package. dplyr utilizes pipe operator from another package **(magrittr)**.

> It allows you to write sub-queries like we do it in sql.

Note : All the functions in dplyr package can be used **without** the pipe operator. The question arises **"Why to use pipe operator %>%". The answer is** it lets to wrap multiple functions together with the use of %>%.

Syntax :

> filter(data_frame, variable == value)
> **or**
> data_frame **%>%** filter(variable == value)

The %>% is NOT restricted to filter function. It can be used with any function.

Example :

The code below demonstrates the usage of pipe %>% operator. In this example, we are selecting 10 random observations of two variables "Index" "State" from the data frame "mydata".

> dt = sample_n(select(mydata, Index, State),10)
> **or**
> dt = mydata **%>%** select(Index, State) **%>%** sample_n(10)

	Index	State
44	T	Texas
32	N	New Mexico
51	W	Wyoming
9	D	District of Columbia
5	C	California
40	R	Rhode Island
22	M	Massachusetts
4	A	Arkansas
42	S	South Dakota
46	V	Vermont

Output

group_by() function :

Use : Group data by categorical variable

Syntax :

> group_by(data, variables)
> **or**
> data %>% group_by(variables)

Example 24 : Summarise Data by Categorical Variable

We are calculating count and mean of variables Y2011 and Y2012 by variable Index.

> t = summarise_at(group_by(mydata, Index), vars(Y2011, Y2012), funs(n(), mean(., na.rm = TRUE)))

The above code can also be written like

> t = mydata %>% group_by(Index) %>%
> summarise_at(vars(Y2011:Y2015), funs(n(), mean(., na.rm = TRUE)))

```
Index Y2011_n Y2012_n  Y2013_n Y2014_n Y2015_n Y2011_mean Y2012_mean
A 4 4 4 4 4 1432642 1455876
C 3 3 3 3 3 1750357 1547326
D 2 2 2 2 2 1336059 1981868
F 1 1 1 1 1 1497051 1131928
G 1 1 1 1 1 1851245 1850111
H 1 1 1 1 1 1902816 1695126
I 4 4 4 4 4 1690171 1687056
K 2 2 2 2 2 1489353 1899773
L 1 1 1 1 1 1210385 1234234
M 8 8 8 8 8 1582714 1586091
N 8 8 8 8 8 1448351 1470316
O 3 3 3 3 3 1882111 1602463
P 1 1 1 1 1 1483292 1290329
R 1 1 1 1 1 1781016 1909119
S 2 2 2 2 2 1381724 1671744
T 2 2 2 2 2 1724080 1865787
U 1 1 1 1 1 1288285 1108281
V 2 2 2 2 2 1482143 1488651
W 4 4 4 4 4 1711341 1660192
```

do() function :

Use : Compute within groups

Syntax :

> do(data_frame, expressions_to_apply_to_each_group)

Note : *The **dot (.)** is required to refer to a data frame.*

Example 25 : Filter Data within a Categorical Variable

Suppose you need to pull top 2 rows from 'A', 'C' and 'I' categories of variable Index.

> t = mydata %>% filter(Index %in% c("A", "C","I")) %>% **group_by(Index)** %>% **do(head(. , 2))**

	Index	State	Y2002	Y2003	Y2004	Y2005	Y2006
1	A	Alabama	1296530	1317711	1118631	1492583	1107408
2	A	Alaska	1170302	1960378	1818085	1447852	1861639
3	C	California	1685349	1675807	1889570	1480280	1735069
4	C	Colorado	1343824	1878473	1886149	1236697	1871471
5	I	Idaho	1353210	1438538	1739154	1541015	1122387
6	I	Illinois	1508356	1527440	1493029	1261353	1540274

Output : do() function

Example 26 : Selecting 3rd Maximum Value by Categorical Variable

We are calculating third maximum value of variable Y2015 by variable Index. The following code first selects only two variables Index and Y2015. Then it filters the variable Index with 'A', 'C' and 'I' and then it groups the same variable and sorts the variable Y2015 in descending order. At last, it selects the third row.

```
t = mydata %>% select(Index, Y2015) %>%
  filter(Index %in% c("A", "C","I")) %>%
  group_by(Index) %>%
  do(arrange(.,desc(Y2015))) %>%  slice(3)
```

The **slice() function** is used to select rows by position.

Using Window Functions

Like SQL, dplyr uses window functions that are used to subset data within a group. It returns a vector of values. We could use **min_rank() function** that calculates rank in the preceding example,

	Index	Y2015
1	A	1647724
2	C	1330736
3	I	1583516

Output

```
t = mydata %>% select(Index, Y2015) %>%
  filter(Index %in% c("A", "C","I")) %>%
  group_by(Index) %>%
  filter(min_rank(desc(Y2015)) == 3)
```

```
  Index   Y2015
1     A  1647724
2     C  1330736
3     I  1583516
```

Example 27 : Summarize, Group and Sort Together

In this case, we are computing mean of variables Y2014 and Y2015 by variable Index. Then sort the result by calculated mean variable Y2015.

```
t = mydata %>%
  group_by(Index)%>%
  summarise(Mean_2014 = mean(Y2014, na.rm=TRUE),
          Mean_2015 = mean(Y2015, na.rm=TRUE)) %>%
  arrange(desc(Mean_2015))
```

mutate() function :

Use : Creates new variables

Syntax :

```
mutate(data_frame, expression(s) )
or
data_frame %>% mutate(expression(s))
```

Example 28 : Create a new variable

The following code calculates division of Y2015 by Y2014 and name it "change".

```
mydata1 = mutate(mydata, change=Y2015/Y2014)
```

Example 29 : Multiply all the variables by 1000

It creates new variables and name them with suffix "_new".

```
mydata11 = mutate_all(mydata, funs("new" = .* 1000))
```

The output shown in the image above is truncated due to high number of variables.

Y2002_new	Y2003_new	Y2004_new	Y2005_new
1296530000	1317711000	1118631000	1492583000
1170302000	1960378000	1818085000	1447852000
1742027000	1968140000	1377583000	1782199000
1485531000	1994927000	1119299000	1947979000
1685349000	1675807000	1889570000	1480280000

Output

Note - The above code returns the following error messages -
Warning messages:
1: In Ops.factor(c(1L, 1L, 1L, 1L, 2L, 2L, 2L, 3L, 3L, 4L, 5L, 6L, :
  '*' not meaningful for factors
2: In Ops.factor(1:51, 1000) : '*' not meaningful for factors

It implies you are multiplying 1000 to string(character) values which are stored as factor variables. These variables are 'Index', 'State'. It does not make sense to apply multiplication operation on character variables. For these two variables, it creates newly created variables which contain only NA.

Solution : See **Example 45** -Apply multiplication on only numeric variables

Example 30 : Calculate Rank for Variables

Suppose you need to calculate rank for variables Y2008 to Y2010.

```
mydata12 = mutate_at(mydata, vars(Y2008:Y2010), funs(Rank=min_rank(.)))
```

By default, **min_rank()** assigns 1 to the smallest value and high number to the largest value. In case, you need to assign rank 1 to the largest value of a variable, use **min_rank(desc(.))**

```
mydata13 = mutate_at(mydata,
vars(Y2008:Y2010),
funs(Rank=min_rank(desc(.))))
```

Y2008_Rank	Y2009_Rank	Y2010_Rank
47	46	8
27	9	38
33	14	12
8	24	40
24	27	36
43	31	47
37	50	48

Output

Example 31 : Select State that generated highest income among the variable 'Index'

```
out = mydata %>% group_by(Index) %>%
filter(min_rank(desc(Y2015)) == 1) %>%
  select(Index, State, Y2015)
```

```
   Index        State   Y2015
1      A        Alaska 1979143
2      C   Connecticut 1718072
3      D      Delaware 1627508
4      F       Florida 1170389
5      G       Georgia 1725470
6      H        Hawaii 1150882
7      I         Idaho 1757171
8      K      Kentucky 1913350
9      L     Louisiana 1403857
10     M      Missouri 1996005
11     N New Hampshire 1963313
12     O        Oregon 1893515
13     P  Pennsylvania 1668232
14     R  Rhode Island 1611730
15     S  South Dakota 1136443
16     T         Texas 1705322
17     U          Utah 1729273
18     V      Virginia 1850394
19     W       Wyoming 1853858
```

Example 32 : Cumulative Income of 'Index' variable

The **cumsum function** calculates cumulative sum of a variable. With **mutate function,** we insert a new variable called 'Total' which contains values of cumulative income of variable Index.

> out2 = mydata %>% group_by(Index) %>% mutate(Total=**cumsum**(Y2015)) %>%
> select(Index, Y2015, Total)

join() function :

Use : Join two datasets

Syntax :

> inner_join(x, y, by =)
> left_join(x, y, by =)
> right_join(x, y, by =)
> full_join(x, y, by =)
> semi_join(x, y, by =)
> anti_join(x, y, by =)

x, y - datasets (or tables) to merge / join
by - common variable (primary key) to join by.

Example 33 : Common rows in both the tables

```
df1 = data.frame(ID = c(1, 2, 3, 4, 5),
                  w = c('a', 'b', 'c', 'd', 'e'),
                  x = c(1, 1, 0, 0, 1),
                  y=rnorm(5),
                  z=letters[1:5])

df2 = data.frame(ID = c(1, 7, 3, 6, 8),
                  a = c('z', 'b', 'k', 'd', 'l'),
                  b = c(1, 2, 3, 0, 4),
                  c =rnorm(5),
                  d =letters[2:6])
```

INNER JOIN returns rows when there is a match in both tables. In this example, we are merging df1 and df2 with ID as common variable (primary key).

> df3 = inner_join(df1, df2, by = "ID")

If the primary key does not have same name in both the tables, try the following way:

> inner_join(df1, df2, by = c("ID"="ID1"))

```
  ID w x          y z a b          c d
1  1 a 1 -0.9934455 a z 1 -0.6556326 b
2  3 c 0 -1.4342218 c k 3 -1.4055054 d
```

Output : INNER JOIN

Example 34 : Applying LEFT JOIN

LEFT JOIN : It returns all rows from the left table, even if there are no matches in the right table.

> left_join(df1, df2, by = "ID")

```
  ID w x          y z    a  b          c    d
1  1 a 1 -0.9934455 a    z  1 -0.6556326    b
2  2 b 1 -1.3061685 b <NA> NA         NA <NA>
3  3 c 0 -1.4342218 c    k  3 -1.4055054    d
4  4 d 0 -0.8628479 d <NA> NA         NA <NA>
5  5 e 1  1.7037992 e <NA> NA         NA <NA>
```

Output : LEFT JOIN

Combine Data Vertically

intersect(x, y)
Rows that appear in both x and y.
union(x, y)
Rows that appear in either or both x and y.

setdiff(x, y)
Rows that appear in x but not y.

Example 35 : Applying INTERSECT

Prepare Sample Data for Demonstration

```
mtcars$model <- rownames(mtcars)
first <- mtcars[1:20, ]
second <- mtcars[10:32, ]
```

INTERSECT selects unique rows that are common to both the data frames.

```
intersect(first, second)
```

Example 36 : Applying UNION

UNION displays all rows from both the tables and removes duplicate records from the combined dataset. By using **union_all function**, it allows duplicate rows in the combined dataset.

```
x=data.frame(ID = 1:6, ID1= 1:6)
y=data.frame(ID = 1:6,  ID1 = 1:6)
union(x,y)
union_all(x,y)
```

Example 37 : Rows appear in one table but not in other table

```
setdiff(first, second)
```

Example 38 : IF ELSE Statement

Syntax :

```
if_else(condition, true, false, missing = NULL)
```

true : Value if condition meets
false : Value if condition does not meet
missing : Value if missing cases.It will be used to replace missing values (Default : NULL)

```
df <- c(-10,2, NA)
if_else(df < 0, "negative", "positive", missing = "missing value")
```

Create a new variable with IF_ELSE
If a value is less than 5, add it to 1 and if it is greater than or equal to 5, add it to 2. Otherwise 0.

```
df =data.frame(x = c(1,5,6,NA))
df %>% mutate(newvar=if_else(x<5, x+1, x+2,0))
```

x	newvar
1	2
5	7
6	8
NA	0

Output

Nested IF ELSE
Multiple IF ELSE statement can be written using if_else() function.
See the example below -

> mydf =data.frame(x = c(1:5,NA))
> mydf %>% mutate(newvar= **if_else**(is.na(x),"I am missing",
> if_else(x==1,"I am one",
> if_else(x==2,"I am two",
> if_else(x==3,"I am three","Others")))))

Output

```
   x          flag
1  1       I am one
2  2       I am two
3  3     I am three
4  4         Others
5  5         Others
6 NA I am missing
```

SQL-Style CASE WHEN Statement

We can use **case_when()** function to write nested if-else queries. In case_when(), you can use variables directly within case_when() wrapper. **TRUE** refers to ELSE statement.

```
mydf %>% mutate(flag = case_when(is.na(x) ~ "I am missing",
                                  x == 1 ~ "I am one",
                                  x == 2 ~ "I am two",
                                  x == 3 ~ "I am three",
                                 TRUE ~ "Others"))
```

Important Point

> Make sure you set **is.na()** condition at the beginning in nested ifelse. Otherwise, it would not be executed.

Example 39 : Apply ROW WISE Operation

Suppose you want to find maximum value in each row of variables 2012, 2013, 2014, 2015. The **rowwise()** function allows you to apply functions to rows.

> df = mydata %>%
> **rowwise()** %>% mutate(Max= max(Y2012:Y2015)) %>%
> select(Y2012:Y2015,Max)

Y2012	Y2013	Y2014	Y2015	Max
1186741	1852841	1558906	1916661	1916661
1512804	1985302	1580394	1979143	1979143
1907284	1363279	1525866	1647724	1907284
1216675	1591896	1360959	1329341	1329341
1921845	1156536	1388461	1644607	1921845

Output

Example 40 : Combine Data Frames

Suppose you are asked to combine two data frames. Let's first create two sample datasets.

> df1=data.frame(ID = 1:6,
> x=letters[1:6])
> df2=data.frame(ID = 7:12,
> x=letters[7:12])

The **bind_rows() function** combine two datasets with rows. So combined dataset would contain **12 rows (6+6) and 2 columns.**

> xy = bind_rows(df1,df2)

It is equivalent to base R function rbind.

> xy = rbind(df1,df2)

df1	
ID	x
1	a
2	b
3	c
4	d
5	e
6	f

df2	
ID	x
7	g
8	h
9	i
10	j
11	k
12	l

Input Datasets

The **bind_cols() function** combine two datasets with columns. So combined dataset would contain **4 columns and 6 rows.**

> xy = bind_cols(x,y)
> **or**
> xy = cbind(x,y)

The output is shown below-

ID	x	ID	x
1	a	7	g
2	b	8	h
3	c	9	i
4	d	10	j
5	e	11	k
6	f	12	l

cbind Output

Example 41 : Calculate Percentile Values

The **quantile()** function is used to determine Nth percentile value. In this example, we are computing percentile values by variable Index.

```
mydata %>% group_by(Index) %>%
 summarise(Pecentile_25=quantile(Y2015, probs=0.25),
          Pecentile_50=quantile(Y2015, probs=0.5),
          Pecentile_75=quantile(Y2015, probs=0.75),
          Pecentile_99=quantile(Y2015, probs=0.99))
```

The **ntile()** function is used to divide the data into N bins.

```
x= data.frame(N= 1:10)
x = mutate(x, pos = ntile(x$N,5))
```

Example 42 : Automate Model Building

This example explains the advanced usage of **do() function**. In this example, we are building linear regression model for each level of a categorical variable. There are 3 levels in variable cyl of dataset mtcars.

```
length(unique(mtcars$cyl))
```

Result : 3

```
by_cyl <- group_by(mtcars, cyl)
models <- by_cyl %>% do(mod = lm(mpg ~ disp, data = .))
summarise(models, rsq = summary(mod)$r.squared)
models %>% do(data.frame(
  var = names(coef(.$mod)),
  coef(summary(.$mod)))
)
```

rsq
0.64840514
0.01062604
0.27015777

Output : R-Squared Values

if() Family of Functions
It includes functions like select_if, mutate_if, summarise_if. They come into action only when logical condition meets. See examples below.

Example 43 : Select only numeric columns

The **select_if()** function returns only those columns where logical condition is TRUE. The **is.numeric** refers to retain only numeric variables.

```
mydata2 = select_if(mydata, is.numeric)
```

Similarly, you can use the following code for selecting factor columns -

```
mydata3 = select_if(mydata, is.factor)
```

Example 44 : Number of levels in factor variables

Like select_if() function, summarise_if() function lets you to summarise only for variables where logical condition holds.

```
summarise_if(mydata, is.factor, funs(nlevels(.)))
```

It returns 19 levels for variable Index and 51 levels for variable State.

Example 45 : Multiply by 1000 to numeric variables

```
mydata11 = mutate_if(mydata, is.numeric, funs("new" = .* 1000))
```

Example 46 : Convert value to NA
In this example, we are converting "" to NA using **na_if()** function.

```
k <- c("a", "b", "", "d")
na_if(k, "")
```

Result : "a" "b" NA "d"
Endnotes

There are hundreds of packages that are dependent on this package. The main benefit it offers is to take off fear of R programming and make coding effortless and lower processing time. However, some R programmers prefer **data.table** package for its speed. I would recommend learn both the packages. The data.table package wins over dplyr in terms of speed if data size greater than 1 GB.

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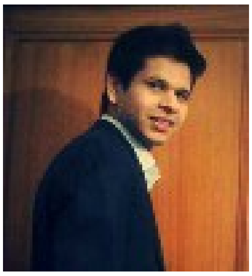

Deepanshu founded ListenData with a simple objective - Make analytics easy to understand and follow. He has over 7 years of experience in data science and predictive modeling. During his tenure, he has worked with global clients in various domains like banking, Telecom, HR and Health Insurance.

While I love having friends who agree, I only learn from those who don't.

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